

THE SINGARENI COLLIERIES COMPANY LTD

(A Government Company)



SINGARENI THERMAL POWER PROJECT STAGE-II (1x800 MW)

TECHNICAL SPECIFICATION

FOR

EPC PACKAGE

PART – A

SECTION – VI

BIDDING DOCUMENT NO.:CW-CM-11159-C-O-M-001

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PART-A

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**



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SUB-SECTION – I

INTENT OF SPECIFICATION

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CLAUSE NO.	INTENT OF SPECIFICATION		
1.00.00 1.01.00	INTENT OF SPECIFICATION Scope of the proposal The complete scope of the proposal for the Design, Engineering, Manufacture, Supply, Construction, Erection, Testing & Commissioning works for the EPC Package for Singareni Thermal Power Project Stage-II (1X800 MW), shall be on the basis of single point responsibility, completely covering the following activities and services in respect of all the equipment & works specified and covered under the specifications : a) Basic Engineering of the plant including preparation of Plant Definition Manuals; b) Detailed design of all the equipment and equipment system(s) including civil, structure steel works included in bidder's scope. c) Providing engineering drawings, equipment sizing & performance data, instruction manuals, as built drawings and other information; d) Compliance with statutory requirements and obtaining clearances from statutory authorities, wherever required; e) Complete manufacturing including shop testing/type testing; f) Complete Civil, Structural and Architectural works, including survey, providing construction offices, field laboratory and construction equipments, construction water supply, construction power distribution from the supply point of Employer, infrastructure works, construction / permanent roads, drainage arrangements, fencing / boundary wall around the land boundary. g) Packing and transportation from the manufacturer's works to the site including logistic studies, customs clearance & port clearance, port charges, if any. h) Receipt, storage, preservation, handling and conservation of equipment at the site; i) Fabrication, pre-assembly, if any, erection, testing, commissioning and completion of facilities including putting into satisfactory operation all the equipment including successful completion of initial operation; j) Performance and guarantee tests will be carried out along with the initial operation; k) Furnishing of spares on FOR site basis; l) Reconciliation with customs authorities, as required. m) Conclusion of the contract. n) Insurance and other requirements for the complete EPC package in accordance with the provisions of general conditions of contract (Section-IV) of the bidding document. The requirements, conditions, appendices etc. given in Technical Specifications (Section-VI, Parts A, B, C, D and E) shall apply to and shall be considered as a part of this volume as completely as if bound herewith. The work to be carried out as per the above scope shall be all in accordance with the requirements, conditions, appendices, etc., stated in Section GCC, which shall be considered as a part of the Technical Specification (Section VI) as completely as if bound herewith. The Contractor shall be responsible for providing all material, equipment and service, which are required to fulfill the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under this specification, irrespective of whether it has been specifically listed herein or not. It is not the intent to specify herein all aspects of design and construction; nevertheless, the equipments and civil works shall conform in all aspects to high standard of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in a manner acceptable to the Employer, who will interpret the meaning of the specification and drawings and shall have a right to reject or accept any work or material which in his assessment is not complete to meet the requirements of this specification and/or applicable to Indian/ International standards mentioned elsewhere in this specification.		
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1.02.00	Bidders are requested to carefully examine and understand the specifications and seek clarifications, if required, to ensure that they have understood the specifications. Such clarifications should be sought within the time period as stipulated in section ITB. Bidder's offer should not carry any sections like clarifications, interpretations and/or assumptions. However, if the bidder feels that, in his opinion, certain features brought out in his offer are superior to what has been specified, these may be highlighted separately. Bidder may also make alternate offers provided such offers are superior, in his opinion, to the requirements of these specifications in which case adequate technical information, operating feed back, etc. are to be enclosed with the offer, to enable the Employer to assess the superiority and reliability of the alternatives offered. In case of each alternative offer, its implications on the performance, guaranteed efficiency, auxiliary power consumption, etc. shall be clearly brought out. In any case, the base offer shall necessarily be in line with the specifications. Under no circumstances the equipment/systems as specified herein shall be brought out as an alternative offer i.e. the system/equipment specified shall be made as a base offer. In case the above requirements are not complied with, the offers may be considered as incomplete and would become liable for rejection.			
	This enquiry concerns one (1) power generating units each having a rated output of 800 MW, including but not limited to: ➤ Steam Generators and Auxiliaries including, - Complete pressure parts, structures, platforms, stairs, piping, valves, supports etc. - Soot blowing system with piping, valves, controls etc. - Coal feeder and complete milling system - Coal combustion system including coal / oil burners & scanners. - NA - Air and flue gas ductwork. - Primary air fans. - Forced draft fans. - Induced draft fans. - Aux PRDS and piping - Start up & circulation system, - Air heaters & SCAPH. - Fuel oil pressurizing system (Common system) - Elevators for Steam generators - Chemical LP Dozing system and Oxygenated Treatment system - Electrostatic Precipitators. - Wet Limestone based Flue Gas Desulphurization System - Other systems like tools & tackles etc. as specified. ➤ Turbo Generators including, - Steam turbines. - Condensing plant. - Complete Regenerative Feed system.			
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	- HP-LP Bypass system. - Low Pressure Chemical Dosing system. - Condensate Extraction Pumps. - Boiler Feed Pumps - Condensate transfer pumps - Turbine hall E.O.T. crane. - Power cycle piping - Low pressure piping. - Equipment cooling water system - Boiler fill system ➤ Water Treatment Plant Including, - DM plant and CW chemical treatment. - Pre treatment and liquid effluent treatment plant - Chlorination plant - Condensate polishing unit including regeneration facility ➤ Cooling Water System including, - Equipment Cooling water system including ACW pumps. - Circulating water system including CW pumps - Cooling towers for circulating water system - Aux water system including Raw water pumps ➤ Plant Utilities including, - Compressed air system - Air conditioning and ventilation system - Fire detection and protection system ➤ Material Handling System including, - Mill Reject Handling system. - Coal & Biomass Handling Plant - Ash Handling system - Fuel Oil Handling Plant ➤ Elevators, Cranes and Hoisting equipments ➤ Electrical Equipments including, - Main generator and associated equipment. - All Transformers. - Bus ducts. - Medium and low-voltage switchgear, motor control centres. - Motors & Cables etc. - Illumination, Earthing, Lightning protection, DG sets, Batteries, Battery Chargers, Overhead lines etc.		
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2.00.00	- Electrical systems as required. - Switchyard ➤ Control and Instrumentation system along with accessories and Instrument Cables. ➤ Civil works for the complete plant covered under bidder's scope shall be as mentioned in Sub-Section II-D, Section VI, Part-A of the specification. ➤ Complete Mechanical, Civil, Electrical & C&I works related to raw water System. ADDITIONAL REQUIREMENTS (a) Before submitting his bid, the Bidder should inspect and examine the site and its surroundings and should satisfy himself as to the nature of the ground and subsoil, the quantities and nature of work, materials necessary for completion of the work and their availability, means of access to site and in general shall himself obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect his offer. No consequent extra claims on any misunderstanding or otherwise shall be allowed by the Employer. (b) Bidder shall take all necessary precautions to protect all the existing equipment, structures, facilities and buildings etc. from damage. In case any damage occurs due to the activities of the contractor on account of negligence, ignorance, accidental or any other reason whatsoever, the damage shall be immediately made good by the contractor at his own cost to the satisfaction of the Employer. The contractor shall also take all necessary safety measures with specific reference to excavation in rock, at his own cost, to avoid any harm or injury to his workers and staff from the equipment and facilities of the power plant. (c) For his site office and covered store buildings, the contractor shall adopt pre-engineered / pre-fabricated constructions made of steel with single / double skin, insulated or uninsulated roof and wall coverings (fabricated out of permanently color coated metal sheets). Alternatively, contractor can adopt readymade 'Porta cabin' or similar construction. Contractor shall ensure that all such constructions are well engineered, neatly constructed and overall present a pleasing look. (d) In line with Gazette Notification on Ash Utilization issued by MOEF and its amendment thereafter, contractor shall use ash and ash based products in works as specified in these specifications, drawings and as per instructions of the Engineer. He shall also use ash and ash based products in construction of his offices, stores, staff quarters and labour huts etc. He shall furnish a compliance report along with all details of use of ash and ash based products along with each bill. (e) Contractor shall establish/set up at site suitable repair facilities for construction plant, equipment and machinery (like piling rigs, cranes batching plant, dewatering pumps etc.) In case of piling rigs, cranes, batching plant etc. he will also make arrangements / tie up with equipment manufacturers / suppliers for periodic overhaul/maintenance and for major breakdown, if any. He shall also keep adequate stock of spares at site for various plant, equipment and machinery to meet day to day requirements as recommended by the equipment manufacturer/suppliers or as instructed by the Engineer. Contractor shall deploy dedicated qualified, full time mechanical/electrical foreman/supervisors for manning the repair facilities as specified above. 3.00.00 TENDER DRAWINGS The tender drawings are enclosed along with the specification as Part-E, Section-VI and shall supplement the requirements specified in these technical specifications. The scope and		
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4.00.00 OTHER GENERAL REQUIREMENTS Items though not specifically mentioned in the specification but needed to complete the equipment/systems to meet the intent of specification, shall also be deemed to be included unless otherwise specifically mentioned in exclusions. In addition to the scope of supply and services indicated in other Sub-Sections of the scope of supply and services, the other general requirements are covered in this sub-section as part of the scope of the Contractor. 4.01.00 Paints The Contractor's scope of work includes supply of paints and painting of all equipments and structures as per stipulated requirements and the Employer's standard color coding scheme. 4.02.00 Pre-commissioning and commissioning activities The Contractor's scope shall include all pre-commissioning and commissioning activities, materials and services as detailed in other portions of technical specifications including supply of all consumables (except coal, oil and limestone for which subsequent para may be referred), temporary equipment and pipings, instruments, labour / skilled manpower's etc. The scope includes the complete requirement of flushing oils including fresh oil refilling during the pre-commissioning and commissioning activities and subsequent initial operation. The Employer shall issue the following quantities of Fuel oil and Coal per unit for firing up to successful completion of "Initial Operation" (as defined in General Technical Requirements, Part-C, Section-VI of Technical Specification) for each unit free of charge. <table border="1"> <tr> <td>Unit Size</td><td>800 MW</td></tr> <tr> <td>Fuel Oil</td><td>11200 kL</td></tr> <tr> <td>Coal</td><td>3.7 lakh MT</td></tr> </table> Fuel oil and coal required for the successful completion of the "Initial Operation", more than the above-specified quantity limits, would be issued by the Employer. However, the Employer shall charge the Contractor the cost of these as per the prevailing landed rates at the site at that time. Coal quantity issued free by the Employer shall be corrected for variation above/below 60% of the rated load during the period of initial operation as per the following: The coal quantity issued free by the Employer for each unit = X kg for an average load of 60% of the rated value during the initial operation Coal Consumption for the unit during Initial Operation = Y kg Average Load for the unit during Initial Operation = L % of rated load Corrected Coal quantity issued free by the Employer for unit = $X + [Y * (L - 60) / L]$ There will be no correction for Oil Quantity issued free by the Employer. The employer shall issue the total required limestone free of charge for such purposes. 4.03.00 First Fill of Consumable, Oils & Lubricants i. All the first fills of consumables and one year's topping requirements of consumables such as greases, oil, lubricants, servo fluids / control fluids, gases (excluding H₂, CO₂ and N₂ for	Unit Size	800 MW	Fuel Oil	11200 kL	Coal	3.7 lakh MT	
Unit Size	800 MW						
Fuel Oil	11200 kL						
Coal	3.7 lakh MT						
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ii. 4.04.00 4.05.00 4.06.00 4.07.00 4.08.00	Generator) and essential chemicals etc. which will be required to put the equipment covered under the scope of specifications, into successful commissioning / initial operation and to establish completion of facilities shall be supplied by the Contractor. Suitable standard lubricants as available in India are desired. Efforts should be made to limit the variety of lubricants to minimum. Bidder shall supply a quantity not less than 10% of the full charge or one (1) year topping requirement mentioned above (Whichever is higher) of each variety of lubricants, servo fluids gases, etc.(as detailed above) used which is expected to be utilized during the first year of operation. This additional quantity shall be supplied in separate Containers. Bidder scope shall supply H2, CO2 and N2 as applicable for the Generator till successful commissioning of the Generator.			
	Guarantee Tests The guarantee tests for various equipment and systems shall be carried out as specified under chapter of Functional Guarantees and Liquidated damages, of this part of technical specification. All special equipment, tools and tackles, instruments, measuring devices required for the successful conductance of Guarantee Tests shall be provided by the contractor. All costs associated with the tests shall be included in bid price.			
	Spares The scope of supply of contractor includes supply of mandatory spares, start-up and commissioning spares, recommended spares, consumable spares and other spares as required for plant erection, testing, commissioning, startup, initial operation etc.			
	Special Tools & Tackles and Test/Measuring Equipment One set of all special tools and tackles including testing, calibrating and measuring instruments required for erection, assembly, disassembly and maintenance and testing of all equipment/systems covered under the scope of the contractor shall be supplied by the Contractor as per relevant clause indicated in Part-C of Section-VI and as specified elsewhere in Part-A of Section-VI of Technical Specifications. The Contractor shall not use these special tools, tackles and testing/measuring equipment for erection/commissioning purposes and shall be in an unused and new condition, when they are handed over to the Employer. A list of all such special tools and tackles shall be submitted along with the offer.			
	The scope of the Contractor includes complete design and engineering, technical co-ordination (including participation and arranging technical co-ordination meetings), finalization of drawings/documents, submission of engineering drawing/documents and processing of their approvals by the Employer as per requirement indicated in Part-C of section -VI and other relevant clauses given elsewhere in the Technical Specifications. Further, the scope shall also include submission, in proper shape and format, of all types of manuals, handbooks and documents in requisite numbers to the Employer at different phases of the project as per the requirement of Employer.			
	All the plant layouts shall be made in computerized 3D modelling system as detailed in Part C of the Technical Specification. Contractor shall prepare the model of all the facilities located within plant boundary covering facilities in Main Plant Block area and Balance of plant (BOP) area in an integrated & intelligent 3D software solution. Main Plant Block area shall include, Transformer Yard, TG building (including all facilities), Boiler area, ESP area, chimney area, FGD area and any other facility located in main plant block. BOP area shall include all facilities pertaining to AHP, CHP, , DM PT plant, pipe & cable racks and any other facility located within plant boundary. Contractor shall prepare 3D design review model (network ready, which shall include visual interference check, walk-through animation, video simulation for major equipment placement and removal, visual effect, photo realism etc), which is extracted from intelligent 3D model, for employer's review as & when desired by employer. However, all piping layouts, equipment			
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	layouts, floor plans, ducting layout (Air/flue gas, A/C, Ventilation etc.) and structural arrangement drawings shall necessarily be extracted from the aforesaid 3D model and submitted for employer's review along with the 3D review model to enable Engineering Consultant of SCCL to review and approve these drawings. The contractor shall prepare the 3D model indicating the control & instrumentation equipments, devices such as location of LIE,LIR, flow elements, instrument tappings, thermowell stubs, JBs , cable trays, Flame scanners, Flame viewing cameras, ASLD, Acoustic Pyrometer, Control valves & actuators, Coal bunker level instruments along with approach / maintenance platform, provided for all these equipment's/devices. The LIE & LIR shall be placed in such a way that the doors can be opened freely from front & back side for ease of maintenance. The cable tray layout shall be implemented in such a way that the fouling to the pipes, ducts and other structures can be avoided. These above drawings are to be extracted from the said 3D model and submitted for employers review and approval.		
4.09.00	The Contractor shall be responsible to undertake some activities related to its Corporate Social Responsibility (CSR) in the immediate vicinity of the project. The Contractor shall undertake such activities after prior consultations with the Employer to ensure that the efforts of the Employer and Contractor are complemented. The vendor / contractor is expected to carry out the CSR activities as per the provision (Rules) under section 135 of the companies Act 2013 relating to CSR and other circulars / instructions of various government departments viz MoEF etc. The share of CSR expenditure to be incurred by the vendor / contractor for this project in the total CSR expenditure incurred by the vendor/contractor as a company will be in the same proportion as the turnover of the project concerned to the total company turnover. This will be certified by the chartered accountant once every fiscal year. Such activities will be undertaken by the contractor / vendor in consultation with the Employer.		
4.10.00	The vendor / contractor shall visit the site to ascertain the position of land acquisition etc. and it is presumed that the contractor submitted his bid after considering the facts on the ground and that once vendor / contractor is successful in his bid, he will work in cooperation with the client for smooth execution of the project.		
4.11.00	The scope of the contractor shall also include supply and installation of e-learning packages for the equipment / system for the Steam Turbine Generator & auxiliaries and Steam Generator & auxiliaries along with associated electrical and C&I system as indicated in Part-C of Section-VI.		
5.00.00	GENERAL ENVIRONMENTAL REQUIREMENTS The contractor shall execute all work at site as per the general environmental requirement and following the applicable codal provisions and local regulations in this respect. The contractor shall provide and install suitable safeguards and facilities as approved by the Engineer for meeting general environment requirements given herein under.		
5.01.00	Protect from damage and disturbance of the existing trees, shrubs, any other plants, pole lines, fences, signs, monuments, buildings, pipe lines, drains, sewers, or other surface or sub-surface systems / facilities within or adjacent to the works being carried out given herein below.		
5.02.00	Take all necessary precautions against soil erosion, water and environmental pollution and safe disposal of waste material.		
5.03.00	Control the ground in the vicinity of all excavations, so that the surface of the ground is properly sloped or dyked to prevent surface water from running into the excavated areas, during construction.		
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5.04.00	All natural materials arising out of site clearance and excavation shall be the property of owner. All salvaged materials of archaeological importance or of value (in the opinion of the Engineer) shall be segregated from the other materials and stacked separately at locations as indicated by the Engineer.		
5.05.00	The method and arrangement of blast cleaning shall conform to factory act, local laws, stipulations of pollution control board, if any.		
5.06.00	a) Excavated earth should be stockpiled properly at designated areas so as not to spread and cause air pollution (fugitive dust emission) and water pollution (suspended solids in run-off). Top soil (top 150mm layer of the fertile soil) may be stored separately for future use in landscaping / revegetation / horticulture. b) Solid wastes generated during construction such as construction debris, excess cement / concrete, wrapping materials (e.g. plastic packets and wrappers), timber, tins, cans and drums, wire, nails, glass etc., chemical wastes and hazardous wastes, food and domestic wastes etc., should be properly disposed off so as not to cause any air / water pollution. c) Potential pollutants (such as oils, chemicals) shall be kept, stored, and used in such a manner that any escape can be contained and the surface and ground water resources are not contaminated. d) Water containing pollutants such as cements, concrete, lime, chemicals and oils shall be discharged through a temporary sedimentation and equalization tank. e) The necessary precautions shall be taken to control emission of fugitive dust and suspended solids in effluents leading to sedimentation of receiving water bodies. f) Provide necessary sanitation facilities to the labour camps. g) All vehicles and equipment shall be kept in good working order and serviced regularly to maintain the exhaust emissions and noise levels within reasonable limits. h) Control the movement of all vehicles so as to minimize disruption to regular users of the routes. i) The speed of the vehicles on gravel or earth roads in and around site may be restricted to minimize the emission of fugitive dust. Further, the road surface of gravel or earth roads may be provided with suitable cover to reduce the emission of fugitive dust.		
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SUB-SECTION-I-A

PROVENNESS

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The bidder/its sub-vendor(s) is required to meet the provenness criteria and/or qualification requirement for the items/ services listed below as per the stipulated criteria indicated in the respective clauses. For the purpose of qualification of Bidders / Sub-vendor(s), experience shall be reckoned as on the LOA date of EPC package unless otherwise specified in the respective clauses. **The Bidder/its Sub vendor(s) shall be a company incorporated in India under the Companies Act of India for Collaborator(s) / Associate / Licensor / Technology provider route as specified in various clauses of the provenness requirement for equipment/systems.**

1.0 Provenness of Turbine Set

- (a) The turbine set offered shall be built up using proven design modules of HP, IP (or Combined HP-IP ,if applicable) and LP turbines of the Qualified Steam Turbine Generator Manufacturer. The offered HP turbine module should have been in successful operation with Super critical pressure and Main steam temperature of 593 deg C or higher for a period of not less than one (1) year prior to the date of techno commercial bid opening. The offered IP turbine module should have been in successful operation with Reheat steam temperature of 593 deg C or higher for a period of not less than one (1) year prior to the date of techno commercial bid opening. In case Combined HP-IP turbine module is offered it shall meet the respective requirements of HP turbine and IP turbine modules as above. The offered LP turbine module should have been in successful operation for a period of not less than one (1) year prior to the date of techno commercial bid opening. The Bidder shall furnish experience list of HP, IP (or Combined HP-IP) and LP turbine modules offered to substantiate their provenness along with the techno commercial bid.
- (b) The turbine to be supplied under this contract shall be manufactured, assembled and tested in a factory where turbines of at least 500MW rating have been manufactured in the past. Alternatively the same can also be manufactured in the Indian Manufacturing Company under supervision of Qualified Steam Turbine Generator Manufacturer.

2.0 Provenness of Generator

- a) The generator offered shall be of proven design of the Qualified Generator Manufacturer, of 800 MW or above rating, which is in successful operation for a minimum period of one (1) year prior to the date of techno-commercial bid opening.

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b) The offered generator shall be similar in design and construction to the above proven generator in respect of:

- i. Cooling medium (e.g. water, Hydrogen etc.) and number of shaft mounted fans.
- ii. Thermal Class of Insulation for stator and rotor windings.
- iii. Core support system (e.g. spring type, rigid type etc.)
- iv. Type of Excitation system

c) The generator to be supplied under this contract shall be manufactured, assembled and tested in a factory where generator of at least 500MW rating have been manufactured in the past. Alternatively the same can also be manufactured in the Indian Manufacturing Company under supervision of Qualified Generator Manufacturer.

The Bidder shall furnish experience list for offered Generator to substantiate it's provenness along with the techno commercial bid.

3.0 Provenness criteria for critical equipment(s) and bought out items

3.1 The Bidder/ Sub vendor should have previously designed (either by itself or under collaboration / licensing agreement), manufactured / got manufactured the respective equipment(s) of the type and minimum equipment rating as stipulated below such that the respective equipment(s) are in successful operation in at least one (1) plant for a period not less than one (1) year .

Sl. No	Name of equipment	Type of equipment	Equipment rating
a)	PA Fans	Axial type (2 stage) with variable pitch control	Flow 210 M3/Sec (minimum) with Head 1130 mmWC (minimum) & Fan Speed 1500 rpm (maximum)
b)	ID Fans	Axial type (2 stage) with variable pitch control	Flow 525 M3/Sec (minimum) with Head 525 mmWC

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Sl. No	Name of equipment	Type of equipment	Equipment rating
			(minimum) & Fan Speed 900 rpm (maximum)
c)	FD Fans	Axial type with variable pitch control	Flow 365 M3/Sec (minimum) with Head 350 mmWC (minimum) & Fan Speed 1500 rpm (maximum)
d)	Coal Pulveriser	Bowl mill/Roller mill/Ball & Race mill/or approved equivalent	Minimum capacity -78 T/hr with: a) Coal pulverizing fineness not less than 70% through 200 mesh b) Coal input size up to 50 mm c) Total moisture in coal- 12% d) HGI of input coal-55
e)	Raw coal feeders	Gravimetric, belt type with minimum size of 36 inch	Capacity not less than 95 T/hr
f)	Boiler start up drain re-circulation pumps	Glandless pump with submerged type wet motor with external high pressure cooler.	Pump rating not less than that supplied for a 500 MW or higher size super-critical unit.
g)	Air pre-heaters	Rotary regenerative (Lungstorm or approved equivalent)-Bisector type or Trisector type with vertical axis of rotation	Air pre-heater rating not less than that supplied for a 500 MW or higher size unit.
h)	Booster Fans	Axial type with variable pitch control Application - Coal fired power plant	Flow 525 m3/s (min.) with Head 400 mmwc (min.) & Fan Speed 900 rpm (max.)

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Sl. No	Name of equipment	Type of equipment	Equipment rating
i)	NA	NA	NA
j)	Condenser	Condenser of the type specified	Condenser of a 500 MW or higher size steam turbine generator unit
k)	Condensate Extraction Pumps (CEP)	Vertical, cannister with double suction first stage impeller for steam turbine generator sets	Condensate Extraction Pump (CEP) rating not less than that supplied for minimum 660 MW size Steam Turbine Generator Unit
l)	Condenser Air Evacuation Pump	Liquid ring type for steam turbine generator sets	Free dry air capacity 20 SCFM at 1" of Hg (abs) at 21.1 deg C.
m)	Feed Water Low Pressure Heaters	Horizontal, U-tube type having condensing and drain cooling zones for steam turbine generator sets	Feed Water Low Pressure Heater of a 500 MW or higher size unit
n)	Feed water High Pressure Heaters	Horizontal, U-tube type, having integral desuperheating, condensing and drain cooling zones for steam turbine generator sets	Feed Water High Pressure Heater of a 500 MW or higher size unit.
o)	Deaerator	Horizontal / vertical, direct contact, spray or spray cum tray design for steam turbine generator sets	Deaerator of a 500 MW or higher size unit

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Sl. No	Name of equipment	Type of equipment	Equipment rating
p)	Boiler Feed Pumps (BFP)	Horizontal, centrifugal, multistage, outer casing barrel type with end rotor removal for supercritical steam turbine generator sets	Boiler Feed Pump (BFP) rating not less than that supplied for minimum 660 MW size Super-critical Steam Turbine Generator Unit
q)	HP Bypass system	HP Bypass system for supercritical steam turbine generator sets	Capacity of each valve not less than 750 Ton/hr at 270 Kg/Cm2(abs) & 600 deg.C Main Steam pressure and temperature at Turbine inlet.
r)	LP Bypass system	LP Bypass system for steam turbine generator sets	Capacity of each valve not less than 750 Ton/hr at pressure corresponding to 100% TMCR condition reheat pressure (abs) & 600 deg.C reheat temperature at Turbine inlet.

Bidder shall offer and supply only the type of the above equipment(s) for which it, itself or the manufacturer proposed by the Bidder for the above equipment(s) is qualified.

The provenness criteria for equipment (PA fans, ID fans, FD fans and Booster Fans) stipulated at Sl. No. (a), (b), (c) & (h) above shall also be considered acceptable provided the rating parameters (i.e., flow, head and rated rpm) is covered within the operating regime of the respective fan performance curve of the reference plant equipment.

- 3.2 In case the Bidder or the proposed Indian sub-vendor(s) is not manufacturer of proven equipment(s) as per clause 3.1 above then it should have manufactured such equipment(s) for units of at least 500 MW rating, and it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such equipment(s), in India with such

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manufacturer(s) who meet the requirements stipulated at clause 3.1 above for the respective equipment(s).

- 3.3 (a) A JV / Subsidiary Company formed for manufacturing and supply of equipment(s) as listed at clause no. 3.1 above in India, should have a valid collaboration or licensing agreement for design, engineering, manufacturing of such equipment(s) in India with a qualified equipment manufacturer who meets the requirements stipulated at clause 3.1 above (or the technology provider of the qualified equipment manufacturer). Further, in such a case, such qualified equipment manufacturers should have, directly or indirectly through its holding company/ subsidiary company, at least 26% equity participation in the Indian Joint Venture Company/ Subsidiary Company, which shall be maintained for a lock-in period of seven (7) years from the date of incorporation of such Joint Venture/ Subsidiary or up to the end of defect liability period of the contract, whichever is later.

OR

Indian Holding Company, of the Qualified Equipment Manufacturer who meets the requirements stipulated at clause 3.1 above for the respective equipment(s), should have a valid collaboration or licensing agreement for design, engineering, manufacturing of such equipment(s) in India with the qualified equipment manufacturer. Further, in such a case, such Indian Holding company shall maintain at least 51 % equity participation in the Qualified Equipment manufacturing company either directly or indirectly, which shall be maintained for a lock-in period of seven (7) years from the date of acquisition of such Qualified Equipment manufacturing company or up to the end of defect liability period of the contract, whichever is later.

- (b) Bidder shall be required to furnish a letter of support from Collaborator(s) / Licensor / Technology provider for successful performance of respective equipment(s) valid up to the end of defect liability period of the contract as per the format enclosed in the bidding document, at the time of placement of order on the approved sub-vendor.
- 3.4 Before taking up the manufacturing of such equipment(s) as per clause 3.2 and 3.3 above, the Bidder / its sub vendor(s) must create (or should have created) manufacturing and testing facilities at its works as per Collaborator / licensor's design, manufacturing and quality control system for such equipments duly certified by the Collaborator / licensor.

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Further, the Collaborator / Licensor shall provide (or should have provided) all design, design calculation, manufacturing drawings and must provide (or should have provided) technical and quality surveillance assistance and supervision during manufacturing, erection, testing, commissioning of equipments.

- 3.5 Bidder shall offer and supply only the type of the above equipment(s) for which it, itself or the manufacturer / Collaborator(s) / Licensor(s) proposed by the Bidder for the above equipment(s) is qualified.
- 3.6 The Employer reserves the right to fully satisfy himself regarding capability and capacity of Bidder / its sub-vendor(s) and the proposed arrangement and may prescribe additional requirement before allowing manufacture of the equipment listed above for this contract.

4.0 Provenness criteria for other equipments/ systems

4.1 Electrostatic Precipitator

Bidder / Bidder's sub-vendor should meet the qualifying requirement here under in clauses 4.1.1 or 4.1.2 or 4.1.3 as the case may be.

- 4.1.1 The Bidder/Bidder's sub-vendor should have designed, supplied, erected/ supervised erection and commissioned/supervised commissioning of rigid discharge framework Electrostatic Precipitators (of the type offered), having a designed efficiency of not less than 99%, operating in conjunction with pulverized coal fired steam generating units, rated for a minimum of 500MW unit size or minimum 1500 T/hr steaming capacity, which should have been in successful operation in at least one installation for a period not less than one (1) year.
- 4.1.2(a)(i) The Bidder/Bidder's sub-vendor should be an Engineering, Procurement and Construction (EPC) organization executing contracts for setting up of coal fired power plants and shall have experience of supplying at least one (1) no. coal fired power plant of 200 MW capacity or above comprising of Electrostatic Precipitators, which has been in successful operation for a period of not less than one (1) year.

Alternatively

- (a)(ii) The Bidder/Bidder's sub-vendor should be an Engineering, Procurement and Construction (EPC) organization and should have executed, in the last 10 years, large industrial projects on EPC basis (with or without civil works) in the area of power, steel, oil & gas, petro-chemical,

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fertilizer and / or any other process industry with the total value of such projects being INR 5,000 million or more. At least one of such projects should have a contract value of INR 2,000 million or more. These projects shall be in successful operation for a period of not less than one (1) year.

- (b) The Bidder/Bidder's sub-vendor who fulfill the requirements as per clause 4.1.2(a) (i) or 4.1.2(a) (ii) above shall Associate/Collaborate with an Electrostatic Precipitator manufacturer who meets the requirements of 4.1.1 above on its own. The Bidder/ Bidder's sub-vendor shall either source the Electrostatic Precipitator from such manufacturer or manufacture the Electrostatic Precipitator as per the design and manufacturing drawings released by such manufacturer under an on-going Collaboration agreement/ Technology Licensing Agreement.

Bidder shall be required to furnish a letter of support from Collaborator / Licenser / Technology provider for successful performance of Electrostatic Precipitator valid up to the end of defect liability period of the contracts as per the format enclosed in the bidding document, at the time of placement of order on the approved sub-vendor.

4.1.3

- (a) The Bidder/Bidder's sub-vendor should have designed, supplied, erected/ supervised erection and commissioned/ supervised commissioning rigid discharge framework Electrostatic Precipitators (of the type offered), having a designed efficiency of not less than 99%, operating in conjunction with pulverized coal fired steam generating units, in at least one installation rated for a minimum of 200 MW unit size or minimum 600T/hr steaming capacity, which should have been in successful operation for a period not less than one (1) year.
- (b) The Bidder/ Bidder's sub-vendor who fulfill the requirements at clause 4.1.3(a) above, shall also have an on-going Collaboration Agreement/Technology Licensing agreement prior to the date of submission of proposal for sub-vendor with such a manufacturer of Electrostatic Precipitators, who meets the requirements of clause 4.1.1 above.

Bidder shall be required to furnish a letter of support from Collaborator / Licenser / Technology provider for successful performance of Electrostatic Precipitator valid for a period of 07 (seven) years or up to the end of defect liability period of the contract whichever is later, as per the format enclosed in the bidding document, along with the techno commercial bid.

Notes to clause 4.1.1, 4.1.2 & 4.1.3

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- (1) "Qualified Electrostatic Precipitator Manufacturer" means a manufacturer meeting requirements stipulated at 4.1.1.
- (2) The Bidder/ Bidder's sub-vendor shall also be considered qualified, in case the award for executing the reference works (Electrostatic Precipitator set) has been received by the Bidder/ Bidder's sub-vendor either directly from owner of plant or any other intermediary organization. However, a certificate from such owner of plant or any other intermediary organization shall be required to be furnished by the Bidder/ its sub-vendor in support of Bidder/ Bidder's sub-vendor claim of meeting the qualification requirement as per 4.1.1 or 4.1.2 or 4.1.3 above. Further, certificate from owner of the plant shall also be furnished by the Bidder/ Bidder's sub-vendor for the successful operation of the Electrostatic Precipitator as specified at clause 4.1.1 or 4.1.2 or 4.1.3 above, whichever is applicable.
- (3) Whenever the term 'coal fired' is appearing above, "Coal" shall be deemed to also include bituminous coal/brown coal/lignite.

4.2 CW Pumps

The Bidder/its Sub-vendor should meet the qualifying requirements of any one of the qualifying routes stipulated under clause 4.2.1 or 4.2.2 or 4.2.3.

4.2.1 The Bidder/its sub-vendor should have designed either by itself or through its Collaborator/ Associate, manufactured/got manufactured, supplied, erected/supervised erection, and commissioned / supervised commissioning of at least one (1) no. vertical wet pit pump or one (1) no. concrete volute pump or one (1) no. metallic volute pump with concrete encasement, each of rated capacity 42000 cum/hr. or offered rated capacity whichever is lower, having specific speed in the range of 4000–7000 (*) (US units) which should have been in successful operation for at least one (1) year.

In case the bidder/its sub-vendor has acquired the design and technology of the offered pump model from its collaborator under the Technology transfer/Assistance/Licensing Agreement and has executed/is executing the contract(s) for the offered pump model involving design, manufacturing, supply, erection and commissioning, the bidder/its sub-vendor is required to submit the copy of whole/part of the agreement or any other supporting document(s) establishing technology transfer covering drawings/documentation of design, manufacturing, quality assurance plans and imparting relevant training of personnel. Further, the bidder/its sub-vendor shall be required to submit a letter for satisfactory performance of CW pumps along with the techno-commercial bid, as per the format enclosed in the bidding documents.

4.2.2 Bidder/its sub-vendor who has designed by itself, manufactured/got manufactured, supplied, erected/supervised erection, and commissioned/supervised commissioning of at least one (1) no. vertical wet pit pump or one (1) no. concrete volute pump or one (1) no. metallic volute pump with concrete encasement, each of rated capacity 15,000 cum./hr. or more, having a specific speed in the range of 4000–7000 (*) (US units) which should have been in successful operation for at least one (1)

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year can also participate, provided it associates/ collaborates with a firm who in turn meets the requirements of 4.2.1 above.

4.2.3 The Bidder/its sub-vendor should be a wholly or partially (with minimum 51% holding) held Indian subsidiary of a firm who in turn meets the requirements of clause 4.2.1. Further, the Bidder/its sub-vendor should have executed/be executing atleast one (1) Contract involving design, manufacture/got manufactured, supply, erection/supervision of erection, and commissioning/supervision of commissioning of at least one (1) no. vertical wet pit pump or one (1) no. of concrete volute pump or one (1) no. of metallic volute pump with concrete encasement, each of rated capacity 15,000 cum/hr or more, having specific speed in the range of 4000–7000 (*) (US units).

Notes for 4.2:

(i) For qualification under clause 4.2.2 & 4.2.3, the Collaborator / Associate / Holding company can meet the requirements stipulated under clause 4.2.1 above either singularly or collectively along with its Subsidiaries.

In such a case, the Bidder/its sub-vendor shall be required to furnish a letter of technical support from Collaborator / Associate / Holding company along with all its subsidiaries extending support to the holding company / Associate or collaborator for complying requirements of clause 4.2.1 for successful performance of CW pumps, as per the format enclosed in the bidding document. This letter of technical support should be submitted to Employer prior to the placement of order on approved sub-vendor.

(ii) The Bidder/its sub-vendor should offer only the type of CW pumps i.e., vertical wet pit type pumps or concrete volute type pumps or metallic volute pumps with concrete encasement for which the Bidder/ its sub-vendor/ Collaborator/ Associate/ Holding Company of the Bidder/its sub-vendor (i.e., the firm meeting requirements of clause 4.2.1 above) is qualified.

(iii) (*) Specific speed as stipulated above is the specific speed calculated at the best efficiency point of the pumps as defined in Hydraulic Institute Standards (HIS).

4.3 Induced Draught Cooling Tower

The Bidder/its Sub-vendor should meet the qualifying requirements of any one of the qualifying routes stipulated under clause 4.3.1 or 4.3.2 or 4.3.3.

4.3.1 The bidder/ its sub-vendor should have designed, constructed, and commissioned at least one (01) number Induced Draught Cooling Tower in RCC or Pultruded Fiberglass Reinforced Plastic (FRP) Construction of capacity not less than 13000m³/hr which should have been in successful operation for at least one (1) year.

In case the reference cooling tower was designed by a party other than the Bidder /its sub vendor, the Bidder/ its sub vendor shall employ a cooling tower Design Agency, who has independently designed an Induced Draught Cooling Tower of same type as being offered of capacity not less than 13,000 Cu.M/Hr in RCC or Pultruded Fiberglass Reinforced Plastic (FRP) construction and which should have been in successful operation for at least one (1) year.

Further, if such design agency has not carried out the engineering activities by itself in respect of the system of the reference installation against which the design agency is seeking the qualification, then the engineering of the package shall be carried out by an Engineering firm who should have

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engineered an Induced Draught Cooling Tower of same type & construction as being offered of capacity not less than 13,000 Cu.M/Hr in RCC or Pultruded Fiberglass Reinforced Plastic (FRP) construction and which should have been in successful operation for at least one (1) year.

In such a case, the Bidder shall be required to furnish a letter of technical support from the Cooling Tower Design Agency and Engineering firm (as applicable) for successful performance of Cooling Tower system, as per the format enclosed in the bidding document. This letter of technical support should be submitted to Employer prior to the placement of order on approved sub-vendor.

OR

4.3.2 The Bidder/ its sub-vendor should be a wholly or partially (with minimum 51% holding) held Indian subsidiary of a firm who in turn meets the requirements of clause 4.3.1 above. Further, the Bidder/ its sub-vendor on its own or along with its Holding company should have executed/ be executing at least one contract involving design, construction, and commissioning of at least one (1) number Induced Draft Cooling Tower in RCC/ Pultruded Fiberglass Reinforced Plastic (FRP) Construction of capacity not less than 6500m³/hr.

In such a case, the Bidder/its sub-vendor should furnish a letter of technical support from Holding Company (i.e., the firm meeting requirements of clause 4.3.1 above) for successful performance of the Cooling Tower(s) as per format enclosed in bidding documents. This Letter of Technical Support should be submitted to Employer prior to the placement of order on approved sub-vendor.

OR

4.3.3 The Bidder/ its sub-vendor who has independently constructed RCC cooling towers of capacity not less than 13,000 Cu.M/Hr can also participate along with it's Holding company/ Subsidiary/Collaborator/Associate who in turn meets the requirements of clause 4.3.1 above.

In such a case, the Bidder/it's sub-vendor shall be required to furnish a Deed of Joint Undertaking executed by the Bidder/sub-vendor and it's Holding company/Subsidiary/Collaborator/Associate for the successful performance of Cooling Tower, as per the format enclosed with the bidding documents. The Deed of Joint Undertaking (DJU) shall be submitted at the time of placement of order on the approved sub-vendor. In case of award, Bidder's sub-vendor and it's Holding company/Subsidiary/Collaborator/Associate shall each be required to furnish an on-demand bank guarantee for INR 28 Million only in addition to the contract performance security to be furnished by the bidder.

Note for 4.3:

The Bidder/its sub-vendor should offer only the same type i.e. counter flow or cross flow and of the same construction type i.e. RCC construction or FRP construction of Cooling Towers for which the bidder/its sub-vendor/Holding Company/Subsidiary/Collaborator/ Associate (i.e., the firm meeting requirements of clause 4.3.1 above) is qualified.

4.4 Fire Detection and Protection System:

The Bidder/its sub-vendor should have designed, supplied, erected and commissioned at least one (1) fire protection system of contract value not less than **INR 35.0 Million** or equivalent in

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foreign currency (exchange rate applicable as on date of Techno-Commercial bid opening), in industrial installation. The fire protection system should have comprised of:

- a) Fire hydrant system.
- b) High velocity water (HVW) spray or medium velocity water (MVW) spray or sprinkler system.
- c) Fire water pumping and pressurizing arrangement.

The system mentioned above should have been designed to the recommendations of Tariff Advisory Committee of India or Oil Industry Safety Directorate (OISD) or any other International reputed authority (like LPC-U.K. or NFPA, USA) and this system should have been in successful operation for a period of not less than one (1) year.

In addition, the analogue addressable type fire alarm system proposed to be supplied shall be sourced from a firm who has supplied at least one (1) similar system which has been approved or listed by UL-USA/ FM-USA/ LPC-UK/ similar agency and should have been in operation for at least one (1) year. Further, the Inert gas fire extinguishing system shall be sourced from an agency who has designed and supplied at least one (1) Inert gas total flooding fire extinguishing system having a total risk volume of at-least 1000 Cum. This system must have been designed to the recommendation of Tariff Advisory Committee of India or any other International reputed authority (like LPC-U.K. or NFPA, USA) and should have been in operating condition for a period not less than one (1) year.

4.5 Air Conditioning System

The Bidder/ its sub-vendor should have designed, supplied, erected and commissioned at least one (1) number of Air conditioning system having a total installed capacity of **300TR or more including stand-by chiller unit (if any)**, which should have included at least one chilling unit with a minimum capacity of **60TR**. The system should have been in successful operation for at least one (1) year.

In addition, the chiller unit(s) proposed to be supplied for this package shall be sourced from the manufacturer(s) who have manufactured and supplied at least one (1) number of similar type of chiller unit having a capacity of not less than 150 TR, which should have been in successful operation for at least one (1) year.

4.6 Ventilation System

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The Bidder/its sub-vendor should have designed, supplied, erected, and commissioned at least one (1) number ventilation system including air washer unit having individual fan capacity of 80,000 Cum./Hr. or more. The system should have been in successful operation for at least one (1) year.

4.7 Compressed Air System

- A) The bidder/ its sub-vendor should have designed, manufactured, supplied, erected/supervised erection and commissioned/supervised commissioning of at least one (1) number non-lubricated oil free screw type air compressor of minimum capacity 20 NM3/min or at least one (1) number centrifugal air compressor of minimum capacity 50 NM3/min and at rated discharge pressure of 8 kg/cm² (g) which should have been in successful operation for at least one (1) year. Bidder/its sub-vendor shall offer only the type of compressors for which he is qualified.
- B) The Air Drying Plant (A.D.P) shall be supplied from such manufacturers who have manufactured and supplied at least one (1) number Air Drying Plant of capacity 50 NM3/min or more and the type same as offered, which should have been in successful operation.

4.8 Water Pre-treatment Plant

The Bidder/its sub-vendor should have designed, supplied, erected/ supervised erection and commissioned/ supervised commissioning of at least one (1) number water / wastewater treatment plant having capacity of not less than 1000 Cu.m/hr., comprising of clarifiers/tube settlers/thickeners or a combination thereof including civil works. The plant should have been in successful operation for at least one (1) year.

4.9 Ion Exchange Demineralization Plant

In case the Bidder/its sub-vendor offers ion exchange based demineralization Plant for DM water, the Bidder /its sub vendor should have designed, supplied, erected and commissioned at least one (1) number of ion exchange based demineralizing plant, consisting of atleast one (1) stream of minimum 60 cum./hr. capacity, capable of producing outlet water quality of silica and conductivity not more than 0.02 ppm as SiO₂ and 0.2 micromho/cm respectively, which should have been in successful operation for at least one (1) year.

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4.10 NA

4.11 CW Chemical Treatment

The Bidder/its sub-vendor should have executed contracts for cooling water treatment program of at least two (2) different cooling water systems each having a flow rate not less than 10,000 Cu.M/hr operating in alkaline pH range and both the treatment programs should have been in successful operation for at least one (1) year. These contracts should include supply of chemicals, operation and maintenance of the system. The Chemicals used in these programs should have been organic polymers/ organic phosphorous compounds/ organic phosphates-based chemicals.

4.12 NOT USED

4.13 Mill Reject Handling System

Mill reject handling system offered by the Bidder/its Sub-Vendor shall be only from such manufacturer/supplier who has previous experience of manufacturing/got manufactured and supplying metallic belt conveyor type or chain flight conveyor type handling systems of capacity 1.5 MTPH or higher for any industrial installations which are in successful operation in at least one (1) plant for a period not less than one (1) year.

The reference handling systems should be of the same type i.e. metallic belt conveyor system or chain flight conveyor system as is being offered by the Bidder/ its Sub- vendor.

4.14 Condensate Polishing Plant

The Bidder/its Sub-vendor should meet the qualifying requirements of any one of the qualifying routes stipulated under clause 4.14 (a) or 4.14 (b)

- a) The Bidder/its Sub-vendor should have designed, supplied, erected and commissioned at least one (1) Condensate Polishing Plant of mixed bed, deep bed type consisting of service vessel of minimum capacity of 500 M3/hr. The plant shall have external regeneration system, incorporating the same resin separation and regeneration process as proposed by the Bidder / its Sub-vendor for this package. The above plant should have been in successful operation for a period of at least one (1) year.
- b) The Bidder/its Sub-vendor who do not meet the qualification requirements stipulated at (a) above, may also participate provided the Bidder/its Sub-vendor is a Contractor in water treatment plant and has executed at least one (1) number ion exchange based demineralising plant of minimum capacity of 60 Cu.m/hr consisting of maximum two (2) streams and associates for this bid with an Associate who in turn fully meets the requirements stipulated at 4.14 (a) above.

In such a case, the Bidder/its sub-vendor shall be required to furnish a letter of technical support from Collaborator / Associate for successful performance of Condensate Polishing Plant, as per the format enclosed in the bidding document. This letter of technical support should be submitted to NTPC prior to the placement of order on approved sub-vendor.

4.15 Turbine Hall EOT crane

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The Bidder/ its sub-vendor should have designed, manufactured, erected and commissioned EOT cranes of capacity 100T or more with minimum crane span of 28 meters, which is in successful operation in at least one (1) station for a minimum period of one (1) year.

4.16 Condenser on-load tube cleaning system (COLTCS)

The Bidder/ its sub-vendor should have designed, manufactured, erected and commissioned COLTCS with ball collecting strainer having diameter of not less than 2100 mm, which is in successful operation in at least one (1) station for a minimum period of one (1) year.

4.17 Not Applicable

4.18 On-line Blade Vibration Monitoring System for Low Pressure (LP) Turbines (in case Free Standing Blades are offered)

The Bidder/sub-vendor should have designed, engineered, supplied, installed and commissioned at least one (1) number of Integrated On-line Blade Vibration system for health monitoring/Crack Detection of free standing blades of Low Pressure Turbine of Steam Turbine Generator set of 200 MW or above capacity. This integrated system* should have been in successful operation at each installation for at least 7000 operating hours. The Bidder should offer and supply the integrated system* of same Make and type for which it/its sub-vendor meets the above requirement.

OR

The Bidder/sub-vendor should have designed, engineered, supplied, installed and commissioned at least one (1) number of On-line Blade Vibration integrated system* for health monitoring/Crack Detection of free standing blades of Compressor/Turbine of Gas Turbine Generator set** of 200 MW or above capacity. This integrated system* should have been in successful operation for at least 7000 operating hours. The Bidder should offer and supply the integrated system* of same Make and type for which it/its sub-vendor meets the above requirement.

* integrated system means complete system combining both hardware and software and sensors mounted inside turbine casing, directly seeing the blades in non-contact manner.

** In case of combined cycle gas stations, Gas Turbine Generator set capacity means capacity exclusively of Gas Turbine Generator set.

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4.19 Ash Handling System

4.19.1 The Bidder/ its Sub- vendor(s) should be supplier of ash handling system(s) and should have executed ash handling system(s) involving design, engineering, manufacturing/got manufactured, supply, erection /supervised erection and commissioning/ supervised commissioning for-

(a) Wet Bottom Ash handling system comprising either a jet pump system in conjunction with water impounded Bottom Ash Hopper or a submerged Scraper Chain Conveyor system designed for the following conveying capacities for coal/lignite fired boilers.

Jet Pump System : 50 tonnes/hour (dry ash basis) or more per jet pump.

Submerged Scraper :20 tonnes/hour (dry ash basis) Scraper Chain Conveyor System or more per Conveyor.

The reference Bottom Ash Handling systems should be of the same type i.e. Jet pump system or Submerged Scraper chain conveyor system as is being offered by the Bidder/ its Sub- vendor.

If the bidder/its sub-vendor is not fully meeting requirement of Jet Pump System in conjunction with water impounded bottom ash hopper referred under clause 4.19.1 (a), can also participate provided it has designed, engineered, supplied, erected / supervised erection and commissioned/ supervised commissioning of Jet Pump of capacity 50 tonnes/hour (dry ash basis) or more per jet pump for coal fired boilers. In such case, bidder /its sub-vendor shall engage design agency for vetting/review/carrying out the design and Engineering activity of 'Jet Pump system in conjunction with water impounded bottom ash hopper'. Design agency can be either Wet bottom ash system (Jet Pump System in conjunction with water impounded bottom ash hopper) supplier meeting the qualification of clause 4.19.1 (a) or design consultant having experience of design/review of Jet Pump System in conjunction with water impounded bottom ash hopper which are in successful operation in at least one (1) plant for a period not less than one (1) year. Vetting by reputed institutes like IITs & IISc is also acceptable.

(b) **Pneumatic fly ash handling system for conveying** fly ash from ESPs of a single pulverized coal fired boiler unit by either:

(i) **Pressure conveying** system designed for 30 TPH or more conveying capacity.

OR

(ii) **Vacuum conveying** system designed for 30 TPH or more conveying capacity per vacuum extractor.

The reference fly ash handling systems should be of the same type i.e., pressure system or vacuum system, as is being offered by the Bidder/ its Sub-vendor.

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An individual boiler unit having its own independent fly ash handling system up to wetting units/ dry dust collection buffer hoppers/intermediate Silos which includes, among others, independent fly ash handling equipment below ESP hoppers, independent ash conveying piping up to wetting units/ dry dust collection buffer hoppers can be considered as a plant for meeting the requirement above.

And

- (c) Pneumatic Fly Ash Transportation System for transporting fly ash from pulverized coal fired boiler unit having capacity of not less than 20 TPH for a conveying distance of not less than 500 meters.

Further, a transportation system provided for an individual boiler unit having dedicated transportation vessels below dry dust collection buffer hoppers and dedicated piping from dry dust collection buffer hoppers / intermediate Silos to storage silos, including storage silo equipment (like Vent Fan, Rotary Feeder, Ash Unloader, Ash Conditioner etc) can be considered as a plant for meeting the requirement above.

- (d) Complete ash slurry disposal system for handling not less than 40 tons of ash per hour for **coal/lignite** fired power stations which includes, among others, ash slurry pumps & piping system with associated controls.
- (e) Fly Ash slurry disposal system: Complete high concentration ash slurry disposal system for handling not less than 40 tons of ash per hour for **coal fired power stations** which includes, among others, positive displacement ash slurry pumps & piping system with associated controls.

Notes to Clause no. 4.19.1

- (i) An individual boiler unit having its own independent bottom ash handling system of either the jet pump system type or submerged scrapper chain conveyor system type can be considered as a plant for meeting the requirement of 4.19.1 (a) above.
- (ii) The activity of design and engineering under 4.19.1 (a), (b), (c) & (d) should have been carried out by the Bidder/ its Sub-vendor(s). The activity of design and engineering under 4.19.1 (e) should have been carried out either by the Bidder/ its Sub-vendor(s) or through design agency/agencies having experience for high concentration ash slurry disposal system.
- (iii) The systems mentioned at 4.19.1 (a), (b), (c),(d) & (e) above, should have been in successful operation in at least one (1) plant for at least one (1) year. For the purpose of qualification, the experience as at 4.19.1 (a), (b), (c), (d) & (e) above in separate plants also is permissible.
- (iv) For reference fly ash handling systems, the design capacity of conveying from ESPs to wetting units/buffer hoppers/intermediate Silos and of transportation from buffer hoppers/ intermediate Silos to storage silos will be the capacity which the client (of the reference plant against which the Bidder / its Sub- vendor is seeking qualification) must have specified in its contract documents.

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- (v) De-packaging can be done by engaging separate sub-vendors for the sub-systems of AHP i.e., Bottom Ash system [4.19.1 (a)] can be ordered to vendor A, fly ash system [4.19.1 (b) & (c)] can be ordered to vendor B & Ash slurry disposal system [4.19.1 (d)] can be ordered to Vendor C, High Concentration Ash slurry disposal system [4.19.1 (e)] can be ordered to Vendor D.

OR

4.19.2 The Bidder/ its Sub- vendor who has executed ash handling systems but does not meet the requirements under clause 4.19.1 in part or in full can also participate provided it has executed at least the following systems of ash handling plant involving design, engineering, manufacturing/got manufactured, supply, erection/supervised erection and commissioning/ supervised commissioning:

- a) **Bottom ash handling system** comprising either a jet pump system in conjunction with water impounded Bottom Ash Hopper or submerged scraper chain conveyor system.
- b) **Fly Ash Handling System** for conveying fly ash from ESPs in dry form involving pneumatic conveying systems of vacuum or pressure type.

The systems mentioned at 4.19.2 (a) and 4.19.2 (b) above should have been in successful operation in at least one (1) plant for one (1) years and should have been installed for pulverized coal fired boiler units generating not less than 40 TPH of ash per boiler.

And

collaborates/ associates with party(ies) who meet(s) either the total requirement or the balance part under 4.19.1 (a) ,(b), (c) & (d) above which the Bidder/ its Sub- vendor itself is not able to meet.

In such a case, the Bidder/its sub-vendor shall be required to furnish a 'letter of support' from Collaborator/ Associates for successful performance of the relevant system valid for a period of seven (7) years or up to the end of defect liability period of the contract whichever is later, as per the format enclosed with the bidding documents. The 'letter of support' should be submitted at the time of placement of order on the approved sub-vendor.

Note to Clause no. 4.19.2:

For design and engineering activity referred under paras 4.19.2 should have been carried out by either the Bidder/ its Sub- vendor or through design agency/agencies having experience for reference systems. In case of Collaborator(s)/associate(s) (meeting the balance part of total requirement under clause 4.19.1, the activity of design and engineering for the reference systems should have been carried out by them.

4.19.3 EPC Organization in collaboration with QAHPM

EPC organization in Collaboration with QAHPM (Qualified Ash Handling Plant Manufacturer): (Alternate route for Bidder/ its Sub- vendor who does not meet the requirements under clause 4.19.1 or 4.19.2)

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- a. The Bidder/Bidder's sub-vendor should be an Engineering, Procurement and Construction (EPC) organization and should have executed, in the last 10 years, industrial projects on EPC basis (with or without civil works) in the area of Power, Steel, Oil & Gas, Petro-chemical, Fertilizer, Flue Gas Desulphurisation and/or any other process industry with the total value of such projects being INR 4,000 million or more. At least one of such projects should have a contract value of INR 1,600 million or more. These projects shall be in successful operation for a period of not less than one (1) year.
- b. The Bidder/Bidder's sub-vendor should also have a valid ongoing collaboration and technology transfer/Licensing agreement with a QAHPM meeting requirements of clause 4.19.1 on its own, valid minimum up to the end of the defect liability period of the contract. In such a case, Bidder/Bidder's sub-vendor can either source the AHP System from such manufacturer or manufacture/get manufactured the AHP System as per the design and manufacturing drawings released by such QAHPM.
- c. Bidder shall be required to furnish a letter of support (Refer Annexure- LETTER OF SUPPORT_4.19.3) from Collaborator/ Licensor /Technology provider for successful performance of the AHP system valid up to the end of defect liability period of the contract as per the format enclosed in the bidding document, at the time of placement of order on the approved sub-vendor.

Notes for Clause 4.19.3

- (i) QAHPM (Qualified Ash Handling Plant Manufacturer) means a single manufacture meeting requirement stipulated at 4.19.1 (a), (b) , (c), (d) & (e)
- (ii) Technology Transfer/Licensing agreement

The Technology transfer/Licensing agreement between the Bidder, Bidder's sub- vendor & QAHPM shall necessarily cover transfer/licensing of technological knowhow for AHP system in the form of transfer/licensing of design dossier, design software's, drawings and documentation, quality system manuals and imparting relevant personnel training to the Bidder/Bidder's sub- vendor.

4.19.4 (a) Ash Slurry Disposal Pumps

The ash slurry pumps to be supplied shall be from such manufacturers who have in the past supplied and installed ash slurry pumps for similar duty applications and have at least two (2) nos. pumps of same models that are being offered having capacity not less than 1000 cubic meters per hour at each of the two (2) different stations which are in successful operation for at least one (1) years.

(b) Positive Displacement Pumps for High Concentration Slurry Disposal System

The positive displacement pumps for high concentration slurry disposal System to be supplied shall be from such manufacturers/suppliers who have in the past supplied and installed positive displacement pumps for high concentration slurry disposal System for similar duty applications and have at least two (2) nos. pumps of same

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models that are being offered having capacity not less than 150 m³/hr which should have been in successful operation for at least one (1) years prior to the date of Techno-Commercial bid opening.

(c) Design and Engineering Agency for High Concentration Slurry Disposal System:

Design agency/agencies for high concentration slurry disposal system should be either an high concentration slurry disposal system supplier meeting the qualification of clause 4.19.1(e), for the offered system or consultancy organization who has designed and engineered similar system(s) for handling not less than 40 tonnes of ash per hour, for coal fired power station(s) and the system(s) should have been in successful operation in at least one (1) plant for at least one (1) years prior to the date of Techno-Commercial bid opening.

4.20 Coal Handling Plant

4.20.1 The Bidder/ its Sub-vendor should have designed, manufactured/ got manufactured, erected/supervised erection and commissioned/ supervised commissioning at least one (1) number integrated bulk material handling plant (essentially comprising of conveying and crushing) including all associated structural steel works and electrical works of 1000 Metric tonnes per hour rated capacity or above for coal or other minerals of equivalent volumetric capacity which should have been in successful operation for at least one (1) year.

4.20.2 The Bidder/ its Sub- vendor should have designed, manufactured/ got manufactured, supplied, erected/supervised erection and commissioned/ supervised commissioning including all associated structural steel works and electrical works at least one (1) number cantilever boom type, slewable and luffable, bucket wheel type traveling Stacker-cum-Reclaimer suitable for stacking and reclaiming at a rated capacity of 1000/1000 Metric tonnes per hour (or above) for coal or other mineral of equivalent volumetric capacity which should have been in successful operation for at least one (1) year.

4.20.3 Wagon Tippler

Bidder/ its Sub-vendor should have designed, manufactured/ got manufactured, supplied, erected /supervised erection and commissioned / supervised commissioning at least one (1) number of side discharge wagon tippler suitable for tipping Indian Railway Wagons used for transportation of coal or other minerals which should have been in successful operation for at least one (1) year

4.20.4 Not Used

4.21 Fuel Oil System:

Bidder/ its Sub-vendor should have engineered/ got engineered, supplied, erected, tested and commissioned at least one (1) no. fuel oil handling and storage installations, which should have been in successful operation for minimum one (1) year, consisting of:

i) Fuel Oil decanting facilities for road tankers/railway wagons.

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ii) Fuel oil Storage tanks of capacity not less than 500 cubic meters each.

The experience as at (i) and (ii) above in separate installations is also permissible.

4.22 Not used

4.23 NA

4.25 Wet Limestone based Flue Gas Desulphurisation System

Bidder or Bidder's sub-vendor shall be a company incorporated in India under the Companies Act of India and should meet the qualifying requirements stipulated in any one of the qualifying routes i.e Route-1 (clause 4.25.1) or Route-2 (clause 4.25.2) or Route-3 (clause 4.25.3) or Route-4 (clause 4.25.4) including requirements stipulated in sub clauses of respective Route.

4.25.1 Route-1: Qualified Wet Limestone based Flue Gas Desulphurisation (FGD) System Manufacturer (QFGDM)

The Bidder or Bidder's sub-vendor should have designed, engineered, supplied, erected/supervised erection and commissioned/supervised commissioning of at least one (1) no. of wet limestone based Flue Gas Desulphurisation System, having flue gas treatment capacity of not less than 23,00,000 Nm³/hr, with desulphurisation efficiency of at least 90 %, operating in a pulverised coal fired power plant. The above wet limestone based Flue Gas Desulphurisation System should have been in successful operation for a period not less than one (1) year.

4.25.2 Route-2: Wet Limestone based Flue Gas Desulphurisation (FGD) System Manufacturer with Collaboration and Technology Transfer Agreement with QFGDM

- (a) The Bidder or Bidder's sub-vendor should have designed, engineered, supplied, erected/supervised erection and commissioned/supervised commissioning of at least one(1) no. of wet limestone based Flue Gas Desulphurisation system having flue gas treatment capacity of not less than 6,00,000 Nm³/hr, with desulphurisation efficiency of at least 85%, operating in a pulverised coal fired power plant. The above wet limestone based Flue Gas Desulphurisation System should have been in successful operation for a period not less than one (1) year.
- (b) Bidder/Bidder's sub-vendor should also have a valid ongoing collaboration and technology transfer agreement with a QFGDM meeting requirements of clause 4.25.1

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on its own, valid minimum up to the end of the defect liability period of the contract. In such a case Bidder/ Bidder's sub-vendor can either source the FGD System from such manufacturer or manufacture/get manufactured the FGD System as per the design and manufacturing drawings of such QFGDM.

- (c) Bidder shall be required to furnish a letter of support from Collaborator(s) / Licensor / Technology provider for successful performance of the FGD system valid up to the end of defect liability period of the contract as per the format enclosed in the bidding document, at the time of placement of order on the approved sub-vendor.

4.25.3 Route-3: Steam Generator Manufacturer / Indian JV Company of Steam Generator manufacturer or QFGDM/ Indian Subsidiary company of Steam Generator manufacturer or QFGDM with Collaboration and Technology Transfer Agreement with QFGDM

- (a)(i) Bidder/Bidder's sub-vendor should have designed, engineered, manufactured/got manufactured, erected/ supervised erection and commissioned/supervised commissioning of least one (1) no. of pulverised coal fired steam generator for 200MW or higher capacity unit or having minimum 600T/hr steaming capacity. Further, such Steam Generator should have been in successful operation for a period not less than one (1) year.

Alternatively

- (a)(ii) The Bidder/Bidder's sub-vendor shall be a Joint Venture (JV) Company incorporated in India under the Companies Act of India, as on the date of techno-commercial bid opening, promoted by (i) an Indian Company registered in India under the Companies Act of India and (ii) a Steam Generator Manufacturer meeting requirements of clause 4.25.3(a)(i) or a QFGDM meeting requirements of clause 4.25.1, created for the purpose of manufacturing/supply in India of steam generator sets/Flue Gas Desulphurisation System.

The Steam Generator Manufacturer/QFGDM shall maintain a minimum equity participation of 26% in the JV Company for a lock-in period of 7 years from the date of incorporation of JV Company and One of the promoters shall be a majority stakeholder who shall maintain a minimum equity participation of 51% in the JV Company for a lock in period of 7 years from the date of incorporation of JV Company or up to the end of

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defect liability period of the contract whichever is later. Further, Bidder/Bidder's sub-vendor should have executed order(s), during the last 5 years, with the total value of such projects being INR 5,000 million or more.

Alternatively

- (a)(iii) The Bidder/Bidder's sub-vendor shall be an Indian Subsidiary Company of a Steam Generator Manufacturer meeting requirements of clause 4.25.3(a)(i) or an Indian Subsidiary Company of a QFGDM meeting requirements of clause 4.25.1, registered in India under the Companies Act of India, as on the date of techno-commercial bid opening, for manufacturing/supply of Steam Generator sets/Flue Gas Desulphurisation System.

The subsidiary Company shall remain a subsidiary company of the Steam Generator Manufacturer/ QFGDM for a minimum period of 7 years from the date of incorporation of such Subsidiary Company or up to the end of defect liability period of the contract whichever is later. Further, Bidder/Bidder's sub-vendor should have executed order(s), during the last 5 years, with the total value of such projects being INR 5,000 million or more.

- (b) Bidder/Bidder's sub-vendor should also have a valid ongoing collaboration and technology transfer agreement with a QFGDM meeting requirements of clause 4.25.1 on its own, valid minimum up to the end of the defect liability period of the contract. In such a case Bidder/Bidder's sub-vendor can either source the FGD System from such manufacturer or manufacture/get manufactured the FGD System as per the design and manufacturing drawings of such QFGDM.
- (c) Bidder shall be required to furnish a letter of support from Collaborator(s) / Licensor / Technology provider for successful performance of the FGD system valid up to the end of defect liability period of the contract as per the format enclosed in the bidding document, at the time of placement of order on the approved sub-vendor.

4.25.4 Route-4: EPC Organization in Collaboration with QFGDM

- (a) The Bidder or Bidder's sub-vendor should be an Engineering, Procurement and Construction (EPC) organization and should have executed, in the last 10 years, large industrial projects on EPC basis (with or without civil works) in the area of power, steel, oil & gas, petro-chemical, fertilizer, Flue Gas Desulphurisation and / or any other process

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- industry with the total value of such projects being INR 5,000 million or more. At least one of such projects should have a contract value of INR 2,000 million or more. These projects shall be in successful operation for a period of not less than one (1) year.
- (b) Bidder/Bidder's sub-vendor should also have a valid ongoing collaboration and technology transfer agreement with a QFGDM meeting requirements of clause 4.25.1 on its own, valid minimum up to the end of the defect liability period of the contract. In such a case Bidder/Bidder's sub-vendor can either source the FGD System from such manufacturer or manufacture/get manufactured the FGD System as per the design and manufacturing drawings released by such QFGDM.
- (c) Bidder shall be required to furnish a letter of support from Collaborator(s) / Licensor / Technology provider for successful performance of the FGD system valid up to the end of defect liability period of the contract as per the format enclosed in the bidding document, at the time of placement of order on the approved sub-vendor.

Notes for clause 4.25

(1) **Definitions**

- (i) "QFGDM" (Qualified Wet Limestone based Flue Gas Desulphurisation System Manufacturer) means a manufacturer meeting requirements stipulated at 4.25.1.
- (ii) Whenever the term 'coal fired' is appearing above, "Coal" shall be deemed to also include bituminous coal/brown coal/Anthracite Coal/lignite.
- (iii) "Flue Gas Desulphurisation System" or "FGD System" wherever appearing above shall mean consisting of at least Absorber System.
- (iv) The word "executed" in Clause 4.25.3 (a) (ii) / Clause 4.25.3 (a) (iii) means the Bidder should have commissioned the project(s) specified in the Clause 4.25.3 (a) (ii) / Clause 4.25.3 (a) (iii) even if the contract has been started earlier and / or is not completed / closed.

(2) **Erection/Commissioning**

Where erection / supervision of erection and commissioning / supervision of commissioning has not been in the scope of the Bidder/Bidder's sub-vendor as mentioned in clause 4.25.1 & 4.25.2 & 4.25.3 (a)(i), the Bidder should have acted as an advisor for erection and commissioning. Necessary documents / certificates from the client, in support of above shall be furnished.

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(3) **Direct / Indirect order**

The Bidder/ QFGDM shall also be considered qualified, in case the award for executing the reference works has been received by the Bidder either directly from owner of plant or any other intermediary organization. However, a certificate from such owner of plant or any other intermediary organisation shall be required to be furnished by the Bidder in support of the Bidder's/ QFGDM claim of meeting the qualification requirement as per clause 4.25.1 or 4.25.2 or 4.25.3(a)(i) or 4.25.4 above. Further, certificate from owner of the plant shall also be furnished by the Bidder for the successful operation as specified at clause 4.25.1, 4.25.2, 4.25.3(a)(i) and 4.25.4 above.

(4) **Holding Company as a Qualified Wet Limestone based Flue Gas Desulphurisation system Manufacturer**

A Holding Company, singularly or collectively along with its Subsidiaries (held either directly or indirectly), meeting the requirements of clause 4.25.1 above shall also be considered as Qualified Wet Limestone based Flue Gas Desulphurisation System Manufacturer (QFGDM).

(5) **Technology Transfer Agreement (Applicable for Clause 4.25.2, 4.25.3 & 4.25.4)**

The technology transfer agreement between the Bidder/Bidder's sub-vendor & QFGDM shall necessarily cover transfer of technological knowhow for Wet Limestone based Flue Gas Desulphurisation System in the form of complete transfer of design dossier, design software's, drawings and documentation, quality system manuals and imparting relevant personnel training to the Bidder/Bidder's sub-vendor.

(6) **Equity Lock in period**

Wherever equity lock in period requirement or subsidiary status requirement is indicated, the Bidder would be required to furnish a Letter of Undertaking from the promoter(s), supported by Board Resolution as per the format enclosed in the bid documents, for maintaining the required minimum equity for the specified lock in period.

4.26 Provenness criteria for critical equipment, auxiliaries, systems and bought out items for Flue Gas Desulphurisation System:

- 4.26.1 The Bidder / Bidder's sub-vendor(s) is required to meet the provenness criteria and/or qualification requirement for critical equipment, auxiliaries, system and bought out items as per criteria stipulated below:

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Slurry Recirculation Pumps, Oxidation Blowers, Wet Limestone Grinding Mills, Slurry Pumps, Agitators & Vacuum Belt Filters for the Wet Limestone based Flue Gas Desulphurisation (FGD) System offered by the Bidder shall be only from such manufacturer(s) who has previously designed (either by itself or under collaboration / licensing agreement), manufactured / got manufactured the respective equipment(s) of the type, application and minimum equipment rating as stipulated below such that the respective equipment(s) should have been in successful operation in at least one (1) plant for a period not less than one(1) year:

S. N.	Name of Equipment	Type of Equipment	Application	Equipment Rating
(a)	Slurry Recirculation Pumps	Centrifugal type	Wet Limestone based FGD application in Coal fired power plant	Flow 10200 m ³ /hr (min.) with Head 16 Meters of Liquid Column (min.)
(b)	Oxidation Blowers	Centrifugal/ positive displacement type blower	Wet Limestone based FGD application in Coal fired power plant or in any other process application	Flow 7300 Nm ³ /hr Dry Basis (min.) with Head 8500 mmwc (min.) for spray tower process Or Head 3500 mmwc (min.) for bubbling type process Oxidation Blower
(c)	NA	NA	NA	NA
(d)	Slurry Pumps	Centrifugal type	Wet Limestone based FGD application or ash slurry application in Coal fired power plant	Flow 50 m ³ /hr (min.) with head 30 Meters of Liquid Column (min.)
(e)	Agitators	Vertical/Horizontal	Wet Limestone based FGD application in Coal fired power plant	Agitator rating not less than that supplied for 500 MW or higher size unit for similar application
(f)	NA	NA	NA	NA
(g)	Gas Cooling Pumps	Centrifugal type	Wet Limestone based FGD application in Coal fired power plant	Flow 2800 m ³ /hr (min.) with Head 16 Meters of Liquid Column (min.)

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Bidder shall offer and supply only the type of the above equipment(s) for which he himself or the manufacturer proposed by the bidder for the above equipment(s) is qualified. The provenness criteria for equipment (Slurry Recirculation Pumps) stipulated at Sl. No. 4.26.1 (a) above shall also be considered acceptable provided the rating parameters (i.e., flow and head) is covered within the operating regime of the respective Slurry Recirculation Pump performance curve of the reference plant equipment.

- 4.26.2 A JV / Subsidiary Company formed for manufacturing and supply of equipment(s) as listed at clause no. 4.26.1 above in India **shall be considered qualified for** such equipments, provided that it has a valid collaboration or licensing agreement for design, engineering, manufacturing of such equipment(s) in India with a qualified equipment manufacturer who meets the requirements stipulated at clause 4.26.1 above (or the technology provider of the qualified equipment manufacturer) for the respective equipment(s). Before taking up the manufacturing of such equipment(s), the bidder/ his sub-vendor(s) must create /have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system for such equipment(s).

Further, in such a case, such qualified equipment manufacturers should have, directly or indirectly through its holding company/ subsidiary company, at least 26% equity participation in the Indian Joint Venture Company/ Subsidiary Company, which shall be maintained for a lock-in period of seven (7) years from the date of incorporation of such Joint Venture/ Subsidiary or upto the end of defect liability period of the contract, whichever is later.

- 4.26.3 In case the Bidder or the proposed sub-vendor is not manufacturer of proven Oxidation Blowers as per clause 4.26.1 (b) above but is a manufacturer of Blowers/compressors for minimum 50 NM³/min capacity, the Bidder or the proposed sub-vendor can also manufacture Oxidation Blowers, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Oxidation Blowers in India with such manufacturer who meet the requirements stipulated at clause 4.26.1 (b) above for the Oxidation Blowers. Before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments.

- 4.26.4 NA

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- 4.26.5 In case the Bidder or the proposed sub-vendor is not manufacturer of proven Agitators as per clause 4.26.1 (e) above but is a manufacturer of Agitators for similar process/duty application in petrochemical or metals and mining industry, the Bidder or the proposed sub-vendor can also manufacture Agitators, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Agitators in India with such manufacturer who meet the requirements stipulated at clause 4.26.1 (e) above for the Agitators. Before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments.
- 4.26.6 In case the Bidder or the proposed sub-vendor is a manufacturer of Slurry Pumps who meets the requirements stipulated at clause 4.26.1 (d) above, the Bidder or the proposed sub-vendor can also manufacture Slurry Recirculation Pumps, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such equipment in India with such manufacturer who meet the requirements stipulated at clause 4.26.1 (a) above for the Slurry Recirculation Pumps. Before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipment.
- 4.26.7 Before taking up the manufacturing of such equipment(s) as per clause 4.26.2, 4.26.3, 4.26.4(i), 4.26.5 & 4.26.6 above, the Bidder / its sub vendor(s) must create (or should have created) manufacturing and testing facilities at its works as per Collaborator / licenser's design, manufacturing and quality control system for such equipments duly certified by the Collaborator / licensor. Further, the Collaborator / Licensor shall provide (or should have provided) all design, design calculation, manufacturing drawings and must provide (or should have provided) technical and quality surveillance assistance and supervision during manufacturing, erection, testing, commissioning of equipments.
- 4.26.8 Bidder shall offer and supply only the type of the above equipment(s) for which it, itself or the manufacturer / Collaborator(s) / Licenser(s) proposed by the Bidder for the above equipment(s) is qualified.
- 4.26.9 The Employer reserves the right to fully satisfy himself regarding capability and capacity of Bidder / its sub-vendor(s) and the proposed arrangement and may prescribe additional requirement before allowing manufacture of the equipment listed above for this contract.

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Note to clause 4.26.1

Whenever the term 'coal fired' is appearing above, "Coal" shall be deemed to also include bituminous coal/brown coal/Anthracite Coal/lignite.

4.27 Agency for Wet Stack Flow Model Study

Wet Stack Flow Model Study shall be carried out by an agency which has successfully performed at least two (2) flow model studies, in separate coal fired power plants, of wet stack installed after wet limestone based FGD Absorber (without reheating of cleaned flue gas), and based on the studies developed at least two (2) wet stack liquid collection systems which are in successful operation for a period of at least two (2) years.

5.0 PROVENNESS CRITERIA FOR ELECTRICAL EQUIPMENTS

5.1.0 Not used

5.2.0 ISOLATED PHASE BUSDUCT

Bidder / Sub Vendor should have designed, manufactured, supplied, erected/ supervised erection and commissioned/supervised commissioning of Isolated Phase Busduct for a turbo-generator of at least 500MW, which should have been in successful operation for at least two (2) years.

5.3.0 HT MOTORS

BFP MOTOR

Bidder / Sub Vendor should have manufactured and supplied motor of 10 MW or above rating, which should have been in successful operation in at least one (1) plant for at least two (2) years.

ID FAN MOTOR

Bidder / Sub Vendor should have manufactured and supplied motor of 8 MW or above rating, which should have been in successful operation in at least one (1) plant for **at least two (2) years**.

CW MOTOR

Bidder / Sub Vendor should have manufactured and supplied motor of 2 MW or above rating and motor speed not exceeding 500 rpm synchronous, which should have been in successful operation in at least one (1) plant for **at least two (2) years**.

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BOOSTER FAN MOTOR

Bidder/Sub Vendor should have manufactured and supplied motor of 4MW or above rating, which should have been in successful operation in at least one (1) plant for at least two (2) years.

5.4.0 BATTERY CHARGER

Bidder/ Sub Vendor should have manufactured and supplied at least two (2) numbers of static automatic voltage regulator type Battery Chargers of highest offered rating or above, at least one (1) each at two (2) different industrial installations, which should have been in successful operation for at least two (2) years.

NOTE: Two different installations mean two different project sites or two different contracts.

5.5.1A POWER TRANSFORMERS – Highest Voltage 400kV (As Applicable) (For transformers voltage class from 220 kV to 420 kV)

The Bidder/Sub-vendor should meet the qualifying requirements of any one of the qualifying routes stipulated under clause 5.5.1A.1 or 5.5.1A.2:

5.5.1A.1 ROUTE-1

Bidder/Sub-Vendor should have designed, manufactured and supplied at least two (2) nos. (One each at two different installations) of 400 KV or above class Generator transformers of at least 200 MVA capacity (either three phase transformer as a single unit or single phase transformer) which should be in successful operation for at least two (2) years.

5.5.1A.2 ROUTE-2

Bidder/Sub-Vendor who have designed, manufactured and supplied at least two (2) no. 220 KV or above class transformer which are in successful operation for two (2) years and have established manufacturing facilities for 400 KV class transformers in India based on technological support of its associate or collaborator or technology provider or licensor, can also be considered Qualified provided its Associate or Collaborator or Technology provider or Licensor meets the qualifying requirement stipulated at 5.5.1A.1 above, and:-

- (i) Associate or Collaborator or technology provider or licensor provides a letter of technical support, for successful performance of the transformers, as per format, given in bidding document. This letter of technical support should be submitted prior to the placement of order on approved Sub-Vendor.
- (ii) Transformer shall be of Collaborator's/Associate's/Technology provider's/Licensor's design. Transformer shall be manufactured in line with manufacturing & assembly drawings of Collaborator/ Associate/ Technology provider/Licensor.
- (iii) Core coil assembly and final testing of the transformer shall be under the supervision of Collaborator/Associate/Technology provider/Licensor.

5.5.2A SHUNT REACTOR - 400kV (As Applicable)

5.5.2A.1 Bidder/Sub-Vendor should have designed, manufactured and supplied 400 KV or above class shunt reactors of at least 50 MVAR capacity (either three phase as a single unit or bank

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of three single phase reactors of at least 16.67 MVAR each) which should have been in successful operation at atleast two (2) different installations for at least two (2) years.

OR

5.5.2A.2 Bidder/Sub-Vendor who have designed, manufactured and supplied at least two (2) no. 400 KV or above class transformer / 220 KV or above class reactor which are in successful operation for two (2) years and have established manufacturing facilities for 400 KV class shunt reactors in India based on technological support of its Associate or Collaborator or Technology provider or Licensor, can also be considered for manufacturing & supply of reactor specified under present package provided:-

- (i) Associate or Collaborator or Technology provider or Licensor meets the qualifying requirements stipulated at 5.5.2A.1 above and provides a letter of technical support, for satisfactory performance of the reactors supplied under this contract, as per format, given in the bidding documents. This letter of technical support should be submitted prior to the placement of order on approved Sub-Vendor.
- (ii) Reactor shall be of Collaborator's/Associate's/Technology provider's/Licensor's design. Reactor shall be manufactured in line with manufacturing & assembly drawings of Collaborator/Associate/Technology provider/Licensor and Collaborator's/Associate's/Technology provider's/Licensor's drawing approved by OWNER.
- (iii) Core coil assembly and final testing of the reactor shall be under the supervision of Collaborator/Associate/Technology provider/Licensor.

5.5.3A EHV & HV POWER TRANSFORMERS

(Transformer of voltage class above 36 kV to 132 kV and Unit Transformer)

- a) Bidder/Sub-vendor should have designed, manufactured and supplied at least two (2) numbers (one each at two different installations) of 132 kV or above class transformers of at least 110MVA capacity which should have been in successful operation for at least two years.

And

- b) Bidder/Sub-vendor should have its own facilities for conducting all routine and type tests as per IS: 2026 (except short circuit test).

And

- c) 90 MVA, 132 KV or higher rated oil filled transformer manufactured by Bidder/Sub-vendor should have been successfully short circuit tested.

Note (applicable for Cl. No. 5.5.1A, 5.5.2A & 5.5.3A):

- (i) Two different installations means two different project sites or two different contracts.
- (ii) Equipment designed by the Bidder/Sub-vendor by itself or through its collaborator/associate/technology provider/licensor for reference plant, shall also be considered meeting the requirement of design.

PROVENNESS

5.6.0 LT SWITCHGEAR

ROUTE 1

- 1.1 Bidder/ Sub Vendor should have manufactured and supplied at least a total of four hundred & fifty (450) numbers of draw out type Air Circuit Breaker Panels and / or draw out type Motor Control Centre Panels with fault rating of at least 45kA for one (1) second and 105kA peak under a single order and these panels should have been in successful operation for at least two (2) years.

And

- 1.2 Bidder/ Sub Vendor should have manufactured and supplied at least one hundred & fifty (150) numbers of Air Circuit Breakers having fault rating of at least 45kA rms BREAKING, 105kA peak MAKING and 45kA withstand for one (1) second, and their associated draw out type Air circuit breaker panels having fault rating of at least 45kA for one (1) second and 105kA peak, which should have been in successful operation for at least two (2) years.

ROUTE 2

- 1.3 Bidder/ Sub Vendor should have manufactured and supplied at least a total of two hundred & twenty five (225) numbers of draw out type Air Circuit Breaker Panels and / or draw out type Motor Control Centre Panels with fault rating of at least 45kA for one (1) second and 105kA peak under a single order and these panels should have been in successful operation for at least two (2) years.

And

- 1.4 Bidder/ Sub Vendor should have manufactured and supplied at least seventy five (75) numbers of draw out type Air Circuit Breaker panels having fault rating of at least 45kA for one (1) second and 105kA peak, which should have been in successful operation for at least two (2) years.

And

- 1.5 Bidder/Sub Vendor shall be considered qualified provided its Associate or Collaborator or Technology Provider or Licensor meets the requirement stipulated in Route-1 for sourcing of Air Circuit Breakers. The Associate or Collaborator or Technology Provider or Licensor shall provide a letter of technical support for successful performance of the Air Circuit Breakers, as per the format, given in the bidding document. This letter of technical support should be submitted at the time of placement of order on the Sub Vendor.

And

- 1.6 Bidder/ Sub Vendor should have established manufacturing facility for draw out type Air Circuit Breaker Panels and draw out type Motor Control Centre Panels in India. Further, all the panels for this project shall be manufactured and supplied from the Indian manufacturing facility.

PROVENNESS

- NOTE:
1. Each Single Front Panel shall be counted as one (1) Panel, Double Front Panel as one (1) Panel and Air Circuit Breaker Panel as one (1) Panel.
 2. The provenness criteria shall be applicable for all draw out type and fixed type switchboards except Lighting DBs and Welding DBs.

5.7.0 11 kV / 6.6 kV / 3.3 kV SWITCHGEARS

- 1.1 Bidder/ Sub Vendor should have manufactured and supplied at least one hundred (100) numbers of 6.6kV or above Switchgear panels with fault rating of at least 40kA for one (1) second and 100kA peak, which should have been in successful operation for at least two (2) years.
- 1.2 Bidder/ Sub Vendor should have manufactured and supplied at least one hundred (100) numbers of Vacuum Circuit breakers for 6.6kV or above panels with a rating of 40kA rms BREAKING, 100kA peak MAKING and 40kA withstand for one (1) second, which should have been in successful operation in 6.6kV or higher voltage application for at least two (2) years.

5.8.0 NUMERICAL RELAYS & NETWORKING

- 1.1 Bidder/ Sub Vendor should have manufactured and supplied and successfully configured at least one hundred (100) numbers of Numerical Relays with IEC 61850 used for application in Feeder Protections/Transformer Protections/Motor protections. These relays should have been in successful operation for at least two (2) years.
- 1.2 Bidder/ Sub Vendor should have manufactured/ integrated and successfully done Site Acceptance Test (SAT) for a network on IEC 61850 with at least one hundred (100) numbers of Communicable Numerical Relays.

5.9.0 DC BATTERIES

Bidder/ Sub Vendor should have manufactured and supplied at least two (2) numbers of highest offered rating or above of high discharge type plate positive plate type battery (in case bidder offers Lead Acid plate type battery) or high discharge type Nickel Cadmium battery (in case bidder offers Nickel Cadmium battery), at least one (1) each at two (2) different industrial installations, which should have been in successful operation for at least two (2) years.

NOTE: Two different installations mean two different project sites or two different contracts.

5.10.0 HT POWER CABLES

The bidder/Sub-vendor should have manufactured and supplied following cables:

- (a) Atleast 50kms of XLPE insulated power cables of 6.35/11 KV or higher voltage grade, executed in one or more orders.
- (b) At least one (1) Km of flame retardant low smoke cables of any voltage level.

PROVENNESS

5.11.0 DG SETS

The bidder/Sub-vendor should have supplied at least two (2) numbers of DG sets of rating not less than 1500 kVA, at least one (1) each at two (2) different installations, which should be in successful operation for at least two (2) years. The offered make of the DG set (Alternator and Engine) shall be same as that of reference plant DG sets.

NOTE: Two different installations mean two different project sites or two different contracts.

5.12.1 AUXILIARY OIL FILLED TRANSFORMERS AND HT TRANSFORMERS

5.12.1.1 The Bidder/Sub-Vendor should have manufactured & supplied at least two numbers (one each at two different installations) of 16 MVA, 11KV or higher rating oil filled transformers which should have been in successful operation for a period of at least two (2) years.

And

5.12.1.2 Bidder/Sub-Vendor should have his own facilities for conducting all routine and type tests as per IS: 2026 (except short circuit test).

And

5.12.1.3 16 MVA, 11 KV or higher rated oil filled transformer manufactured by Bidder/Sub-Vendor should have been successfully short circuit tested.

NOTE:

- (i) Two different installations means two different project sites or two different contracts.
- (ii) Equipment designed by the Bidder/Sub-vendor by itself or through its collaborator/associate/technology provider/licensor for reference plant, shall also be considered meeting the requirement of design.

5.13 Not Applicable

5.14 400 kV EQUIPMENTS (AIS):

(I) 400KV CIRCUIT BREAKERS:

400kV Circuit Breakers being offered should be from Manufacturer who has manufactured and supplied at least five(5) nos. of three phase circuit breakers suitable for Air Insulated

PROVENNESS

Substation/ Switchyard of 400 kV or above class which should have been in successful operation for minimum two(2) years prior to the date of Techno-Commercial bid opening.

II. **400 kV INSTRUMENT TRANSFORMERS (Current Transformers / Capacitor Voltage Transformers as Applicable):**

400 kV Instrument Transformers being offered should be from Manufacturer who has manufactured and supplied at least fifteen (15) nos. of single phase Instrument Transformers suitable for Air Insulated Substation/ Switchyard of 400 kV or above class which should have been in successful operation for minimum two (2) years prior to the date of Techno-Commercial bid opening.

III. **400 kV DISCONNECTORS :**

400kV Disconnectors being offered should be from Manufacturer who have manufactured and supplied atleast five (5) nos. of three phase Disconnectors suitable for Air Insulated Substation/Switchyard of 400kV or above class which should have been in successful operation for minimum two (2) years prior to the date of Techno-Commercial bid opening.

(IV) **400kV SURGE ARRESTER (AS APPLICABLE)**

The Bidder/Sub-vendor should have manufactured and supplied minimum fifteen (15) nos. of single-phase respective equipment of offered voltage class or above, suitable for Air Insulated Substation/ Switchyard and which must have been in successful operation for a minimum period of two (2) years prior to the date of Techno-Commercial bid opening.

(V) **400KV SWITCHYARD:**

The bidder/sub vendor should have designed, constructed/erected, tested and commissioned one (1) no. of Air Insulated substation/switchyard of 400KV or above voltage class having at least six(6) bays which should have been in successful operation for minimum (2) years prior to the date of techno-commercial bid opening.

PROVENNESS

Note: For the purpose of qualifying requirement one no of bay shall be considered as a bay comprising of at least one circuit breaker, two disconnectors and three single phase current transformers.

(VI) 400kV TRANSMISSION LINE:

The Bidder/Sub-vendor should have erected and commissioned at least 30KM of Transmission line of 400KV or above voltage class on Towers.

5.15 SUBSTATION AUTOMATION SYSTEM & PROTECTIVE RELAYS:

The Substation Automation System offered with distributed architecture and digital process bus should have been in successful operation in at least one (1) Substation/Switchyard of not less than 220 kV class for minimum one (1) year.

The Generator Protection Relays, the Bay Protection Units including the Busbar protection and the energy metering System offered should be from manufacturer(s) who have manufactured and supplied the offered type of devices for respective equipment, which must have been in successful operation in a 100 MW or above unit / 220 kV class or above Substation/Switchyard for a minimum period of one (1) year.

5.16 Not applicable.

6.0 Provenness of Control and Instrumentation (C&I) Equipments / Systems

The Bidder or its proposed sub vendor(s) should meet the provenness requirements of any one of the routes stipulated under clause 6.1 or 6.2 for DDCMIS supplier. In addition, the Bidder or its sub vendor(s) should also meet the requirements stipulated under clause 6.3, 6.4, 6.5 and 6.6 (a to f). For the purpose of qualification of Bidders / Sub-vendor(s), experience shall be reckoned as on date of consideration of approval but not later than six (6) months after award date of EPC package unless otherwise specified in respective clauses.

6.1 Route 1 (For Distributed Digital Control, Monitoring and Information System (DDCMIS) Supplier):

- a. The DDCMIS supplier should be Indian Company registered in India as per Companies Act.

PROVENNESS

- b. The DDCMIS supplier should have engineered, supplied, and commissioned/ got commissioned BOP C&I, SG C&I and TG C&I control systems in at least one (1) unit of rating 200MW or above in a power station(s).

6.2 Route 2 (For DDCMIS Supplier with Collaborator(s)/Associates(s)):

The DDCMIS supplier for this package who fully meets the requirement for BOP C&I at clause no. 6.1 but does not meet the requirement for SG C&I and/or TG C&I at clause no. 6.1(b), may also supply DDCMIS for SG C&I and/or TG C&I provided it collaborates /associates with DDCMIS/ DCS supplier(s) who meet(s) the requirement for SG C&I and/or TG C&I respectively stipulated at clause no. 6.1 (b).

- 6.3 The Control system(s) offered for BOP C&I , SG C&I and TG C&I application(s) shall be same or of same series as that of the control system(s) for respective applications which has been commissioned in at least one (1) unit of rating 200MW or above in a power station(s).
- 6.4 The Control system(s) offered at clause no. 6.3 shall be operating successfully for BOP C&I or SG C&I or TG C&I application(s) for a period of not less than one (1) year in at least one (1) unit of rating 200MW or above in a power station(s).
- 6.5 The Control system(s) offered for BOP C&I , SG C&I and TG C&I application(s) shall be of same make.
- 6.6 The **other C&I systems** offered for this package shall meet the following.
 - For the purpose of qualification of Bidders / Sub-vendor(s), experience shall be reckoned as on date of consideration of approval but not later than eighteen (18) months after award date of EPC package.
 - a) Isolation valves, Blow down Valves, Coolers & Automatic Pressure reducer valves in Primary Rack, Thermal shut-off valves and Analysers of SWAS system offered for this package shall be same or of same series which should have been in successful operation for a period of not less than one (1) year in at least one (1) supercritical unit of rating 660MW or above in a power station.
 - b) CEMS, and Vibration Monitoring system offered for this package shall be same or of same series which should have been in successful operation for a period of not less than one(1) year in at least one(1) unit of rating 200MW or above in a power station.
 - c) Not Applicable

PROVENNESS

- d) UPS system offered for this package shall be same or of same series and type as that of 105 KVA or above capacity UPS which should have been in successful operation for a period of not less than one (1) year in a power station.
- e) 24 V DC modular charger offered for this package shall be same or of same series and type as that of 500A or above capacity 24 V DC modular charger which should have been in successful operation for a period of not less than one(1) year in any industry or telecommunication application.
- f) The combination of offered make of IP based camera and offered make of video management software, for CCTV system, should have been in successful operation for a period of not less than one (1) year in a large industrial setup viz power plant, cement plant, petroleum refinery, steel plants or coal mine, having installation of minimum forty (40) nos. cameras.

Notes:-

(A)	Control system for BOP C&I , TG C&I and SG C&I application(s) referred in Para 6.1, 6.2 , 6.3, 6.4 and 6.5 means following :- (i) Control system for BOP C&I shall include Modulating control for Steam Generator (SG), Modulating control for feed water / Condensate Cycle, Binary Control of the auxiliaries for Steam Generator (SG) and Binary Control of the auxiliaries for Turbine generator (TG) for coal fired units. (ii) Control system for SG C&I shall include Burner Management System & Boiler Protections for coal fired units. (iii) Control system for TG C&I shall include Steam Turbine Electro-hydraulic control & Turbine Protection system.

7.0 PROVENNESS CRITERIA FOR CIVIL & STRUCTURAL WORKS

- 7.1 Bidder or its agency should have executed civil and steel structural works of 500 MW or higher capacity coal based/Lignite based power plant/Nuclear power plant, Earth work in filling involving mechanical compaction and cutting in rock, including Main power house building and Foundation for Turbo-generator.
- 7.2 In case Bidder or its agency do not meet the requirements at 7.1 and the Bidder proposes to engage agency (ies) for concrete & steel structural works, the proposed agency (ies) should fulfil the following criteria:
 - a) For concrete works (other than TG Foundation), Bidder or its agency should have executed concrete works of TG building/Bunker building of 500 MW or higher capacity coal based/Lignite based power plant/ TG Building of Nuclear Power Plant.

PROVENNESS

- b) For Steel Structural works, Bidder or its agency should have executed steel structural works of TG building/Bunker building of 500 MW or higher capacity (coal based/Lignite based) power plant / TG Building of Nuclear Power Plant / Steel Melting Shop/Proportioning Bin Building of Steel Plant
- c) For Turbo Generator Foundation, Bidder or its agency should have executed at least one (1) TG Foundation of 500MW or higher capacity (coal based/Lignite based) power plant / Nuclear Power Plant.

In case, Bidder proposes to engage more than one agency for the works mentioned at para 7.2 (a) or 7.2 (b) above, Bidder shall do so on work volume basis. The annual rate of execution in the reference works should not be less than eighty percent (80%) of the asking rate of such works, for which it is being engaged.

- 7.3 For civil & steel structural works of Coal Handling Plant, Ash Handling Plant and DM/PT Plant, Bidder or its agency(ies) should have executed track hopper or wagon tippler of Coal Handling Plant, Ash Handling Plant and DM/PT Plant of 500 MW or higher capacity Coal based/Lignite based power plant.
- 7.4 For Chimney, Bidder or its agency should have in the past built at least one (1) reinforced concrete chimney of minimum 100m height with slipform shuttering.
- 7.5 NOT USED
- 7.6 Bidder should have executed the reference works within the preceding seven (7) years reckoned as on the date of techno-commercial bid opening.
- 7.7
 - a. Bidder or its design agency (ies) should have carried out the design and detailed engineering of Main plant building, Coal Handling Plant, Mill bunker building, transfer points and conveyor gallery, civil & structural works for ash handling plant, CW System Civil Works, MUW System Civil Works (including RCC Intake structure in river) of coal based/Lignite based power plant of 500 MW or higher capacity.
 - b. For Foundation for Turbo-generator, Bidder or its design agency should have carried out design & detailed engineering of at least one foundation for Turbo-generator (with or without Vibration Isolation system as offered by the Bidder), for a coal based/lignite based power plant of 500MW or higher capacity or Nuclear Power Plant.
 - c. For Chimney, Bidder or its design agency should have carried out design & detailed engineering of at least one reinforced concrete chimney with steel flues, of minimum 100m height.
- 7.8 Finalisation of agency(ies) for above works shall be the responsibility of the successful Bidder and owner's approval for the same is not envisaged.

8.0 Not Applicable

PROVENNESS

9.0 Bidder shall have the option of awarding the BOP system(s) on EPC basis to qualified sub vendor(s). The qualified sub-vendor(s) for BOP EPC shall meet the following requirements:
The BOP EPC sub vendor should have executed on Engineering, Procurement and Construction (EPC) basis, minimum one (1) no. coal based/Lignite based power plant of at least 500 MW unit capacity comprising of at least a) Coal/Lignite handling plant, b) Cooling Tower, c) Water / waste water treatment plant or DM plant ,including associated civil works, Structural and Electrical systems for the above equipment(s) and systems as a single package, which is in successful operation for a period of not less than one (1) year prior to the date of techno-commercial bid opening.

The BOP EPC sub vendor shall source the equipment(s)/ Sub system(s) from such qualified vendors who meet the provenness requirements as stipulated in technical specification for the respective equipment(s)/ Sub system(s).

10.0 Balance equipment's/ systems

The Bidder at its option can source the balance of plant equipment/systems not covered in clause 3.0, 4.0, 5.0, 6.0, 7.0 8.0 & 9.0 above. However for such balance of plant equipment/systems, the Employer reserves the rights to satisfy himself on the provenness of the equipment and capability and capacity of the manufacturers.

11.0 Notwithstanding anything stated above, the Employer reserves the right to assess the capabilities and capacity of the Bidder/its Collaborators/ licenser/ its sub-contractors to perform the contract, should the circumstances warrant such assessment in the overall interest of the Employer.

12.0 To enable the approval of sub-vendors, the Bidder shall provide all necessary data such as type, design, make, capacity, duty conditions, date of commissioning/ operation etc.

13.0 Condenser Vacuum pumps are sometimes imported by contractor from manufacturers meeting the Provenness criteria as specified above. However, to promote make in India, vacuum pump is identified for Indigenous manufacturing. In case the bidder wants to purchase it from Indigenous sources who does not meet the specified criteria then the bidder to make sure following requirements are met. However, bidder can offer only one pump from indigenous sources for this package.

(i) Bidder has to make himself fully satisfied that the equipments/components shall perform to meet all the contractual requirement.

(ii) The bidder will source these equipments from Indian manufacturers who are regular manufacturer of such equipment/components for at least 200 MW or higher size unit.

PROVENNESS

- (iii) In such a case additional Testing and Quality requirement shall be tied-up for quality assurance checks before award.
- (iv) Apart from specific mandatory spares (identified for Vacuum pump), one additional pump of such indigenous source shall be supplied in addition to the requirement as per specification. Same shall be supplied along with the main equipments without any extra cost to the Employer.
- (v) Additional replacement warranty of 5 year after latent defect period shall be given by the bidder.
- (vi) In case of any failure of these equipment/components during unit operation/commissioning, then bidder shall replace the equipment from Owner approved sources

**SINGARENI TPP STAGE-II
(1X800MW) EPC PACKAGE
BIDDING DOCUMENT NO. CW-CM-11159-C-O-M-001
(Experience Details - Applicable to all the Bidders)**

Bidder's Name and Address:

Dept

To
Corp Material Procurement

SCCL
Kothagudem 507101

Summary of Critical Equipment indicated under clause 3.0 & 4.0, sub-section-I-A, Part-A of Section-VI.

Equipment Name	Sub-Vendor Name	Collaborator's Name, if applicable	Seeking Qualification as per clause..... Sub-Section-IA, Part-A of Section-VI
PA Fans			*3.1/*3.2/*3.3
ID Fans			*3.1/*3.2/*3.3
FD Fans			*3.1/*3.2/*3.3
Coal Pulverisers			*3.1/*3.2/*3.3
Raw Coal Feeders			*3.1/*3.2/*3.3
Boiler Startup drain recirculation pumps			*3.1/*3.2/*3.3
Primary Airpreheater*			*3.1/*3.2/*3.3
Secondary Air preheater*			*3.1/*3.2/*3.3
Tri-sector Air Preheater*			*3.1/*3.2/*3.3
Booster Fans			*3.1/*3.2/*3.3
Electrostatic Precipitator			*4.1.1/*4.1.2/*4.1.3

Note : *Strikeoff whichever is not applicable.

1. If qualification sought as per clause 3.1 then the details of the sub vendor (manufacturer) shall be filled by the bidder in the format A to I.
2. If the qualification sought as per the clause 3.2, then the details of proposed sub vendor (i.e manufacturer of such equipment's for at least 500MW unit rating) shall be filled

Signature of authorized signatory.....

- individually for each equipment by the bidder in the format A to Hand the details of collaborator or technology licensor who meets the requirement stipulated at 3.1 shall also be filled by the bidder in the format A to Hseparately. Further, in case of qualification vide clause 3.2 a copy of collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such equipment in India with the collaborator or technology licensor who meets the requirement stipulated at 3.1 shall also be furnished.
3. If the qualification sought as per the clause 3.3, then the details of JV/Subsidiary Company formed for manufacturing of such equipment's in India shall be furnished individually for each equipment by the bidder such as,
- i) Copy of document of incorporation of JV/Subsidiary company in India
 - ii) Copy of collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such equipment in India with the collaborator or technology licensor who meets the requirement stipulated at 3.1.
 - iii) Copy of document of at least 26% equity participation of qualified equipment manufacturer in the Indian JV company/subsidiary company directly or indirectly through its holding company /Subsidiary company, which shall be maintained for a lock -in period of seven (7) years from the date of incorporation of such JV/subsidiary or up to the end of defect liability period of the contract whichever is later.

Further, the details of collaborator or technology licensor or technology provider of the qualified equipment manufacturer who meets the requirement stipulated at 3.1 shall be filled by the Bidder in the format A to H(format given at 1.00.00). In addition to that, the sub vendor along with the Indian JV company/subsidiary company, qualified equipment manufacturer and its holding company/subsidiary company as applicable shall furnish the LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER .

*** strike out whichever is not applicable.**

- 1.00.00 (Applicable for Bidder/his sub vendors seeking qualification as per clause no. 3.1, Sub section-IA, Part-A of Section-VI. Bidder shall furnish the required data only for those equipments / auxiliaries which are proposed to be sourced under this route.)

We, hereby furnish the data on proveness criteria for critical equipment, auxiliaries, systems and Bought Out Items such as PA, ID and FD Fans, Coal Pulverisers, Raw Coal feeders, Boiler Start up drain recirculation pumps, Air pre-heaters, Auxiliary Boiler, which have been designed (either by self manufacturer or under Collaboration/Licencing Agreement), manufactured/ got manufactured and supplied by us /Manufacturer (or manufactured/ got manufactured & supplied by our proposed sub-vendors) and these are in successful operation in at least one (1) plant for a period not less than one year,reckoned as on the date of consideration for approval but not later than six months after award date of EPC package. The details of type and minimum equipment rating of such equipment are given below:

Signature of authorized signatory.....

S. No.	Item Description	Station-I

A. PA FAN

- (i) Name of the station and location
- (ii) Details of units
 - (a) Capacity of each unit (MW)
 - (b) No. of fans per unit
- (iii) Client name and its address,
 - Fax No. & Tel. No.
 - e-mail id
 - website address
- (iv) Name of the manufacturer & address
- (v) Date of commissioning of the fans

Signature of authorized signatory.....

S. No.	Item Description	Station-I
(vi)	Brief Technical particulars of the fans	
(a)	Type (Axial)	*Yes/*No
(b)	Make & Model	
(c)	No. of Stages	
(d)	Capacity	
	(i) Flow (M ³ /Sec.)	
	(ii) Head (mmwc)	
(e)	Speed of fan (rpm)	
(f)	Flow control device (variable blade pitch control as applicable)	
(g)	Bidder to enclosed flow Vs head curve of PA Fan for the reference plant	
(vii)	Whether the PA Fan have been in successful operation for a period not less than one (1) year	*Yes/*No
(viii)	Necessary documents/certificate in support of above are attached at Annexure..... of this Attachment	

B. ID FAN

- (i) Name of the station and location
- (ii) Details of units
 - (a) Capacity of each unit (MW)
 - (b) No. of fans per unit

Signature of authorized signatory.....

S. No.	Item Description	Station-I
(iii)	Client name and its address, - Fax No. & Tel. No. - e-mail id - website address	
(iv)	Name of the manufacturer & address	
(v)	Date of commissioning of the fans	
(vi)	Brief Technical particulars of the fans	
(a)	Type (axial)	*Yes/*No
(b)	Make & Model	
(c)	No. of stages	
(d)	Capacity	
	(i) Flow (M ³ /Sec.)	
	(ii) Head (mmwc)	
(e)	Speed of fan (rpm)	
(f)	Flow control device (Variable blade pitch control as applicable)	
(g)	Bidder to furnish flow Vs Head curves of the ID fans for the reference Plant	

Signature of authorized signatory.....

S. No.	Item Description	Station-I
(vii)	Whether the ID fans have been in successful operation for a period not less than one (1) year	*Yes/*No
(viii)	Necessary documents/certificate in support of above are attached at Annexure..... of this Attachment	

C. FD FAN

- (i) Name of the station and location
- (ii) Details of units
 - (a) Capacity of each unit (MW)
 - (b) No. of fans per unit
- (iii) Client name and its address,
 - Fax No. & Tel. No.
 - e-mail id
 - website address
- (iv) Name of the manufacturer & address
- (v) Date of commissioning of the fans
- (vi) Brief Technical particulars of the fans
 - (a) Type (Axial) *Yes/*No
 - (b) Make & Model
 - (c) No. of stages
 - (d) Capacity
 - (i) Flow (M³/Sec.)
 - (ii) Head (mmwc)

Signature of authorized signatory.....

S. No.	Item Description	Station-I
	(e) Speed of fan (rpm)	
	(f) Flow control device (variable blade pitch control as applicable)	
	(g) Bidder to enclose flow vs head curve of FD fan for the reference plant	
(vii)	Whether the FD fans have been in successful operation for a period not less than one (1) year	*Yes/*No
(viii)	Necessary documents/certificate in support of above are attached at Annexure..... of this Attachment	

D. COAL PULVERISERS

- (i) Name of the Station
and location
- (ii) Client Name and Its Address.
and Fax No.

– email id

– website address
- (iii) Name of the manufacturer
& address
- (iv) Date of commission of
the Coal Pulverisers
 - (a)
 - (b)
 - (c)

Signature of authorized signatory.....

S. No.	Item Description	Station-I
(v)	Details of Units	
	(a) Capacity of each unit (MW)	
	(b) No. of Pulverisers per Unit	
(vi)	Brief Technical particulars of the Coal Pulverisers	
	(a) Type	
	(b) Size & Model no.	
	(c) Capacity (Tonnes/hr.)	
	(i) Capacity of coal pulveriser for the reference plant (Tonnes/hr.) under following associated conditions : (bidder to fill in below)	
	(a) Coal fineness	(..... % through mesh)
	(b) Coal input size	(upto mm)
	(c) Total moisture in coal	(..... %)
	(d) HGI of input coal feed	(.....)
	(ii) Capacity of coal pulverisers for the reference plant (Tonne/hr.) with following associated conditions	
	(a) Coal fineness 70% through 200 mesh	
	(b) Coal input size up to 50 mm	
	(c) Total moisture in input coal 12%	
	(d) HGI of Coal 55	

Signature of authorized signatory.....

S. No.	Item Description	Station-I
	(iii) Bidder to enclose all relevant correction curve for variation in the pulveriser capacity of the reference plant w.r.t parameters indicated at (ii) above	
d)	Details of materials for pulveriser component for the reference plant	
	Material & wear	
	Life of wear parts	
	Material	
	– material of liners	
	– material of rolls/tyres/balls	
	– material of ring segments	
	– wear life of liners	
	– wear life or rolls/tyres/balls	
	– wear life of ring segments	
(e)	Details of coal quality for the project	
	1) HHV (kcal/hr)	
	2) Ash (%)	
	3) Moisture (%)	
	4) YGP Abrasiveness index of coal	
	5) Hard Grove Grindability Index (HGI)	

Signature of authorized signatory.....

S. No.	Item Description	Station-I
(vii)	Whether the coal pulverisers have been in successful operation for a period not less than one (1) year	*Yes/*No
(viii)	Necessary documents/certificate in support of above are attached at Annexure..... of this Attachment	

E. RAW COAL FEEDER

- (i) Name of the station and location
- (ii) Client name and his address and Fax No.
 - email id
 - website address
- (iii) Name of the manufacturer & address
- (iv) Date of commissioning of Raw Coal feeder
 - (a)
 - (b)
- (v) Details of units
 - (a) Capacity of each unit (MW)
 - (b) No. of Raw Coal feeder per unit
- (vi) Type & Rating
- (vii) Feeder size and Model no.
- (viii) Normal capacity (tonnes/hr)
- (ix) Maximum capacity (tonnes/hr)

Signature of authorized signatory.....

S. No.	Item Description	Station-I
(x)	Method of output control	
(xi)	Feeder belt width (mm)	
(xii)	Motor Rating & Auxiliary Power consumption (KW)	
(xiii)	Raw coal weighers -	
	- Method	
	- Range of measurement	
(xiv)	Whether the raw coal feeder have been in successful operation for a period not less than one (1) year	*Yes/*No
(xv)	Necessary documents/certificate in support of above are attached at Annexure..... of this Attachment	

F. BOILER STARTUP DRAIN RE-CIRCULATION PUMPS

- (i) Name of the station and its location
- (ii) No. of units & capacity in MW of each Unit
- (iii) No. of pumps per unit
- (iv) Client name and its address,
 - Fax No. & Tel. No.
 - e-mail id
 - website address
- (v) Name and Designation of the responsible person in client's organisation

Signature of authorized signatory.....

S. No.	Item Description	Station-I
(vi)	Name of the manufacturer & address	
(vii)	Contract No. & Date	
(viii)	Starting date of work	
(ix)	Scheduled date of completion	
(x)	Actual date of completion	
(xi)	Date of Commissioning of system/Package	
(xii)	Whether the Boiler Startup drain Recirculation pumps have been in successful operation for a period not less than one (1) year	*Yes/*No
(xiii)	Brief Technical Particulars of the pump	
	- Type & Model	
	- Gland less pump with submerged type wet motor with external high pressure cooler	*Yes/*No
	- Capacity, head & duty Conditions	
(xiv)	Necessary documents/certificate in support of above are attached at Annexure..... of this Attachment	

G (a) PRIMARY AIR PREHEATER (If applicable)

- (i) Name of the station and location

Signature of authorized signatory.....

S. No.	Item Description	Station-I
(ii)	Details of units	
	(a) Capacity of each unit (MW)	
	(b) No. of Primary Air preheaters per unit	
(iii)	Client name and its address,	
	- Fax No. & Tel. No.	
	- e-mail id	
	- website address	
(iv)	Name of the manufacturer & address	
(v)	Date of commissioning of the Primary Air preheater	
(vi)	Brief Technical particulars of the Primary Air preheater	
	(a) Type	
	(b) Model	
	(c) Size	
	(d) Air quantity entering Primary Air preheater (T/hr.)	
	(e) Gas quantity entering Primary Air preheater (T/hr.)	
(vii)	Whether the Primary Air Preheater have been in successful operation for a period not less than one (1) year	*Yes/*No
(viii)	Necessary documents/certificate in support of above are attached at Annexure..... of this Attachment	

Signature of authorized signatory.....

S. No.	Item Description	Station-I

G (b) SECONDARY AIR PREHEATER (If applicable)

- (i) Name of the station and location
- (ii) Details of units
 - (a) Capacity of each unit (MW)
 - (b) No. of Secondary Air preheaters per unit
- (iii) Client name and its address,
 - Fax No. & Tel. No.
 - e-mail id
 - website address
- (iv) Name of the manufacturer & address
- (v) Date of commissioning of the Secondary Air preheater
- (vi) Brief Technical particulars of the Secondary Air preheater
 - (a) Type
 - (b) Model
 - (c) Size
 - (d) Air quantity entering Secondary Air preheater (T/hr.)
 - (e) Gas quantity entering Secondary Air preheater (T/hr.)

Signature of authorized signatory.....

S. No.	Item Description	Station-I
(vii)	Whether the Secondary Air Preheater have been in successful operation for a period not less than one (1) year	*Yes/*No
(viii)	Necessary documents/certificate in support of above are attached at Annexure..... of this Attachment	

G (c) TRI SECTOR AIR PREHEATER (If Applicable)

- (i) Name of th station and location
- (ii) Details of units
 - (a) capacity of each unit (MW)
 - (b) No. of tri-Sector Air preheaters per unit
- (iii) Client name and its address
 - Fax No. & Tel .No.
 - E-mail id
 - website address
- (iv) Name of the manufacturer & address
- (v) Date of commissioning of the tri-sector Air preheater
- (vi) Brief Technical particulars of the Tri-Sector Air preheater
 - (a) Type
 - (b) Model
 - (c) Size
 - (d) Air quantity entering Tri-sector air preheater (T/Hr.)

Signature of authorized signatory.....

S. No.	Item Description	Station-I

(e)	Gas quantity entering Tri-Sector air preheater (T/hr.)	
(vii)	Whether the Tri-Sector Air preheater have been in successful operation for a period not less than one (1) year	*Yes/*No
(viii)	Necessary documents/certificate in support of above are attached at Annexure..... of this Attachment	

H. BOOSTER FAN(If Applicable)

(i)	Name of the station and location	
(ii)	Details of units	
(a)	Capacity of each unit (MW)	
(b)	No. of fans per unit	
(iii)	Client name and its address,	
	- Fax No. & Tel. No.	
	- e-mail id	
	- website address	
(iv)	Name of the manufacturer & address	
(v)	Date of commissioning of the fans	
(vi)	Brief Technical particulars of the fans	
(a)	Type (axial)	*Yes/*No
(b)	Make & Model	

Signature of authorized signatory.....

S. No.	Item Description	Station-I
	(c) No. of stages	
	(d) Capacity	
	(i) Flow (M ³ /Sec.)	
	(ii) Head (mmwc)	
	(e) Speed of fan (rpm)	
	(f) Flow control device (Variable blade pitch control as applicable)	
	(g) Bidder to furnish flow Vs Head curves of the Booster fans for the reference Plant	
(vii)	Whether the Booster fans have been in successful operation for a period not less than one (1) year	*Yes/*No
(viii)	Necessary documents/certificate in support of above are attached at Annexure..... of this Attachment	

***2.00.00** **Applicable for Bidder/his sub vendors seeking provenness criteria as per clause no. 3.2, Sub section-IA, Part-A of Section-VI.**

2.01.00 We, hereby confirm that we/our sub-vendors are a regular manufacturer of equipment (PA, ID and FD Fans, Coal Pulverisers, Raw Coal feeders, Boiler Start up drain recirculation pumps, Air pre-heaters, Booster Fans for units of atleast

Signature of authorized signatory.....

500MW rating and the details in this regard on provenness criteria as per clause 3.1, sub-section-IA, Part-A, Section-VI are hereby furnished below:

***Bidder to strike off whichever is not applicable.**

(Data to be furnished in line with format given at 1.00.00 of this Attachment))

2.02.00 We further confirm that details in respect of collaboration / valid licencing agreement for the aforesaid equipment as per 2.01.00 above who meets the requirement stipulated at clause 3.1, sub-section-IA, Part-A, Section-VI are enclosed as per **Annexure-I** to this Attachment. The data in respect of provenness criteria for these equipment which are in successful operation in at least one (1) plant for a period not less than one year,reckoned as on the date of consideration for approval but not later than six months after award date of EPC package, are furnished below. We further confirm that we/ our sub vendor(s) have created manufacturing and testing facilities at our/ their works as per collaborator's/ Licensor's design, manufacturing & quality control system for these equipment(s)/ Auxiliary(ies).

(Data to be furnished in line with format given at 1.00.00 of this Attachment)

***3.00.00 Applicable for JV Company/Subsidiary Company meeting provenness criteria as per clause no. 3.3, Sub section-IA, Part-A of Section-VI.**

3.01.00 We, hereby confirm that JV company/ Subsidiary company (Strike off whichever is not applicable) formed for manufacturing and supply of equipment(s) PA, ID and FD Fans, Coal Pulverisers, Raw Coal feeders, Boiler Start up drain recirculation pumps, Air pre-heaters, Booster Fans, Auxiliary Boiler has a valid collaboration or licensing agreement for design, engineering, manufacturing of such equipment(s) in India with a qualified equipment manufacturer who meets the requirements stipulated at clause 3.1 of sub-section-IA, Part-A, Section VI of bidding documents (or the technology provider of the qualified equipment manufacturer). Further, in such a case, such qualified equipment manufacturers is having, directly or indirectly through its holding company/subsidiary company, atleast 26% equity participation in the Indian Joint Venture Company/subsidiary company, which shall be maintained for a lock-in period of seven (7) years from the date of incorporation of such Joint Venture / Subsidiary or upto the end of defect liability period of the contract, whichever is later. In addition, the Bidder along with the Indian Joint Venture Company/Subsidiary Company, qualified equipment manufacturers and its holding/subsidiary company, as applicable, shall furnish a Letter of support for the successful performance of the equipment as per the format enclosed at end of Attachment-3K.

4.0.0 Electrostatic Precipitator

(A) FOR BIDDER/HIS SUBVENDOR SEEKING QUALIFICATIONS AS PER CLAUSE 4.1.1 OF THE SUB-SECTION-IA, PART-A OF SECTION-VI.

Signature of authorized signatory.....

We / proposed sub-vendor meet the requirement of Clause 4.1.1 of the sub-section-IA, Part-A of section-VI and to satisfy this requirement, we declare the following :

We / proposed sub-vendor have designed, supplied, erected/supervised erection and commissioned/supervised commissioning of rigid discharge framework Electrostatic Precipitators (of the type offered), having a designed efficiency of not less than 99%, operating in conjunction with pulverized coal fired steam generating units, rated for a minimum of 500 MW unit size or minimum 1500T/hr steaming capacity, which are in successful operation in atleast one installation for a period not less than One (1) year,reckoned as on the date of consideration for approval but not later than six months after award date of EPC package. The details of above are as under :

S. No.	Item Description	Station-I
1.	Name of Client with full address, Fax No. & Tel. No.	
2.	Name of station & its location	
3.	Name of Package/Contract	
4.	Name of the Contractor on whom the order for executing the reference plant (Electrostatic Precipitator) was placed by the Owner of the reference plant.	
5.	In case the Bidder/ his sub-vendor is not the Contractor at SI.No. 4, Name of the Organisation which placed order for reference plant (Electrostatic Precipitator) on the Bidder / Sub-Vendor	
6.	Detail of Steam Generator/Unit for which Electrostatic Precipitator supplied.	
(a)	Unit Rating (MW)	

Signature of authorized signatory.....

S. No.	Item Description	Station-I
	(b) Whether pulverised coal fired steam generator	Yes/No
	(c) Steaming capacity of steam generator	
7.	Date of Order	
8.	Date of Commissioning	
9.	Type of Electrostatic Precipitator (Whether rigid discharge framework now being offered)	Yes/No
10.	Design Efficiency of ESP	%
11.	Scope of Work included	
	(a) Design	Yes/No
	(b) Supply	Yes/No
	(c) Erection/Supervised Erection	Yes/No
	(d) Commissioning/Supervised Commissioning	Yes/No
12.	No. of years in successful operation reckoned as on the date of consideration for approval but not later than six months after award date of EPC package	
13.	Certificate from client in support of queries of Sl. No. 1 to 12 enclosed as Annex.....	Yes/No
14.	Certificate from Owner of the Plant (in case the Order is received from intermediary organization)	Yes/No
(Signature)..... (Printed Name)..... (Designation)..... (Common Seal).....		

Note: Wherever the term 'Coal Fired" is appearing above, "Coal" shall be deemed to also include bituminous Coal/Brown Coal/lignite.

Signature of authorized signatory.....

B. FOR BIDDER/ HIS SUB-VENDOR SEEKING QUALIFICATIONS AS PER CLAUSE 4.1.2 OF THE SUB-SECTION-IA, PART-A OF SECTION-VI.

Note : BIDDER IS REQUIRED TO FILL EITHER REQUIREMENT UNDER CLAUSE I(A) OR CLAUSE II(B) BELOW, WHICHEVER IS APPLICABLE ALONGWITH CLAUSE (II).

(I)(A) We / proposed sub-vendor meet the requirement of Clause 4.1.2(a)(i) of the Sub-section-IA, Part-A ofSection-VI and to satisfy this requirement, we declare the following :

We / sub-vendor are an Engineering, Procurement and Construction (EPC) organization executing contracts for setting up of Coal fired power plants and have experience of supplying atleast one (1) no. coal fired power plant of 200 MW capacity or above comprising of Electrostatic Precipitators, which is in successful operation for a period of not less than One (1) year reckoned as on the date of consideration for approval but not later than six months after award date of EPC package. The details of above are as follows :

S. No.	Item Description	Station-I
1.	Name of Client with full address Fax No. & Tel No.	
2.	Name of station & its location	
3.	Name of Package/Contract	
4.	Name of the Contractor on whom the order for executing the reference plant was placed	
5.	In case the Bidder/ his sub-vendor is not the Contractor as per SI.No.4 above, the name of organisation which has placed the order for reference plant (Electrostatic precipitator) on the Bidder/Sub-vendor	
6.	Details of Steam Generating Unit	
	(a) Unit Rating (MW)	
	(b) Whether Pulverised coal fired	Yes/No

Signature of authorized signatory.....

S. No.	Item Description	Station-I
7.	Scope of Work	
8.	Whether scope of work included supply of Electrostatic Precipitator	Yes/No
9.	Date of Commissioning	
10.	No. of years in successful operation prior to the date of Techno-commercial Bid opening.	
11.	Certificate from client in support of queries of Sl.No. 1 to 10 above is enclosed as Annex.....	Yes/No

Signature of authorized signatory.....

(I)(B) We / proposed sub-vendor meet the requirement of Clause 4.1.2(a)(ii) of sub-section-IA, Part-A of Section -VI, and to satisfy this requirement, we declare the following:

We / proposed sub-vendor are an Engineering, Procurement and Construction (EPC) organization and have executed, in the last 10 years, large industrial projects on EPC basis (with or without civil works) in the area of power, steel, oil & gas, petro-chemical, fertilizer and / or any other process industry with the total value of such projects being Rs.5,000 million or more. At least one of such projects have a contract value of Rs.2,000 million or more. These projects are in successful operation for a period of not less than One (1) year reckoned as on the date of consideration for approval but not later than six months after award date of EPC package.

Sl.No.	Item Description	Plant#1	Plant#2	Plant#3
1.	Name of Client with full address Fax No. & Tel No.			
2.	Name of station & its location			
3.	Name of the responsible person in Owner's organisation			
4.	Contract No. & Date			
5.	Nature/area of EPC Project (Power/Steel/Oil & Gas / Petrochemical/fertilizer/other process industry) (please specify)			
6.	Scope of Work (Please also specify whether civil work is included)			
7.	Date of Commissioning			
8.	No. of years in successful operation as on date of Techno-commercial bid opening.			
9.	Contract value of project			
10.	Necessary documents/certificate in support of above are attached at Annexure..... of this Attachment.			

Signature of authorized signatory.....

- (II) In order to meet the requirement of Clause 4.1.2(b) of sub-section-IA, Part-A of Section-VI, we further declare the following:

We / proposed sub-vendor have associated/collaborated with Electrostatic Precipitator Manufacturer M/s..... whose address is and who have designed, supplied, erected/supervised erection and commissioned/supervised commissioning rigid discharge framework Electrostatic Precipitators (of the type offered), having a designed efficiency of not less than 99%, operating in conjunction with pulverized coal fired steam generating units, rated for a minimum of 500 MW unit size or minimum 1500 T/hr steaming capacity, which are in successful operation in atleast one installation for a period of not less than One (1) year reckoned as on the date of consideration for approval but not later than six months after award date of EPC package. The details of above are as under:

Sl.No.	Item Description	Station - I
1.	Name of Client with full address Fax No. & Tel. No.	
2.	Name of station & its location	
3.	Name of Package/Contract	
4.	Name of the Contractor on whom the order for executing the reference plant (Electrostatic Precipitator) was placed by the Owner of the reference plant.	
5.	In case the Bidder/Sub-vendor is not the Contractor at Sl. No. 4, Name of the Organisation which placed order for reference plant (Electrostatic Precipitator) on the Bidder/Sub-venor	
6.	Detail of Steam Generator/Unit for which Electrostatic Precipitator supplied	
	(a) Unit Rating (MW)	
	(b) Whether pulverised coal fired steam generator	Yes/No
	(c) Steaming capacity of steam generator	
7.	Date of Order	

Signature of authorized signatory.....

Sl.No.	Item Description	Station - I
8.	Date of Commissioning	
9.	Type of Electrostatic Precipitator (Whether rigid discharge framework now being offered)	Yes/No
10.	Design Efficiency of ESP	%
11.	Scope of Work included	
	(a) Design	Yes/No
	(b) Supply	Yes/No
	(c) Erection/Supervised Erection	Yes/No
	(d) Commissioning/Supervised Commissioning	Yes/No
12.	No. of years in successful operation reckoned as on the date of consideration for approval but not later than six months after award date of EPC package	
13.	Certificate from client in support of queries of Sl.No. 1 to 12 above is enclosed as Annex.....	Yes/No
14.	Letter of support from Collaborator(s) / Licensor / Technology Provider as per Yes/No format enclosed in Annexure I of Attachment-3K Bidding Documents	
15.	Copy of Collaboration Agreement/ Technology licensing Agreement enclosed	Yes/No

(Signature).....

(Printed Name).....

(Designation).....

(Common Seal).....

Signature of authorized signatory.....

(C) FOR BIDDER/HIS SUBVENDOR SEEKING QUALIFICATIONS AS PER CLAUSE 4.1.3 OF SUB-SECTION-IA, PART-A OF SECTION-VI

(i) We / proposed sub-vendor meet the requirement of Clause 4.1.3 of Sub-section-IA, Part-A of Section-VI, and to satisfy this requirement, we declare the following:

We / proposed sub-vendor have designed, supplied, erected/supervised erection and commissioned/supervised commissioning rigid discharge framework Electrostatic Precipitators (of the type offered), having a designed efficiency of not less than 99%, operating in conjunction with pulverised coal fired steam generating units, in at least One (1) installation rated for a minimum of 200 MW unit size or minimum 600 T/hr steaming capacity, which are in successful operation for a period not less than One (1) year reckoned as on the date of consideration for approval but not later than six months after award date of EPC package. The details of above are as follows:

Sl.No.	Item Description	Plant
1.	Name of Client with full address Fax No. & Tel No.	
2.	Name of station & its location	
3.	Name of Package/Contract	
4.	Name of the Contractor on whom the order for executing the reference plant was placed	
5.	In case the Bidder/Sub-vendor is not the Contractor as per Sl.No.4 above, the name of organisation which has placed the order for reference plant (Electrostatic precipitator) on the Bidder/Sub-vendor	
6.	Detail of Steam Generator/Unit for which Electrostatic Precipitator supplied.	
(a)	Unit Rating (MW)	
(b)	Whether pulverised coal fired steam generator	Yes/No

Signature of authorized signatory.....

Sl.No.	Item Description	Station-I
	(c) Steaming capacity of steam generator	
7.	Date of Order	
8.	Date of Commissioning	
9.	Type of Electrostatic Precipitator (Whether rigid discharge frame work now being offered)	Yes/No
10.	Design Efficiency of ESP	
11.	Scope of Work included	
	(a) Design	Yes/No
	(b) Supply	Yes/No
	(c) Erection/Supervised Erection	Yes/No
	(d) Commissioning/Supervised Commissioning	Yes/No
12.	No. of years in successful operation reckoned as on the date of consideration for approval but not later than six months after award date of EPC package	
13.	Certificate from client in support of queries of Sl.No. 1 to 12 enclosed as Annex.....	Yes/No

Signature of authorized signatory.....

- (ii) In order to meet the requirement of Clause 4.1.3(b) of Subsection-IA, Part-A, Section-VI, we further declare the following :

We / proposed sub-vendor have an ongoing collaboration agreement/Technology Licensing Agreement prior to the date of submission of proposal of sub-vendor with manufacturer of Electrostatic Precipitator M/s..... whose address is and who have designed, supplied, erected/supervised erection and commissioned / supervised commissioning rigid discharge framework Electrostatic Precipitators (of the type offered), having a designed efficiency of not less than 99%, operating in conjunction with pulverized coal fired steam generating units, rated for a minimum of 500 MW unit size or minimum 1500 T/hr steaming capacity, which are in successful operation in atleast one installation for a period of not less than one (1) year reckoned as on the date of consideration for approval but not later than six months after award date of EPC package. The details of above are as under:

Sl.No.	Item Description	Station-I
1.	Name of Client with full address Fax No. & Tel. No.	
2.	Name of station & its location	
3.	Name of Package/Contract	
4.	Name of the Contractor on whom the order for executing the reference plant (Electrostatic Precipitator) was placed by the Owner of the reference plant	
5.	In case the Associate/Collaborator is not the Contractor at Sl.No.4, Name of the Organisation which placed order for reference plant (Electrostatic Precipitator) on the Associate/Collaborator	
6.	Detail of Steam Generator/Unit for which Electrostatic Precipitator supplied	
(a)	Unit Rating (MW)	
(b)	Whether pulverised coal fired steam generator	Yes/No
(c)	Steaming capacity of steam generator	

Signature of authorized signatory.....

Sl.No.	Item Description	Station-I
7.	Date of Order	
8.	Date of Commissioning	
9.	Type of Electrostatic Precipitator (Whether rigid discharge framework now being offered)	Yes/No
10.	Design Efficiency of ESP	
11.	Scope of Work included	
	(a) Design	Yes/No
	(b) Supply	Yes/No
	(c) Erection/Supervised Erection	Yes/No
	(d) Commissioning/Supervised Commissioning	Yes/No
12.	No. of years in successful operation prior to the date of Techno-commercial Bid opening.	
13.	Certificate from client in support of quarries of Sl.No. 1 to 12 above is enclosed as Annex.....	Yes/No
14.	Copy of Collaboration Agreement/ Technology Licensing Agreement enclosed	Yes/No
15.	Letter of support from Collaborator(s) / Licensor / Technology Provider as per Yes/No format enclosed in Annexure II of Attachment-3K	

(Signature).....

(Printed Name).....

(Designation).....

(Common Seal).....

Signature of authorized signatory.....

1.0.0 Selective Catalytic Reduction System

A. FOR BIDDER/ BIDDER'S SUB-VENDOR SEEKING QUALIFICATIONS AS PER CLAUSE 4.23.1 OF THE SUB-SECTION-IA, PART-A OF SECTION-VI.

We / proposed sub-vendor meet the requirement of Clause 4.23.1 of the Sub-section-IA, Part-A of Section-VI and to satisfy this requirement, we declare the following:

We / proposed sub-vendor (M/s.....) have designed, engineered, manufactured/ got manufactured/ supplied, erected/supervised erection and commissioned/supervised commissioning of atleast one number of ammonia based SCR System, consisting of SCR reactor & Ammonia injection system, with NOx reduction efficiency of not less than 75%, operating in conjunction with pulverized coal fired steam generator for 500 MW unit size or higher capacity unit or minimum 1500T/hr steaming capacity, which are in successful operation for a period not less than One (1) year. The details of above are as under:

S. No.	Item Description	Station-I
1.	Name of Client with full address, Fax No. & Tel. No.	
2.	Name of station & its location	
3.	Name of Package/Contract	
4.	Name of the Contractor on whom the order for executing the reference plant (SCR System) was placed by the Owner of the reference plant.	
5.	In case the Bidder/ his sub-vendor is not the Contractor at Sl.No. 4, Name of the Organisation which placed order for reference plant (Selective Catalytic Reduction System) on the Bidder / Sub-Vendor	
6.	Detail of Steam Generator/Unit for which Selective Catalytic Reduction System supplied.	
	(a) Unit Rating (MW)	
	(b) Whether pulverised coal fired steam generator	Yes/No
	(c) Steaming capacity of steam generator (T/hr.)	
7.	Date of Order	

Signature of authorized signatory.....

8.	Date of Commissioning of SCR system	
9.	Type of SCR System (Whether same as now being offered)	Yes/No
10.1	Design Efficiency of SCR system	%
10.2	Inlet NOx to SCR at 6%O2 dry	mg/Nm3
10.3	Outlet NOx to SCR at 6%O2 dry	mg/Nm3
10.4	Inlet Dust burden to SCR Reactor	g/ Nm ³
10.5	Type of catalyst (Plate/honeycomb/corrugated)	-----
10.6	Type of reagent (Aqueous Ammonia / Anhydrous Ammonia/urea)	
10.7	Type of Ammonia injection system	
11.	Scope of Work ammonia based SCR system consisting of SCR reactor & Ammonia injection system included	
(a)	Design	Yes/No
(b)	Engineering	Yes/No
(c)	Manufacturing/ got manufactured/ Supply	-----
(d)	Erection/Supervised Erection	-----
(e)	Commissioning/Supervised Commissioning	-----
12.	Whether scope of work include design, engineering, manufacturing/ got manufacture/ supply, erection/ got erection and commissioning of ammonia handling and storage system for SCR	Yes/No
13.	No. of years in successful operation of SCR system as on -----	
14.	Certificate from client in support of queries of Sl. No. 1 to 13 enclosed as Annex.....	Yes/No
15.	Certificate from Owner of the Plant (in case the Order is received from intermediary organization)	Yes/No

(Signature)..... Date Place

(Printed Name).....

(Designation).....

(Common Seal).....

Signature of authorized signatory.....

B. FOR BIDDER/ HIS SUB-VENDOR SEEKING QUALIFICATIONS AS PER CLAUSE 4.23.2 OF THE SUB-SECTION-IA, PART-A OF SECTION-VI.

Note : BIDDER IS REQUIRED TO FILL EITHER REQUIREMENT UNDER CLAUSE (I)(A) OR CLAUSE (I)(B) OR CLAUSE (I)(C) BELOW, WHICHEVER IS APPLICABLE ALONGWITH CLAUSE (II) AND CLAUSE (III).

(I)(A) We / proposed sub-vendor meet the requirement of Clause 4.23.2(a)(i) of the Sub-section-IA, Part-A of Section-VI and to satisfy this requirement, we declare the following:

We / proposed sub-vendor (M/s.....) have designed, engineered, manufactured/ got manufactured, erected/ supervised erection and commissioned/ supervised commissioning of atleast one number of pulverised coal fired steam generator for 200MW or higher capacity unit or having minimum 600T/hr steaming capacity, which are in successful operation for a period not less than One (1) year. The details of above are as under:

S. No.	Item Description	Station-I
1.	Name of Client with full address Fax No. & Tel No.	
2.	Name of station & its location	
3.	Name of Package/Contract	
4.	Name of the Contractor on whom the order for executing the reference plant was placed by the Owner of the reference plant.	
5.	In case the Bidder/ his sub-vendor is not the Contractor as per SI.No.4 above, the name of organisation which has placed the order for reference plant on the Bidder/Sub-vendor	
6.	Details of Steam Generating Unit	
	(a) Unit Rating (MW)	
	(b) Whether pulverised coal fired steam generator	Yes/No
	(c) Steaming capacity of steam generator (T/hr.)	
7.	Date of Order	
8.	Scope of Work	

Signature of authorized signatory.....

(a)	Design	Yes/No
(b)	Engineering	Yes/No
(c)	Manufacturing/ got manufactured	-----
(d)	Erection/Supervised Erection	-----
(e)	Commissioning/Supervised Commissioning	-----
9. Date of Commissioning
10. No. of years in successful operation
As on
11. Certificate from client in support of queries of Sl.No. 1 to 10 above is enclosed as Annex..... Yes/No
12. Certificate from Owner of the Plant (in case the Order is received from intermediary organization) Yes/No

(I)(B) We / proposed sub-vendor meet the requirement of Clause 4.23.2(a)(ii) of sub-section-IA, Part-A of Section -VI, and to satisfy this requirement, we declare the following:

We / proposed sub-vendor are a Joint Venture (JV) company incorporated in India under the Companies Act of India, as on the date of techno-commercial bid opening, created for the purpose of manufacturing steam generator sets in India.

The Joint Venture (JV) Company is promoted by (i) M/s _____ an Indian Company registered in India under the Companies Act of India and (ii) M/s. _____ a Steam Generator Manufacturer who meets the requirements as per details furnished in Clause 4.23.2 a(i) of the Sub-section-IA, Part-A of Section-VI.

We confirm that M/s _____ (the Steam Generator Manufacturer) have a minimum equity participation of 26% in the JV Company for a lock-in period of 7 years from the date of incorporation of JV Company.

Further, M/s _____, one of the promoter is majority stakeholder who have a minimum equity participation of 51% in the JV Company for a lock in period of 7 years from the date of incorporation of JV Company or up to the end of defect liability period of the contract whichever is later.

Also, we / proposed sub-vendor have executed/ executing orders related to Steam Generators, in the last 5 years, with the total value of such projects being INR 5,000 million or more.

Signature of authorized signatory.....

The details of the Joint Venture (JV) company are as follows:

Sl.No.	Item Description
1.	Name of JV Company
2.	Date of incorporation of JV Company in India under the companies act of India and purpose of creation
3.	Name of promoter of JV i.e. Indian company Registered in India
4.	Name of Steam generator manufacturer Meeting requirement of 4.23.2.a(i) of the Sub-section-IA, Part-A of Section-VI (Please fill details as per B(I)(A) above)
5.	Equity participation of Steam Generator Manufacturer in the JV Company (In percentage of the total equity)
6.	Lock in period for above equity participation from the date of incorporation (Bidder to furnish documentary evidence for their equity participation in the JV Company along with lock in period of such equity in compliance to clause 4.23.2 a(ii) of the Sub-section-IA, Part-A of Section-VI, supported by Board Resolution of the Steam Generator manufacturer)
7.	Name of company who is having Equity more than 51% in JV Company And Equity %
8.	Lock in period for above equity participation from the date of incorporation (Majority Stake Holder to furnish documentary evidence for their equity participation in the JV Company along with lock in period of such equity in compliance to clause 4.23.2 a(ii) supported by Board Resolution of the Majority Stake Holder)
9.	Copy of Certificate of Incorporation and Memorandum of Association of JV company is enclosed at Annex.....

Signature of authorized signatory.....

The details of orders executed/ under execution by JV company related to Steam Generators, in the last 5 years, with the total value of such projects being INR 5,000 million or more are as under:

S. No.	Item Description	Station-I	station-II	Station-III
1.	Name of Client with full address Fax No. & Tel No.			
2.	Name of station & its location			
3.	Name of Package/Contract			
4.	Name of the Company who has placed the order			
5.	Details of Steam Generating Unit			
	(a) Unit Rating (MW)			
	(b) Whether pulverised coal fired steam generator			Yes/No
	(c) Steaming capacity of steam generator (T/hr.)			
6.	Date of orders			
7.	Scope of Work			
8.	Completion date of orders			
9.	Total Value of the order (In equivalent INR)			
10.	Certificate from client in support of queries of Sl.No. 1 to 9 above is enclosed as Annex.....			Yes/No

Signature of authorized signatory.....

(I)(C) We / proposed sub-vendor meet the requirement of Clause 4.23.2(a)(iii) of sub-section-IA, Part-A of Section -VI, and to satisfy this requirement, we declare the following:

We / proposed sub-vendor are an Indian Subsidiary Company of a Steam Generator Manufacturer meeting requirements of clause 4.23.2 a(i) of the Sub-section-IA, Part-A of Section-VI, registered in India under the Companies Act of India, as on the date of techno-commercial bid opening, for manufacturing Steam Generator sets.

We confirm that the subsidiary Company is a subsidiary company of the Steam Generator Manufacturer for a minimum period of 7 years from the date of incorporation of such Subsidiary Company or up to the end of defect liability period of the contract whichever is later.

Further, we/ proposed sub-vendor have executed/executing orders related to Steam Generators, in the last 5 years, with the total value of such projects being INR 5,000 million or more.

The details of the Subsidiary Company of a Steam Generator Manufacturer are as follows:

Sl.No.	Item Description	
1.	Name of the Steam Generator Manufacturer Meeting requirement of 4.23.2.a(i) of the Sub-section-IA, Part-A of Section-VI (PI fill details as per B(I)(A) above)	
2.	Name of Indian Subsidiary Company with registration details	
3.	Address, Fax No. and Tel. No. of Subsidiary Company	
4.	Equity Lock in period for 7 years from the date of incorporation/ up to defect liability period (Bidder to furnish documentary evidence for their equity lock in period)	Yes/ No

Signature of authorized signatory.....

The details of orders executed/ under execution related to Steam Generators, in the last 5 years, with the total value of such projects being INR 5,000 million or more are as under:

S. No.	Item Description	Station-I	Station-II	Station-III
1.	Name of Client with full address Fax No. & Tel No.			
2.	Name of station & its location			
3.	Name of Package/Contract			
4.	Name of the Company who has placed the order			
5.	Details of Steam Generating Unit			
	(a) Unit Rating (MW)			
	(b) Whether pulverised coal fired steam generator		Yes/No	
	(c) Steaming capacity of steam generator (T/hr.)			
6.	Date of orders			
7.	Scope of Work			
8.	Completion date of orders			
9.	Total Value of the order (In equivalent INR)			
10.	Certificate from client in support of queries of Sl.No. 1 to 9 above is enclosed as Annex.....		Yes/No	

(II) In order to meet the requirement of Clause 4.23.2(b) of sub-section-IA, Part-A of Section-VI, we further declare the following:

We / proposed sub-vendor have a valid ongoing collaboration and technology transfer agreement with M/s _____ (QSCRM) meeting requirements of clause 4.23.1 of the Sub-section-IA, Part-A of Section-VI, on its own, which is valid minimum up to the end of the defect liability period of the contract. Copy of ongoing collaboration and technology transfer agreement is enclosed at Annex.....(The details of QSCRM required to be filled as per clause A above)

Signature of authorized signatory.....

(III) **In order to meet the requirement of Clause 4.23.2(c) of sub-section-IA, Part-A of Section-VI, we further declare the following:**

We shall furnish Letter of support from Collaborator(s) / Licensor / Technology Provider (LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER) executed between us, our sub-vendor (if applicable) and the QSCRM at the time of placement of order, as per clause 4.23.2 (c) of the Sub-section-IA, Part-A of Section-VI, at Annex..... to this Attachment, for the SCR system.

(Signature)..... Date Place
(Printed Name).....
(Designation).....
(Common Seal).....

C. FOR BIDDER/ HIS SUB-VENDOR SEEKING QUALIFICATIONS AS PER CLAUSE 4.23.3 OF THE SUB-SECTION-IA, PART-A OF SECTION-VI.

(I) We / proposed sub-vendor meet the requirement of Clause 4.23.3 (a) of the Sub-section-IA, Part-A of Section-VI and to satisfy this requirement, we declare the following:

We / proposed sub-vendor(M/s.....) are an Engineering, Procurement and Construction (EPC) organization, who have executed large industrial projects on EPC basis (with or without civil works) in the area of power, steel, oil & gas, petro-chemical, fertilizer, Flue gas de-nitrification system and / or any other process industry with the total value of such projects being INR 5,000 million or more. Atleast one of such projects have a contract value of INR 2,000 million or more. Further, these projects are in successful operation for a period of not less than one (1) year.

Details of EPC projects executed in last 10 years:

Sl.No.	Item Description	Station-I	Station-II	Station-III
1.	Name of Client with full address Fax No. & Tel No.			
2.	Name of station & its location			
3.	Name of the responsible person in Owner's organisation			
4.	Contract No. & Date			
5.	Nature/area of EPC Project (Power/ Steel/ Oil & Gas / Petro chemical/ fertilizer/ other process industry) (please specify)			

Signature of authorized signatory.....

6. Scope of Work (Please also specify whether civil work is included)
 7. Date of execution of Order
 8. Date of Commissioning
 9. No. of years in successful operation.
 10. Contract value of project (In equivalent INR)
 11. Necessary documents/certificate is support of above are attached at Annexure..... of this Attachment.
-

- (II) In order to meet the requirement of Clause 4.23.3(b) of sub-section-IA, Part-A of Section-VI, we further declare the following:

We / proposed sub-vendor have a valid ongoing collaboration and technology transfer agreement with M/s _____ (QSCRM) meeting requirements of clause 4.23.1 of the Sub-section-IA, Part-A of Section-VI, which is valid for minimum up to the end of the defect liability period of the contract. Further, we/ proposed sub-vendor also confirm that we/ sub-vender shall either source the SCR system from collaborator or manufacture/ get manufacture the SCR System as per the design and manufacturing drawings released by collaborator. Copy of ongoing collaboration and technology transfer agreement is enclosed at Annex..... (The details of Collaborator (QSCRM) required to be filled as per clause A above)

- (III) We shall furnish Letter of support from Collaborator(s) / Licensor / Technology Provider (LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER) executed between us, our sub-vendor (if applicable) and the QSCRM, as per clause 4.23.3 (c) at the time of placement of order, for the SCR system.

(Signature)..... Date Place
(Printed Name).....
(Designation).....
(Common Seal).....

Signature of authorized signatory.....

6.0.0 CRITICAL EQUIPMENT(S) FOR SCR& SNCR SYSTEM

6.1.0 Ammonia handling and storage system for SCR

FOR BIDDER/ BIDDER'S SUB-VENDOR SEEKING QUALIFICATIONS AS PER CLAUSE 4.24.1 OF THE SUB-SECTION-IA, PART-A OF SECTION-VI.

We / proposed sub-vendor meet the requirement of Clause 4.24.1 of the sub-section-IA, Part-A of section-VI and to satisfy this requirement, we declare the following:

We / proposed sub-vendor (M/s) have designed, engineered, manufactured/ got manufactured/ supplied, erected/ supervised erection and commissioned/supervised commissioning of atleast one number of anhydrous ammonia storage and handling system for SCR system, operating in conjunction with coal fired steam generating units, rated for minimum of 500MW unit size or minimum 1500T/hr steaming capacity, which are in successful operation for a period not less than One (1) year. The details of above are as under:

S. No.	Item Description	Station-I
1.	Name of Client with full address, Fax No. & Tel. No.	
2.	Name of station & its location	
3.	Name of Package/Contract	
4.	Name of the Contractor on whom the order for executing the reference plant (Ammonia handling and storage system for SCR system) was placed by the Owner of the reference plant.	
5.	In case the Bidder/ his sub-vendor is not the Contractor at SI.No. 4, Name of the Organisation which placed order for reference plant (Ammonia handling and storage system for SCR) on the Bidder / Sub-Vendor	
6.	Detail of Steam Generator/Unit for which Ammonia handling and storage system for SCR supplied.	
(a)	Unit Rating (MW)	
(b)	Whether coal fired steam generator	Yes/No
(c)	Steaming capacity of steam generator (T/hr.)	

Signature of authorized signatory.....

7. Date of Order
8. Date of Commissioning
9. Type of Ammonia handling and storage system for SCR System (Anhydrous/ Aqueous) ----
10. Scope of Work included for Ammonia handling and storage system for SCR System
 - (a) Design Yes/No
 - (b) Engineering Yes/No
 - (c) Manufacturing/ got manufactured/ Supply -----
 - (d) Erection/Supervised Erection -----
 - (e) Commissioning/Supervised Commissioning -----
11. No. of years in successful operation of Ammonia handling and storage system for SCR System as on
12. Ammonia storage system capacity in M³
13. Ammonia supply capacity in Kg/hr
14. Certificate from client in support of queries of Sl. No. 1 to 13 enclosed as Annex..... Yes/No
15. Certificate from Owner of the Plant (in case the Order is received from intermediary organization)enclosed as Annex..... Yes/No

(Signature)..... Date Place
 (Printed Name).....
 (Designation).....
 (Common Seal).....

Signature of authorized signatory.....

6.2.0 Catalyst for SCR system

FOR BIDDER/ BIDDER'S SUB-VENDOR SEEKING QUALIFICATIONS AS PER CLAUSE 4.24.2 OF THE SUB-SECTION-IA, PART-A OF SECTION-VI.

We / proposed sub-vendor meet the requirement of Clause 4.24.2 of the sub-section-IA, Part-A of section-VI and to satisfy this requirement, we declare the following:

We / proposed sub-vendor (M/s)have designed, engineered, manufactured, supplied plate type catalyst for SCR system, operating in conjunction with pulverized coal fired steam generating units, rated for 500MW unit size or higher capacity unit or minimum 1500T/hr steaming capacity, which are in successful operation for atleast 16000hrs without any replacement during this period. The details of above are as under:

S. No.	Item Description	Station-I
1.	Name of Client with full address, Fax No. & Tel. No.	
2.	Name of station & its location	
3.	Name of Package/Contract	
4.	Name of the Contractor on whom the order for executing the reference plant (Catalyst for SCR system) was placed by the Owner of the reference plant.	
5.	In case the Bidder/ his sub-vendor is not the Contractor at Sl.No. 4, Name of the Organisation which placed order for reference plant (Catalyst for SCR system) on the Bidder / Sub-Vendor	
6.	Detail of Steam Generator/Unit for which Catalyst for SCR system supplied.	
(a)	Unit Rating (MW)	
(b)	Whether pulverised coal fired steam generator	Yes/No
(c)	Steaming capacity of steam generator (T/hr.)	
7.	Date of Order of catalyst for SCR system	
8.	Date of Commissioning	

Signature of authorized signatory.....

9. Inlet dust burden to SCR reactor g/Nm³
10. Type of Catalyst (i.e. plate type) & Pitch (in mm)
for SCR system
11. Scope of Work included for Catalyst for SCR system
- (a) Design Yes/No
- (b) Engineering Yes/No
- (c) Manufacturing/ Supply -----
12. No. of hours in successful operation
without any replacement of catalyst
13. Certificate from client in support of queries
of Sl. No. 1 to 12 enclosed as Annex..... Yes/No
14. Certificate from Owner of the Plant
(in case the Order is received from
intermediary organization)enclosed as Annex..... Yes/No
-

(Signature)..... Date Place

(Printed Name).....

(Designation).....

(Common Seal).....

Signature of authorized signatory.....

6.3.0 SNCR system
(Applicable in case Bidder proposed hybrid system i.e. SCR with SNCR)

FOR BIDDER/ BIDDER'S SUB-VENDOR SEEKING QUALIFICATIONS AS PER CLAUSE 4.24.3 OF THE SUB-SECTION-IA, PART-A OF SECTION-VI.

We / proposed sub-vendor meet the requirement of Clause 4.23 & 4.24.3 of the Sub-section-IA, Part-A of Section-VI and to satisfy this requirement, we declare the following:

(Pl. fill the applicable details required as per Clause 4.23 of the Sub-section-IA, Part-A of section-VI indicated above at clause 5.0.0)

We / proposed sub-vendor (M/s) have designed, engineered, manufactured/ got manufactured/ supplied, erected/ supervised erection and commissioned/ supervised commissioning of atleast one number of urea based SNCR system, operating in conjunction with pulverized coal fired steam generator for 500MW or higher capacity unit or for a pulverized coal fired steam generator having minimum 1500T/hr steaming capacity, which are in successful operation for a period not less than One (1) year. The details of above are as under:

S. No.	Item Description	Station-I
1.	Name of Client with full address, Fax No. & Tel. No.	
2.	Name of station & its location	
3.	Name of Package/Contract	
4.	Name of the Contractor on whom the order for executing the reference plant (Urea based SNCR system) was placed by the Owner of the reference plant.	
5.	In case the Bidder/ his sub-vendor is not the Contractor at SI.No. 4, Name of the Organisation which placed order for reference plant (Urea based SNCR system) on the Bidder / Sub-Vendor	
6.	Detail of Steam Generator/Unit for which Urea based SNCR system supplied	
	(a) Unit Rating (MW)	
	(b) Whether pulverised coal fired steam generator	Yes/No
	(c) Steaming capacity of steam generator (T/hr.)	

Signature of authorized signatory.....

7.	Date of Order for Urea based SNCR system	
8.	Date of Commissioning of Urea based SNCR system	
9.	Type of Urea based SNCR system	Yes/No
10.1	No. & Capacity of urea solution Mixer tank (in m ³)	
10.2	No. & Capacity of urea solution storage tank (in m ³)	
10.3	No. & Location of urea injection point	
10.4	No. of urea injection nozzle at each location	
10.	Scope of Work included for Urea based SNCR system	
(a)	Design	Yes/No
(b)	Engineering	Yes/No
(c)	Manufacturing/ got manufactured/ Supply	-----
(d)	Erection/Supervised Erection	-----
(e)	Commissioning/Supervised Commissioning	-----
11.	No. of years in successful operation of Urea based SNCR system	
12.	Whether scope of work include design, engineering, manufacturing/ got manufacture/supply, erection/ got erection and commissioning of Urea handling and storage system for SNCR	Yes/No
13.	Certificate from client in support of queries of Sl. No. 1 to 12 enclosed as Annex.....	Yes/No
14.	Certificate from Owner of the Plant (in case the Order is received from intermediary organization) enclosed as Annex.....	Yes/No

(Signature)..... Date Place

(Printed Name).....

(Designation).....

(Common Seal).....

Signature of authorized signatory.....

6.4.0 Urea handling and storage system

FOR BIDDER/ BIDDER'S SUB-VENDOR SEEKING QUALIFICATIONS AS PER CLAUSE 4.24.4 OF THE SUB-SECTION-IA, PART-A OF SECTION-VI.

We / proposed sub-vendor meet the requirement of Clause 4.24.4 of the Sub-section-IA, Part-A of Section-VI and to satisfy this requirement, we declare the following:

We / proposed sub-vendor(M/s) have designed, engineered, manufactured/ got manufactured/ supplied, erected/ supervised erection and commissioned/ supervised commissioning of atleast one number of Urea handling and storage system for SNCR system, operating in conjunction with a coal fired steam generating units, rated for a minimum of 500MW unit size or for a pulverized coal fired steam generator with minimum 1500T/hr steaming capacity, which are in successful operation for a period not less than One (1) year. The details of above are as under:

S. No.	Item Description	Station-I
1.	Name of Client with full address, Fax No. & Tel. No.	
2.	Name of station & its location	
3.	Name of Package/Contract	
4.	Name of the Contractor on whom the order for executing the reference plant (Urea handling and storage system) was placed by the Owner of the reference plant.	
5.	In case the Bidder/ his sub-vendor is not the Contractor at SI.No. 4, Name of the Organisation which placed order for reference plant (Urea handling and storage system) on the Bidder / Sub-Vendor	
6.	Detail of Steam Generator/Unit for which Urea handling and storage systemsupplied	
	(a) Unit Rating (MW)	
	(b) Whether pulverised coal fired steam generator	Yes/No
	(c) Steaming capacity of steam generator (T/hr.)	
7.	Date of Order of urea handling and storage system	
8.	Date of Commissioning of urea handling and storage system	

Signature of authorized signatory.....

9. Type of Urea handling and storage system
(solid/ liquid urea)
10. Scope of Work included for urea handling and storage system
- | | | |
|-----|---|--------|
| (a) | Design | Yes/No |
| (b) | Engineering | Yes/No |
| (c) | Manufacturing/ got manufactured/ Supply | ----- |
| (d) | Erection/Supervised Erection | ----- |
| (e) | Commissioning/Supervised
Commissioning | ----- |
11. No. of years in successful operation
for urea handling and storage system
as on
12. Certificate from client in support of queries
of Sl. No. 1 to 11 enclosed as Annex..... Yes/No
13. Certificate from Owner of the Plant
(in case the Order is received from
intermediary organization) enclosed as Annex..... Yes/No

(Signature)..... Date Place

(Printed Name).....

(Designation).....

(Common Seal).....

Signature of authorized signatory.....

7.0.0 TO BE FILLED IN BY THE BIDDER/ PROPOSED SUBVENDOR (I.E. HOLDING COMPANY) MEETING REQUIREMENT OF CLAUSE 4.23.1 AND NOTE A(4) TO CLAUSE 4.23 of the Sub-section-IA, Part-A of Section-VI.

(Pl. fill the other relevant details as per the selected route as per format indicated at clause 5.0.0 above)

We/ Proposed sub vendor (M/s.....) are seeking qualification as holding company (singularly or collectively) with our subsidiaries (held either directly or indirectly) as per notes No.A (4) for clause no. 4.23.1 of the Sub-section-IA, Part-A of Section-VI. Further, the details of our subsidiaries meeting the requirements are as follows :

- 1 Ours and our Subsidiary(ies) Experience (To be filled as per 5.0.0 A indicated
Details in respect of meeting requirement of above)
Clause 4.23.1 of the Sub-section-IA, Part-A of
Section-VI
- 2 Name, Address, Tel. No. of the Subsidiary
meeting the requirement of QSCRM as per
clause no. 4.23.1 of the Sub-section-IA, Part-
A of Section-VI
- 3 Name, address & Telephone No. of subsidiary
company owning the technology for SCR
system

We are attaching the necessary documentary evidence as Annexure..... of this Attachment establishing the relationship with our above subsidiaries.

We are attaching the necessary documentary evidence as Annexure..... of this Attachment establishing the relationship between M/s.....(QSCRM) with above subsidiaries.

We are submitting board resolution of holding company as QSCRM stating that in case of any likely change of management control of any of holding company's subsidiaries lending strength / experience to the Holding Company for meeting the requirements of clause 4.23.1 of the Sub-section-IA, Part-A of Section-VI.

We shall furnish at the time of placement of order required LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER as per note A) (4) (iii) to clause no. 4.23 of the Sub-section-IA, Part-A of Section-VI.

Note for clause no. 5.0.0, 6.0.0 & 7.0.0:

1. Wherever the term "Coal Fired" is appearing above, "Coal" shall be deemed to also include bituminous Coal/Brown Coal/lignite.
2. The bidder/its sub-vendor(s) are required to meet the provenness criteria and/or qualification requirement for the items/ services listed below as per the stipulated criteria indicated in the respective clauses. For the purpose of qualification of Bidders / Sub-vendor(s), experience shall be reckoned as on the

Signature of authorized signatory.....

date of consideration for approval but not later than six months after award date of EPC package unless otherwise specified in the respective clauses.

3. The technology transfer agreement shall necessarily cover transfer of technological know-how for SCR System in the form of complete transfer of design dossier, design software's, drawings and documentation, quality system manuals and imparting relevant personnel training to the Indian Manufacturing Company.

Signature of authorized signatory.....

FORM No. SCR-A1 (IF APPLICABLE)

**FORM OF LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR /
TECHNOLOGY PROVIDER TO BE PROVIDED
ALONGWITH *STEAM GENERATOR MANUFACTURER/ *INDIAN JV COMPANY OF STEAM
GENERATOR MANUFACTURER/ *SUBSIDIARY COMPANY OF STEAM GENERATOR
MANUFACTURER AS PER CLAUSE *4.23.2a)(i)/ *4.23.2a)(ii)/ *4.23.2a)(iii) OF SUB-
SECTION-IA, PART A, SECTION VI AND COLLABORATOR AS PER CLAUSE 4.23.2b)OF
SUB-SECTION-IA, PART A, SECTION VI
(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)**

**LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY
PROVIDER TO BE EXECUTED BY CONTRACTOR *AND *HIS SUB-VENDOR MEETING
THE REQUIREMENTS SPECIFIED AT CLAUSE NO. *4.23.2a)(i)/ *4.23.2a)(ii)/ *4.23.2a)(iii)
OF SUB-SECTION-IA, PART A, SECTION VI ALONGWITH THE
COLLABORATOR(SELECTIVE CATALYTIC REDUCTION (SCR) SYSTEM
MANUFACTURER/ SUPPLIER (QSCRM) MEETING THE REQUIREMENTS AS PER CLAUSE
4.23.1 OF SUB-SECTION-IA, PART A, SECTION VI ON HIS OWN) FOR SUCCESSFUL
PERFORMANCE OF SELECTIVE CATALYTIC REDUCTION (SCR) SYSTEM, IN WHICH THE
COLLABORATOR AND THE CONTRACTOR *AND *HIS SUB-VENDOR ARE JOINTLY AND
SEVERALLY LIABLE TO THE EMPLOYER TO PERFORM ALL THE CONTRACTUAL
OBLIGATIONS INCLUDING THE TECHNICAL GUARANTEES FOR COMPLETE SELECTIVE
CATALYTIC REDUCTION (SCR) SYSTEM.**

The LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY
PROVIDER executed on this day of Two thousand by M/s
.....a Company incorporated under having its Registered Office
at(hereinafter called the "Contractor", which expression shall include its
successors, administrators, executors and permitted assigns)

AND

*M/s a Company incorporated under having its Registered
Office at(hereinafter called the "SUB-VENDOR", which expression shall
include its successors, administrators, executors and permitted assigns) who meets the required
experience as per Clause 4.23.2 a)(i) or 4.23.2 a)(ii) or 4.23.2 a)(iii) of Sub-Section-IA, Part A,
Section VI of bidding documents.

AND

M/s a Company registered under the having its Registered
Office at(hereinafter called the "Collaborator", which expression shall include its
successors, administrators, executors and permitted assigns), who meets the required
experience as per Clause 4.23.1 of Sub-Section-IA, Part A, Section VI of bidding documents.

in favour of, having its Registered Office at SCCL, Kothagudem
Collieries,Bhadrari Kothagudaem Dt, Telangana-507101 INDIA("Employer" which expression
shall include its successors, administrators, executors and assigns).

WHEREAS, the Employer invited Bids for design, engineering, manufacture, supply,
transportation to site, construction, installation, testing, commissioning and conductance of

Signature of authorized signatory.....

guarantee tests for the **EPC Package for Singareni TPP-II (1x800MW)**(hereinafter referred to as "Plant") vide its Bidding Document No.

AND WHEREAS vide clause 4.23.2 c) of Sub-Section-IA, Part A, Section VI of bidding documents, it has been specified that bidder/his sub-vendor who meets the required experience as per clause 4.23.2 a)(i) or 4.23.2 a)(ii) or 4.23.2 a)(iii) of Sub-Section-IA, Part A, Section VI shall Collaborate and have Technology Transfer agreement with a Selective Catalytic Reduction (SCR) System Manufacturer/ Supplier who meets the requirements of Clause 4.23.1 of Sub-Section-IA, Part A, Section VI on his own. In such case Contractor/ *his sub-vendor shall furnish a Letter of support from Collaborator(s) / Licensor / Technology Provider as per the requirement of clause no. 4.23.2(c) of Sub-Section-IA, Part A, Section VI.

WHEREAS M/s (Contractor) has submitted its proposal in response to the aforesaid Invitation for Bid by the Employer bearing No. dated for the **EPC Package for Singareni TPP-II(1x800MW)**against the Employer's Bidding Documents.

AND WHEREAS M/s (*Contractor/*his sub-vendor) is a *Steam Generator Manufacturer/ *Indian Joint Venture (JV) Company/ * Subsidiary Company of a Steam Generator Company and meets the requirement specified at clause no. *4.23.2a)(i) *or *4.23.2a)(ii) *or *4.23.2a)(iii) of Sub-Section-IA, Part A, Section VI and for executing the contract desire to collaborate with M/s (hereinafter referred to as Collaborator) who is a manufacturer of Selective Catalytic Reduction (SCR) System and meets the requirements as specified in clause no.4.23.1 of Sub-Section-IA, Part A, Section VI on its own, under an ongoing Collaboration and Technology Transfer Agreement, valid minimum up to the end of the defect liability period of the contract. The Contractor, his sub-vendor (if applicable) and the Collaborator are required to jointly execute and furnish at the time of placement of order an irrevocable Letter of support from Collaborator(s) / Licensor / Technology Provider and be jointly and severally responsible and bound unto the Employer for successful performance of the Selective Catalytic Reduction (SCR) System and be jointly and severally liable to perform all contractual obligations for the Selective Catalytic Reduction (SCR) System for the **EPC Package for Singareni TPP-II(1x800MW)** fully meeting the stipulated technical requirements, guaranteed parameters and characteristics for the Selective Catalytic Reduction (SCR) System as per the Bidding Documents in the event the bid is accepted by the Employer resulting into a Contract.

NOW THEREFORE, THIS DEED WITNESSETH AS UNDER:

1. We the Collaborator and the Contractor *and *his Sub-Vendor, do hereby declare and undertake that we shall be jointly and severally responsible to the Employer for the execution and successful performance of the complete Selective Catalytic Reduction (SCR) System and all the contractual obligations including the technical guarantees for the complete Selective Catalytic Reduction (SCR) System.
2. In case of any breach of the Contract committed by the Contractor *and *his Sub-Vendor, we the Collaborator do hereby undertake, declare and confirm that we shall be fully responsible for the successful performance of the Selective Catalytic Reduction (SCR) System and undertake to carry out all the obligations and responsibilities under this Letter of support from Collaborator(s) / Licensor / Technology Provider in order to discharge the Contractor's obligations stipulated under the Contract. Further, if the Employer sustains any loss or damage on account of any breach of the Contract for the Selective Catalytic Reduction (SCR) System, we the Collaborator and Contractor *and *his Sub-Vendor jointly and severally undertake to promptly indemnify and pay such loss/damages caused to the Employer on its written demand without any demur, reservation, Contest or protest in any manner whatsoever. This is without prejudice to

Signature of authorized signatory.....

- any rights of the Employer against the Contractor/*his Sub-Vendor under the Contract and/or guarantees. It shall not be necessary or obligatory for the Employer to first proceed against the Contractor/ *his Sub-Vendor before proceeding against the Collaborator nor any extension of time or any relaxation given by the Employer to the Contractor shall prejudice any rights of the Employer under this Letter of support from Collaborator(s) / Licensor / Technology Provider to proceed against the Contractor. The liability of the contractor, his sub-vendor and the associate/collaborator shall be limited to an amount equal to 100% of the value of the contract** between the contractor and the sub supplier for the equipments/systems.
3. Without prejudice to the generality of the Undertaking in paragraph 1 above, the manner of achieving the objective set forth in paragraph 1 above shall be as follows:
- (a) We, the Collaborator/Technology Licensor shall be fully responsible for complete engineering, preparation of all designs, design calculations, design documents / drawings and manufacturing drawings for the Selective Catalytic Reduction (SCR) System; preparation of all P&IDs & process flow diagrams; Selection of auxiliaries including catalyst, Ammonia handling and storage system and interfacing/ integrating SCR system with its auxiliaries so as to ensure satisfactory, reliable, safe and trouble free performance of SCR system meeting all stipulated technical requirements as well as all guaranteed parameters specified in the Contract for Selective Catalytic Reduction (SCR) System.
 - (b) We, the Collaborator/Technology Licensor shall be specifically responsible for the following:
 - (i) Complete design of SCR system including selection/ design of material, catalyst; complete mass flow balance as well as design of structural/ supporting system including selection of material & accessories etc.
 - (ii) Selection of auxiliaries for SCR System including preparation of purchase specification for critical auxiliaries including catalyst, Ammonia handling & storage system and gas sampling system.
 - (iii) Design of controls, protections and interlocks for all the auxiliaries for SCR System including Catalyst for their safe and reliable operation as integral units with other equipments of the Main Plant.
 - (iv) Providing all design data required by the Contractor to carry out design/ selection of balance equipment/ system including all civil inputs for foundation design, site construction, structural work etc. for SCR System and for their proper interfacing and integration.
 - (v) Provide manufacturing/fabrication drawings for SCR system.

Further, we, the Collaborator/ Technology Licensor shall extend our quality surveillance/ supervision/ quality control to the Contractor during manufacture, erection, commissioning and performance testing, both at Contractor's/Sub-vendor's works and/ or at Employer's project site. Without prejudice to the overall responsibilities of the Collaborator/Technology Licensor for successful commissioning and performance of Selective Catalytic Reduction (SCR) System, the Collaborator/Technology Licensor shall depute its technical experts from time to time to the Contractor's/ Sub-vendor's works/ Employer's project site, as mutually agreed upon between the Employer and the Contractor in accordance with the stipulation of the Contracts.

Signature of authorized signatory.....

- (c) We, the Collaborator/Technology Licensor will be fully responsible for the quality of manufacture of all equipments/ main assemblies/ components for incorporation in the Selective Catalytic Reduction (SCR) System.

For the items to be manufactured by the contractor at his/or his vendor's works as per the Collaborator/Technology Licensor design & manufacturing drawings released by us, the Collaborator shall ensure completeness and correctness of the design, data, document and information in every detail provided to the Contractor which would result in the same quality of equipment as if manufactured at Collaborator/Technology Licensor or its Sub-vendor's works and shall meet Collaborator/Technology Licensor acceptance.

- (d) We the Collaborator shall be fully responsible for complete design, manufacture, supply, installation so as to ensure satisfactory, reliable, safe and trouble free performance of Selective Catalytic Reduction (SCR) System.

Further, the Collaborator shall depute their technical experts from time to time to the Contractor's/*his sub-vendor's /Employer's project site as required by the Employer and agreed to by Contractor *and *his Sub-Vendor/Collaborator to facilitate the successful performance of the Selective Catalytic Reduction (SCR) System as stipulated in the aforesaid Contract.

Further, the Collaborator shall ensure proper design, manufacture, installation, testing and successful performance of the Selective Catalytic Reduction (SCR) System under the said Contract in accordance with stipulations of Bidding Documents and if necessary, the Collaborator shall advise the Contractor/ *his Sub-Vendor suitable modifications of design and implement necessary corrective measures to discharge the obligations under the contract.

- (e) In the event the Collaborator and the Contractor *and *his Sub-Vendor fail to demonstrate that the Selective Catalytic Reduction (SCR) System meets the guaranteed parameters and demonstration parameters as specified in the contract, the Collaborator and the Contractor and *and *his Sub-Vendor shall promptly carry out all the corrective measures related to engineering services at their own expense and shall promptly provide corrected design to the Employer.
- (f) Implementation of the corrected design and all other necessary repairs, replacements, rectification or modifications to the Selective Catalytic Reduction (SCR) System and payment of financial liabilities and penalties and fulfillment of all other contractual obligations as provided under the contract shall be the joint and severally responsibility of the Contractor *and *his Sub-Vendor and Collaborator.

4. We, the Contractor *and *his Sub-Vendor and the Collaborator do hereby undertake and confirm that this Undertaking shall be irrevocable and shall not be revoked till ninety (90) days after the end of the defect liability period of the last equipment covered under the Contract and further stipulate that the Undertaking herein contained shall terminate after ninety (90) days of satisfactory completion of such defect liability period. In case of delay in completion of defect liability period, the validity of this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be extended by such period of delay. We further agree that this Undertaking shall be without any prejudice to the various liabilities

Signature of authorized signatory.....

of the Contractor including Contract Performance Security as well as other obligations of the Contractor in terms of the Contract.

5. The Contractor *and *his Sub-Vendor and Collaborator will be fully responsible for the quality of all the equipment/main assemblies/components manufactured at their works or at their Vendors' works or constructed at site, and their repair or replacement, if necessary, for incorporation in the Plant and timely delivery thereof to meet the completion schedule under the Contract.
6. In case of Award, in addition to the Contract Performance Security furnished by the Contractor, the Collaborator *and *Contractor's Sub-Vendor shall each furnish 'as security' an on demand Performance Bank Guarantee in favour of the Employer as per provisions of the bidding documents. The value of such Bank Guarantee shall be equal to **INR 24 Million (Indian Rupees TwentyFour Million)** and it shall be guarantee towards the faithful performance /compliance of this Letter of support from Collaborator(s) / Licensor / Technology Provider in accordance with the terms and conditions specified herein. The bank guarantee shall be unconditional, irrevocable and valid till ninety (90) days beyond the end of defect liability period of the last equipment covered under the Contract. In case of delay in completion of the defect liability period, the validity of this Bank Guarantee shall be extended by the period of such delay. The guarantee amount shall be promptly paid to the Employer on demand without any demur, reservation, protest or contest.
7. Any dispute that may arise in connection with this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be settled as per arbitration procedure/rules mentioned in the Contract Documents. This Letter of support from Collaborator(s) / Licensor / Technology Provider shall be construed and interpreted in accordance with the Laws of India and the Courts of Delhi shall have exclusive jurisdiction.
8. We, the Collaborator and the Contractor *and *his Sub-Vendor agree that this Undertaking shall form an integral part of the Contracts from the date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider . We further agree that this Undertaking shall continue to be enforceable till its validity.
9. That this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be operative from the effective date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider .

IN WITNESS WHEREOF, the Collaborator and the Contractor *and *his Sub-Vendor through their authorised representatives, have executed these presents and affixed common seal of their respective companies, on the day, month and year first mentioned above.

1. WITNESS

For M/s

(Contractor)

.....

.....

(Signature Name)

(Signature of the Authorised Representative)

Signature of authorized signatory.....

.....
(Official Address) Name
Designation

Common Seal of the Company

1. WITNESS For M/s
(Collaborator)

.....
(Signature Name)
(Signature of the Authorised Representative)

.....
(Official Address) Name
Designation

Common Seal of the Company

1. WITNESS For M/s
(*Contractor's Sub-vendor)

.....
(Signature Name)
(Signature of the Authorised Representative)

.....
(Official Address) Name
Designation

Common Seal of the Company

Note : Power of Attorney of the persons signing the said Letter of support from Collaborator(s) /
Licensor / Technology Provider is to be furnished.

* Strike out, whichever is not applicable.

** Copy of the priced purchase order for the equipment shall be furnished by the Bidder.

Signature of authorized signatory.....

Signature of authorized signatory.....

FORM No. SCR-A2 (IF APPLICABLE)

**FORM OF LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR /
TECHNOLOGY PROVIDER TO BE PROVIDED
ALONGWITH ENGINEERING, PROCUREMENT AND CONSTRUCTION (EPC)
ORGANIZATION AS PER CLAUSE 4.23.3 a) OF SUB-SECTION-IA, PART A, SECTION VI
AND COLLABORATOR AS PER CLAUSE 4.23.3b) OF SUB-SECTION-IA, PART A,
SECTION VI**

(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

**LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY
PROVIDER TO BE EXECUTED BY CONTRACTOR *AND *HIS SUB-VENDOR MEETING
THE REQUIREMENTS SPECIFIED AT CLAUSE NO. 4.23.3a) OF SUB-SECTION-IA, PART
A, SECTION VI ALONGWITH THE COLLABORATOR (SELECTIVE CATALYTIC
REDUCTION (SCR) SYSTEM MANUFACTURER/ SUPPLIER (QSCRM) MEETING THE
REQUIREMENTS AS PER CLAUSE 4.23.1 OF SUB-SECTION-IA, PART A, SECTION VI ON
HIS OWN) FOR SUCCESSFUL PERFORMANCE OF SELECTIVE CATALYTIC REDUCTION
(SCR) SYSTEM, IN WHICH THE COLLABORATOR AND THE CONTRACTOR *AND *HIS
SUB-VENDOR ARE JOINTLY AND SEVERALLY LIABLE TO THE EMPLOYER TO
PERFORM ALL THE CONTRACTUAL OBLIGATIONS INCLUDING THE TECHNICAL
GUARANTEES FOR COMPLETE SELECTIVE CATALYTIC REDUCTION (SCR) SYSTEM.**

The LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY
PROVIDER executed on this day of Two thousand by M/s
.....a Company incorporated under having its Registered Office
at(hereinafter called the "Contractor", which expression shall include its
successors, administrators, executors and permitted assigns)

AND

*M/s an Engineering, Procurement and Construction (EPC) organization
Company incorporated under having its Registered Office at
.....(hereinafter called the "SUB-VENDOR", which expression shall include
its successors, administrators, executors and permitted assigns) who meets the required
experience as per Clause 4.23.3 a) of Sub-Section-IA, Part A, Section VI of bidding documents.

AND

M/s a Company registered under the having its Registered
Office at(hereinafter called the "Collaborator", which expression shall include its
successors, administrators, executors and permitted assigns), who meets the required
experience as per Clause 4.23.1 of Sub-Section-IA, Part A, Section VI of bidding documents.

in favour of, having its Registered Office at SCCL, Kothagudem
Collieries, Bhadrari Kothagudaem Dt, Telangana-507101 INDIA("Employer" which expression
shall include its successors, administrators, executors and assigns).

WHEREAS, the Employer invited Bids for design, engineering, manufacture, supply,
transportation to site, construction, installation, testing, commissioning and conductance of
guarantee tests for the **EPC Package for Singareni TPP-II(1x800MW)**(hereinafter referred to as
"Plant") vide its Bidding Document No. .

Signature of authorized signatory.....

AND WHEREAS vide clause 4.23.3 c) of Sub-Section-IA, Part A, Section VI of bidding documents, it has been specified that bidder/his sub-vendor who meets the required experience as per clause 4.23.3a) of Sub-Section-IA, Part A, Section VI shall Collaborate and have Technology Transfer agreement with a Selective Catalytic Reduction (SCR) System Manufacturer/ Supplier who meets the requirements of Clause 4.23.1 of Sub-Section-IA, Part A, Section VI on his own. In such case Contractor/ *his sub-vendor shall either source the Selective Catalytic Reduction (SCR) System from such Collaborator or Manufacture/ get manufacture the Selective Catalytic Reduction (SCR) System as per the design & manufacturing drawings released by such Collaborator under an ongoing Collaboration and Technology Transfer Agreement and furnish a Letter of support from Collaborator(s) / Licensor / Technology Provider as per the requirement of clause no. 4.23.3(c) of Sub-Section-IA, Part A, Section VI.

WHEREAS M/s (Contractor) has submitted its proposal in response to the aforesaid Invitation for Bid by the Employer bearing No. dated for the **EPC Package for Singareni TPP-II(1x800MW)** against the Employer's Bidding Documents.

AND WHEREAS M/s (*Contractor/*his sub-vendor) is an Engineering, Procurement and Construction (EPC) company and meets the requirement specified at clause no. 4.23.3a) of Sub-Section-IA, Part A, Section VI and for executing the contract desire to collaborate with M/s (hereinafter referred to as Collaborator) who is a manufacturer of Selective Catalytic Reduction (SCR) System and meets the requirements as specified in clause no.4.23.1 of Sub-Section-IA, Part A, Section VI on its own, for *sourcing the Selective Catalytic Reduction (SCR) System from the above Collaborator or *Manufacturing the Selective Catalytic Reduction (SCR) System as per the design and manufacturing drawings released by above Collaborator under an ongoing Collaboration and Technology Transfer Agreement, valid minimum up to the end of the defect liability period of the contract. The Contractor, his sub-vendor (if applicable) and the Collaborator are required to jointly execute and furnish at the time of placement of order an irrevocable Letter of support from Collaborator(s) / Licensor / Technology Provider and be jointly and severally responsible and bound upto the Employer for successful performance of the Selective Catalytic Reduction (SCR) System and be jointly and severally liable to perform all contractual obligations for the Selective Catalytic Reduction (SCR) System for the **EPC Package for Singareni TPP-II(1x800MW)** fully meeting the stipulated technical requirements, guaranteed parameters and characteristics for the Selective Catalytic Reduction (SCR) System as per the Bidding Documents in the event the bid is accepted by the Employer resulting into a Contract.

NOW THEREFORE, THIS DEED WITNESSETH AS UNDER:

1. We the Collaborator and the Contractor *and *his Sub-Vendor, do hereby declare and undertake that we shall be jointly and severally responsible to the Employer for the execution and successful performance of the complete Selective Catalytic Reduction (SCR) System and all the contractual obligations including the technical guarantees for the complete Selective Catalytic Reduction (SCR) System.
2. In case of any breach of the Contract committed by the Contractor *and *his Sub-Vendor, we the Collaborator do hereby undertake, declare and confirm that we shall be fully responsible for the successful performance of the Selective Catalytic Reduction (SCR) System and undertake to carry out all the obligations and responsibilities under this Letter of support from Collaborator(s) / Licensor / Technology Provider in order to discharge the Contractor's obligations stipulated under the Contract. Further, if the Employer sustains any loss or damage on account of any breach of the Contract for the Selective Catalytic Reduction (SCR) System, we the Collaborator and Contractor *and *his Sub-Vendor jointly and severally undertake to promptly indemnify and pay such loss/damages caused to the Employer on its written demand without any demur,

Signature of authorized signatory.....

reservation, Contest or protest in any manner whatsoever. This is without prejudice to any rights of the Employer against the Contractor/*his Sub-Vendor under the Contract and/or guarantees. It shall not be necessary or obligatory for the Employer to first proceed against the Contractor/ *his Sub-Vendor before proceeding against the Collaborator nor any extension of time or any relaxation given by the Employer to the Contractor shall prejudice any rights of the Employer under this Letter of support from Collaborator(s) / Licensor / Technology Provider to proceed against the Contractor. The liability of the contractor, his sub-vendor and the associate/collaborator shall be limited to an amount equal to 100% of the value of the contract** between the contractor and the sub supplier for the equipments/systems.

3. Without prejudice to the generality of the Undertaking in paragraph 1 above, the manner of achieving the objective set forth in paragraph 1 above shall be as follows:
 - (a) We, the Collaborator/Technology Licensor shall be fully responsible for complete engineering, preparation of all designs, design calculations, design documents / drawings and manufacturing drawings for the Selective Catalytic Reduction (SCR) System; preparation of all P&IDs & process flow diagrams; Selection of auxiliaries including catalyst, Ammonia handling and storage system and interfacing/ integrating SCR system with its auxiliaries so as to ensure satisfactory, reliable, safe and trouble free performance of SCR system meeting all stipulated technical requirements as well as all guaranteed parameters specified in the Contract for Selective Catalytic Reduction (SCR) System.
 - (b) We, the Collaborator/Technology Licensor shall be specifically responsible for the following:
 - (i) Complete design of SCR system including selection/ design of material, catalyst; complete mass flow balance as well as design of structural/ supporting system including selection of material & accessories etc.
 - (ii) Selection of auxiliaries for SCR System including preparation of purchase specification for critical auxiliaries including catalyst, Ammonia handling & storage system and gas sampling system.
 - (iii) Design of controls, protections and interlocks for all the auxiliaries for SCR System including Catalyst for their safe and reliable operation as integral units with other equipments of the Main Plant.
 - (iv) Providing all design data required by the Contractor to carry out design/ selection of balance equipment/ system including all civil inputs for foundation design, site construction, structural work etc. for SCR System and for their proper interfacing and integration.
 - (v) Provide manufacturing/fabrication drawings for SCR system.

Further, we, the Collaborator/ Technology Licensor shall extend our quality surveillance/ supervision/ quality control to the Contractor during manufacture, erection, commissioning and performance testing, both at Contractor's/Sub-vendor's works and/ or at Employer's project site. Without prejudice to the overall responsibilities of the Collaborator/Technology Licensor for successful commissioning and performance of Selective Catalytic Reduction (SCR) System, the Collaborator/Technology Licensor shall depute its technical experts from time to time to the Contractor's/ Sub-vendor's works/ Employer's project site, as mutually

Signature of authorized signatory.....

agreed upon between the Employer and the Contractor in accordance with the stipulation of the Contracts.

- (c) We, the Collaborator/Technology Licensor will be fully responsible for the quality of manufacture of all equipments/ main assemblies/ components for incorporation in the Selective Catalytic Reduction (SCR) System.

For the items to be manufactured by the contractor at his/or his vendor's works as per the Collaborator/Technology Licensor design & manufacturing drawings released by us, the Collaborator shall ensure completeness and correctness of the design, data, document and information in every detail provided to the Contractor which would result in the same quality of equipment as if manufactured at Collaborator/Technology Licensor or its Sub-vendor's works and shall meet Collaborator/Technology Licensor acceptance.

- (d) We the Collaborator shall be fully responsible for complete design, manufacture, supply, installation so as to ensure satisfactory, reliable, safe and trouble free performance of Selective Catalytic Reduction (SCR) System.

Further, the Collaborator shall depute their technical experts from time to time to the Contractor's/*his sub-vendor's /Employer's project site as required by the Employer and agreed to by Contractor *and *his Sub-Vendor/Collaborator to facilitate the successful performance of the Selective Catalytic Reduction (SCR) System as stipulated in the aforesaid Contract.

Further, the Collaborator shall ensure proper design, manufacture, installation, testing and successful performance of the Selective Catalytic Reduction (SCR) System under the said Contract in accordance with stipulations of Bidding Documents and if necessary, the Collaborator shall advise the Contractor/ *his Sub-Vendor suitable modifications of design and implement necessary corrective measures to discharge the obligations under the contract.

- (e) In the event the Collaborator and the Contractor *and *his Sub-Vendor fail to demonstrate that the Selective Catalytic Reduction (SCR) System meets the guaranteed parameters and demonstration parameters as specified in the contract, the Collaborator and the Contractor and *and *his Sub-Vendor shall promptly carry out all the corrective measures related to engineering services at their own expense and shall promptly provide corrected design to the Employer.
- (f) Implementation of the corrected design and all other necessary repairs, replacements, rectification or modifications to the Selective Catalytic Reduction (SCR) System and payment of financial liabilities and penalties and fulfillment of all other contractual obligations as provided under the contract shall be the joint and severally responsibility of the Contractor *and *his Sub-Vendor and Collaborator.

4. We, the Contractor *and *his Sub-Vendor and the Collaborator do hereby undertake and confirm that this Undertaking shall be irrevocable and shall not be revoked till ninety (90) days after the end of the defect liability period of the last equipment covered under the Contract and further stipulate that the Undertaking herein contained shall terminate after ninety (90) days of satisfactory completion of such defect liability period. In case of delay in completion of defect liability

Signature of authorized signatory.....

period, the validity of this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be extended by such period of delay. We further agree that this Undertaking shall be without any prejudice to the various liabilities of the Contractor including Contract Performance Security as well as other obligations of the Contractor in terms of the Contract.

5. The Contractor *and *his Sub-Vendor and Collaborator will be fully responsible for the quality of all the equipment/main assemblies/components manufactured at their works or at their Vendors' works or constructed at site, and their repair or replacement, if necessary, for incorporation in the Plant and timely delivery thereof to meet the completion schedule under the Contract.
6. In case of Award, in addition to the Contract Performance Security furnished by the Contractor, the Collaborator *and *Contractor's Sub-Vendor shall each furnish 'as security' an on demand Performance Bank Guarantee in favour of the Employer as per provisions of the bidding documents. The value of such Bank Guarantee shall be equal to **INR 24 Million (Indian Rupees Twenty Four Million)** and it shall be guarantee towards the faithful performance /compliance of this Letter of support from Collaborator(s) / Licensor / Technology Provider in accordance with the terms and conditions specified herein. The bank guarantee shall be unconditional, irrevocable and valid till ninety (90) days beyond the end of defect liability period of the last equipment covered under the Contract. In case of delay in completion of the defect liability period, the validity of this Bank Guarantee shall be extended by the period of such delay. The guarantee amount shall be promptly paid to the Employer on demand without any demur, reservation, protest or contest.
7. Any dispute that may arise in connection with this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be settled as per arbitration procedure/rules mentioned in the Contract Documents. This Letter of support from Collaborator(s) / Licensor / Technology Provider shall be construed and interpreted in accordance with the Laws of India and the Courts of Delhi shall have exclusive jurisdiction.
8. We, the Collaborator and the Contractor *and *his Sub-Vendor agree that this Undertaking shall form an integral part of the Contracts from the date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider . We further agree that this Undertaking shall continue to be enforceable till its validity.
9. That this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be operative from the effective date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider .

IN WITNESS WHEREOF, the Collaborator and the Contractor *and *his Sub-Vendor through their authorised representatives, have executed these presents and affixed common seal of their respective companies, on the day, month and year first mentioned above.

1. WITNESS

For M/s

(Contractor)

Signature of authorized signatory.....

.....	
(Signature Name)	(Signature of the Authorised Representative)
.....	Name
(Official Address)	Designation
	Common Seal of the Company

1. WITNESS

For M/s

(Collaborator)

.....

(Signature Name) (Signature of the Authorised Representative)

..... Name

(Official Address) Designation

Common Seal of the Company

1. WITNESS

For M/s

(*Contractor's Sub-vendor)

.....

(Signature Name) (Signature of the Authorised Representative)

..... Name

(Official Address) Designation

Common Seal of the Company

Note : Power of Attorney of the persons signing the said Letter of support from Collaborator(s) / Licensor / Technology Provider is to be furnished.

* Strike out, whichever is not applicable.

** Copy of priced purchase order for the equipment shall be furnished by the Bidder.

Signature of authorized signatory.....

Signature of authorized signatory.....

FORM No. SCR-A3 (IF APPLICABLE)

**FORM OF LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR /
TECHNOLOGY PROVIDER TO BE PROVIDED
ALONGWITH HOLDING COMPANY AS PER NOTES a) (4) (II) TO CLAUSE 4.23.1, 4.23.2
AND 4.23.3 OF SUB-SECTION-IA, PART A, SECTION VI**

(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

**LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY
PROVIDER TO BE EXECUTED BY THE BIDDER/ CONTRACTOR, THE QUALIFIED
SELECTIVE CATALYTIC REDUCTION (SCR) SYSTEM MANUFACTURER/ SUPPLIER
(QSCRM) (HOLDING COMPANY WHO ALONGWITH ITS SUBSIDIARIES MEETS THE
REQUIREMENT OF CLAUSE 4.23.1 OF SUB-SECTION-IA, PART-A, SECTION-VI.**

The LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY
PROVIDER executed on this day of Two thousand by M/s
.....a Company incorporated under having its Registered Office
at(hereinafter called the "Contractor", which expression shall include its
successors, administrators, executors and permitted assigns)

AND

*M/s a Company incorporated under having its Registered
Office at(hereinafter called the "SUB-VENDOR", which expression shall
include its successors, administrators, executors and permitted assigns) who meets the required
experience as per Clause 4.23.2 of Sub-Section-IA, Part A, Section VI of bidding documents.

AND

M/s a Company registered under the having its Registered
Office at(hereinafter called the "COLLABORATOR/ HOLDING COMPANY", which
expression shall include its successors, administrators, executors and permitted assigns), who
meets the required experience as per Clause 4.23.1 of Sub-Section-IA, Part A, Section VI of
bidding documents.

in favour of, having its Registered Office at SCCL, Kothagudem
Collieries, Bhadrari Kothagudaem Dt, Telangana-507101 INDIA("Employer" which expression
shall include its successors, administrators, executors and assigns).

WHEREAS, the Employer invited Bids for design, engineering, manufacture, supply,
transportation to site, construction, installation, testing, commissioning and conductance of
guarantee tests for the **EPC Package for Singareni TPP-II(1x800MW)**(hereinafter referred to as
"Plant") vide its Bidding Document No. .

AND WHEREAS vide A) Note to clause 4.23.1, 4.23.2 & 4.23.3, (4) of Sub-Section-IA, Part A,
Section VI of bidding documents, it has been specified that bidder/ his sub-vendor who meets
the required experience as per clause 4.23.2 of Sub-Section-IA, Part A, Section VI shall
Associate/ Collaborate with a Holding Company who meets the requirements of Clause 4.23.1 of
Sub-Section-IA, Part A, Section VI alongwith its Subsidiary company(ies). In such case
Contractor/ *his sub-vendor shall furnish a Letter of support from Collaborator(s) / Licensor /

Signature of authorized signatory.....

Technology Provider as per the requirement of A) Note to clause 4.23.1, 4.23.2 & 4.23.3, (4) (ii) of Sub-Section-IA, Part A, Section VI of bidding documents.

WHEREAS M/s (Contractor) has submitted its proposal in response to the aforesaid Invitation for Bid by the Employer bearing No. dated for the **EPC Package for Singareni TPP-II(1x800MW)** against the Employer's Bidding Documents.

AND WHEREAS M/s (*Contractor/*his sub-vendor) meets the requirement specified at clause no. 4.23.2 of Sub-Section-IA, Part A, Section VI and for executing the contract desire to associate/ collaborate with M/s (hereinafter referred to as Collaborator) who is a Holding Company and meets the requirements as specified in clause no.4.23.1 of Sub-Section-IA, Part A, Section VI alongwith its Subsidiary company(ies). The Contractor, his sub-vendor (if applicable) and the Collaborator are required to jointly execute and furnish at the time of placement of order an irrevocable Letter of support from Collaborator(s) / Licensor / Technology Provider and be jointly and severally responsible and bound unto the Employer for successful performance of the Selective Catalytic Reduction (SCR) System and be jointly and severally liable to perform all contractual obligations for the Selective Catalytic Reduction (SCR) System for the **EPC Package for Singareni TPP-II(1x800MW)** fully meeting the stipulated technical requirements, guaranteed parameters and characteristics for the Selective Catalytic Reduction (SCR) System as per the Bidding Documents in the event the bid is accepted by the Employer resulting into a Contract.

NOW THEREFORE, THIS DEED WITNESSETH AS UNDER:

1. We the Collaborator and the Contractor *and *his Sub-Vendor, do hereby declare and undertake that we shall be jointly and severally responsible to the Employer for the execution and successful performance of the complete Selective Catalytic Reduction (SCR) System and all the contractual obligations including the technical guarantees for the complete Selective Catalytic Reduction (SCR) System.
2. In case of any breach of the Contract committed by the Contractor *and *his Sub-Vendor, we the Collaborator do hereby undertake, declare and confirm that we shall be fully responsible for the successful performance of the Selective Catalytic Reduction (SCR) System and undertake to carry out all the obligations and responsibilities under this Letter of support from Collaborator(s) / Licensor / Technology Provider in order to discharge the Contractor's obligations stipulated under the Contract. Further, if the Employer sustains any loss or damage on account of any breach of the Contract for the Selective Catalytic Reduction (SCR) System, we the Collaborator and Contractor *and *his Sub-Vendor jointly and severally undertake to promptly indemnify and pay such loss/damages caused to the Employer on its written demand without any demur, reservation, Contest or protest in any manner whatsoever. This is without prejudice to any rights of the Employer against the Contractor/*his Sub-Vendor under the Contract and/or guarantees. It shall not be necessary or obligatory for the Employer to first proceed against the Contractor/ *his Sub-Vendor before proceeding against the Collaborator nor any extension of time or any relaxation given by the Employer to the Contractor shall prejudice any rights of the Employer under this Letter of support from Collaborator(s) / Licensor / Technology Provider to proceed against the Contractor. The liability of the contractor, his sub-vendor and the associate/collaborator/holding company shall be limited to an amount equal to 100% of the value of the contract** between the contractor and the sub supplier for the equipments/systems.

Signature of authorized signatory.....

3. Without prejudice to the generality of the Undertaking in paragraph 1 above, the manner of achieving the objective set forth in paragraph 1 above shall be as follows:
- (a) We, the Collaborator/Technology Licensor shall be fully responsible for complete engineering, preparation of all designs, design calculations, design documents / drawings and manufacturing drawings for the Selective Catalytic Reduction (SCR) System; preparation of all P&IDs & process flow diagrams; Selection of auxiliaries including catalyst, Ammonia handling and storage system and interfacing/ integrating SCR system with its auxiliaries so as to ensure satisfactory, reliable, safe and trouble free performance of SCR system meeting all stipulated technical requirements as well as all guaranteed parameters specified in the Contract for Selective Catalytic Reduction (SCR) System.
 - (b) We, the Collaborator/Technology Licensor shall be specifically responsible for the following:
 - (i) Complete design of SCR system including selection/ design of material, catalyst; complete mass flow balance as well as design of structural/ supporting system including selection of material & accessories etc.
 - (ii) Selection of auxiliaries for SCR System including preparation of purchase specification for critical auxiliaries including catalyst, Ammonia handling & storage system and gas sampling system.
 - (iii) Design of controls, protections and interlocks for all the auxiliaries for SCR System including Catalyst for their safe and reliable operation as integral units with other equipments of the Main Plant.
 - (iv) Providing all design data required by the Contractor to carry out design/ selection of balance equipment/ system including all civil inputs for foundation design, site construction, structural work etc. for SCR System and for their proper interfacing and integration.
 - (v) Provide manufacturing/fabrication drawings for SCR system.

Further, we, the Collaborator/ Technology Licensor shall extend our quality surveillance/ supervision/ quality control to the Contractor during manufacture, erection, commissioning and performance testing, both at Contractor's/Sub-vendor's works and/ or at Employer's project site. Without prejudice to the overall responsibilities of the Collaborator/Technology Licensor for successful commissioning and performance of Selective Catalytic Reduction (SCR) System, the Collaborator/Technology Licensor shall depute its technical experts from time to time to the Contractor's/ Sub-vendor's works/ Employer's project site, as mutually agreed upon between the Employer and the Contractor in accordance with the stipulation of the Contracts.

- (c) We, the Collaborator/Technology Licensor will be fully responsible for the quality of manufacture of all equipments/ main assemblies/ components for incorporation in the Selective Catalytic Reduction (SCR) System.

For the items to be manufactured by the contractor at his/or his vendor's works as per the Collaborator/Technology Licensor design & manufacturing drawings released by us, the Collaborator shall ensure completeness and correctness of the design, data, document and information in every detail provided to the Contractor which would result in the same quality of equipment as if manufactured at

Signature of authorized signatory.....

Collaborator/Technology Licensor or its Sub-vendor's works and shall meet Collaborator/Technology Licensor acceptance.

- (d) We the Collaborator shall be fully responsible for complete design, manufacture, supply, installation so as to ensure satisfactory, reliable, safe and trouble free performance of Selective Catalytic Reduction (SCR) System.

Further, the Collaborator shall depute their technical experts from time to time to the Contractor's/*his sub-vendor's /Employer's project site as required by the Employer and agreed to by Contractor *and *his Sub-Vendor/Collaborator to facilitate the successful performance of the Selective Catalytic Reduction (SCR) System as stipulated in the aforesaid Contract.

Further, the Collaborator shall ensure proper design, manufacture, installation, testing and successful performance of the Selective Catalytic Reduction (SCR) System under the said Contract in accordance with stipulations of Bidding Documents and if necessary, the Collaborator shall advise the Contractor/ *his Sub-Vendor suitable modifications of design and implement necessary corrective measures to discharge the obligations under the contract.

- (e) In the event the Collaborator and the Contractor *and *his Sub-Vendor fail to demonstrate that the Selective Catalytic Reduction (SCR) System meets the guaranteed parameters and demonstration parameters as specified in the contract, the Collaborator and the Contractor and *and *his Sub-Vendor shall promptly carry out all the corrective measures related to engineering services at their own expense and shall promptly provide corrected design to the Employer.
- (f) Implementation of the corrected design and all other necessary repairs, replacements, rectification or modifications to the Selective Catalytic Reduction (SCR) System and payment of financial liabilities and penalties and fulfillment of all other contractual obligations as provided under the contract shall be the joint and severally responsibility of the Contractor *and *his Sub-Vendor and Collaborator.

4. We, the Contractor *and *his Sub-Vendor and the Collaborator do hereby undertake and confirm that this Undertaking shall be irrevocable and shall not be revoked till ninety (90) days after the end of the defect liability period of the last equipment covered under the Contract and further stipulate that the Undertaking herein contained shall terminate after ninety (90) days of satisfactory completion of such defect liability period. In case of delay in completion of defect liability period, the validity of this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be extended by such period of delay. We further agree that this Undertaking shall be without any prejudice to the various liabilities of the Contractor including Contract Performance Security as well as other obligations of the Contractor in terms of the Contract.
5. The Contractor *and *his Sub-Vendor and Collaborator will be fully responsible for the quality of all the equipment/main assemblies/components manufactured at their works or at their Vendors' works or constructed at site, and their repair or replacement, if necessary, for incorporation in the Plant and timely delivery thereof to meet the completion schedule under the Contract.

Signature of authorized signatory.....

6. In case of Award, in addition to the Contract Performance Security furnished by the Contractor, the Collaborator *and *Contractor's Sub-Vendor shall each furnish 'as security' an on demand Performance Bank Guarantee in favour of the Employer as per provisions of the bidding documents. The value of such Bank Guarantee shall be equal to **INR 24 Million (Indian Rupees Twenty Four Million)** and it shall be guarantee towards the faithful performance /compliance of this Letter of support from Collaborator(s) / Licensor / Technology Provider in accordance with the terms and conditions specified herein. The bank guarantee shall be unconditional, irrevocable and valid till ninety (90) days beyond the end of defect liability period of the last equipment covered under the Contract. In case of delay in completion of the defect liability period, the validity of this Bank Guarantee shall be extended by the period of such delay. The guarantee amount shall be promptly paid to the Employer on demand without any demur, reservation, protest or contest.
7. Any dispute that may arise in connection with this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be settled as per arbitration procedure/rules mentioned in the Contract Documents. This Letter of support from Collaborator(s) / Licensor / Technology Provider shall be construed and interpreted in accordance with the Laws of India and the Courts of Delhi shall have exclusive jurisdiction.
8. We, the Collaborator and the Contractor *and *his Sub-Vendor agree that this Undertaking shall form an integral part of the Contracts from the date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider . We further agree that this Undertaking shall continue to be enforceable till its validity.
9. That this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be operative from the effective date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider .

IN WITNESS WHEREOF, the Collaborator and the Contractor *and *his Sub-Vendor through their authorised representatives, have executed these presents and affixed common seal of their respective companies, on the day, month and year first mentioned above.

1. WITNESS	For M/s
	(Contractor)
.....	
(Signature Name)	(Signature of the Authorised Representative)
.....	Name
(Official Address)	Designation
	Common Seal of the Company

Signature of authorized signatory.....

1. WITNESS For M/s
(Collaborator/ Holding Company)
.....
(Signature Name)
(Signature of the Authorised Representative)
..... Name
(Official Address) Designation

Common Seal of the Company

1. WITNESS For M/s
(*Contractor's Sub-vendor)
.....
(Signature Name) (Signature of the Authorised Representative)
..... Name
(Official Address) Designation

Common Seal of the Company

Note :

1. However, in case the Holding Company anticipates change of management control of any of its subsidiaries lending strength/ experience for fulfillment of requirement of clause 4.23.1 of Sub-Section-IA, Part-A, Section-VI, the Holding Company shall arrange for signing of LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER and bank guarantees from all such subsidiaries lending strength / experience to the Holding Company for fulfillment of requirement of clause 4.23.1 of Sub-Section-IA, Part-A, Section-VI, before the change in management control actually occurs.
2. Power of Attorney of the persons signing the said Letter of support from Collaborator(s) / Licensor / Technology Provider is to be furnished.

Signature of authorized signatory.....

3. * Strike out, whichever is not applicable.
4. ** Copy of priced purchase order for the equipment shall be furnished by the Bidder.

Signature of authorized signatory.....

FORM No. SCR-A4 (IF APPLICABLE)

**FORM OF LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR /
TECHNOLOGY PROVIDER TO BE PROVIDED
ALONGWITH HOLDING COMPANY AS PER NOTES a) (4) (II) TO CLAUSE 4.23.1, 4.23.2
AND 4.23.3 OF SUB-SECTION-IA, PART A, SECTION VI**

(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

**LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY
PROVIDER TO BE EXECUTED BY THE BIDDER/ CONTRACTOR, THE QUALIFIED
SELECTIVE CATALYTIC REDUCTION (SCR) SYSTEM MANUFACTURER/ SUPPLIER
(QSCRM) (HOLDING COMPANY WHO ALONGWITH ITS SUBSIDIARIES MEETS THE
REQUIREMENT OF CLAUSE 4.23.1 OF SUB-SECTION-IA, PART-A, SECTION-VI.**

The LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY
PROVIDER executed on this day of Two thousand by M/s
.....a Company incorporated under having its Registered Office
at(hereinafter called the "Contractor", which expression shall include its
successors, administrators, executors and permitted assigns)

AND

*M/s a Company incorporated under having its Registered
Office at(hereinafter called the "SUB-VENDOR", which expression shall
include its successors, administrators, executors and permitted assigns) who meets the required
experience as per Clause 4.23.3 of Sub-Section-IA, Part A, Section VI of bidding documents.

AND

M/s a Company registered under the having its Registered
Office at(hereinafter called the "COLLABORATOR/ HOLDING COMPANY", which
expression shall include its successors, administrators, executors and permitted assigns), who
meets the required experience as per Clause 4.23.1 of Sub-Section-IA, Part A, Section VI of
bidding documents.

in favour of, having its Registered Office at SCCL, Kothagudem
Collieries, Bhadrari Kothagudaem Dt, Telangana-507101 INDIA("Employer" which expression
shall include its successors, administrators, executors and assigns).

WHEREAS, the Employer invited Bids for design, engineering, manufacture, supply,
transportation to site, construction, installation, testing, commissioning and conductance of
guarantee tests for the **EPC Package for Singareni TPP-II(1x800MW)**(hereinafter referred to as
"Plant") vide its Bidding Document No. .

AND WHEREAS vide A) Note to clause 4.23.1, 4.23.2 & 4.23.3, (4) of Sub-Section-IA, Part A,
Section VI of bidding documents, it has been specified that bidder/ his sub-vendor who meets
the required experience as per clause 4.23.3 of Sub-Section-IA, Part A, Section VI shall
Associate/ Collaborate with a Holding Company who meets the requirements of Clause 4.23.1 of
Sub-Section-IA, Part A, Section VI alongwith its Subsidiary company(ies). In such case
Contractor/ *his sub-vendor shall either source the Selective Catalytic Reduction (SCR) System

Signature of authorized signatory.....

from such Collaborator or Manufacture/ get manufacture the Selective Catalytic Reduction (SCR) System as per the design & manufacturing drawings released by such Collaborator under an ongoing Collaboration and Technology Transfer Agreement and furnish a Letter of support from Collaborator(s) / Licensor / Technology Provider as per the requirement of A) Note to clause 4.23.1, 4.23.2 & 4.23.3, (4) (ii) of Sub-Section-IA, Part A, Section VI of bidding documents.

WHEREAS M/s (Contractor) has submitted its proposal in response to the aforesaid Invitation for Bid by the Employer bearing No. dated for the **EPC Package for Singareni TPP-II(1x800MW)** against the Employer's Bidding Documents.

AND WHEREAS M/s (*Contractor/*his sub-vendor) meets the requirement specified at clause no. *4.23.3 of Sub-Section-IA, Part A, Section VI and for executing the contract desire to associate/ collaborate with M/s (hereinafter referred to as Collaborator) who is a Holding Company and meets the requirements as specified in clause no.4.23.1 of Sub-Section-IA, Part A, Section VI alongwith its Subsidiary company(ies). The Contractor, his sub-vendor (if applicable) and the Collaborator are required to jointly execute and furnish at the time of placement of order an irrevocable Letter of support from Collaborator(s) / Licensor / Technology Provider and be jointly and severally responsible and bound unto the Employer for successful performance of the Selective Catalytic Reduction (SCR) System and be jointly and severally liable to perform all contractual obligations for the Selective Catalytic Reduction (SCR) System for the **EPC Package for Singareni TPP-II(1x800MW)** fully meeting the stipulated technical requirements, guaranteed parameters and characteristics for the Selective Catalytic Reduction (SCR) System as per the Bidding Documents in the event the bid is accepted by the Employer resulting into a Contract.

NOW THEREFORE, THIS DEED WITNESSETH AS UNDER:

1. We the Collaborator and the Contractor *and *his Sub-Vendor, do hereby declare and undertake that we shall be jointly and severally responsible to the Employer for the execution and successful performance of the complete Selective Catalytic Reduction (SCR) System and all the contractual obligations including the technical guarantees for the complete Selective Catalytic Reduction (SCR) System.
2. In case of any breach of the Contract committed by the Contractor *and *his Sub-Vendor, we the Collaborator do hereby undertake, declare and confirm that we shall be fully responsible for the successful performance of the Selective Catalytic Reduction (SCR) System and undertake to carry out all the obligations and responsibilities under this Letter of support from Collaborator(s) / Licensor / Technology Provider in order to discharge the Contractor's obligations stipulated under the Contract. Further, if the Employer sustains any loss or damage on account of any breach of the Contract for the Selective Catalytic Reduction (SCR) System, we the Collaborator and Contractor *and *his Sub-Vendor jointly and severally undertake to promptly indemnify and pay such loss/damages caused to the Employer on its written demand without any demur, reservation, Contest or protest in any manner whatsoever. This is without prejudice to any rights of the Employer against the Contractor/*his Sub-Vendor under the Contract and/or guarantees. It shall not be necessary or obligatory for the Employer to first proceed against the Contractor/ *his Sub-Vendor before proceeding against the Collaborator nor any extension of time or any relaxation given by the Employer to the Contractor shall prejudice any rights of the Employer under this Letter of support from Collaborator(s) / Licensor / Technology Provider to proceed against the Contractor. The liability of the contractor, his sub-vendor and the associate/collaborator/holding company shall be limited to an amount equal to 100% of the value of the contract** between the contractor and the sub supplier for the equipments/systems.

Signature of authorized signatory.....

3. Without prejudice to the generality of the Undertaking in paragraph 1 above, the manner of achieving the objective set forth in paragraph 1 above shall be as follows:
- (a) We, the Collaborator/Technology Licensor shall be fully responsible for complete engineering, preparation of all designs, design calculations, design documents / drawings and manufacturing drawings for the Selective Catalytic Reduction (SCR) System; preparation of all P&IDs & process flow diagrams; Selection of auxiliaries including catalyst, Ammonia handling and storage system and interfacing/ integrating SCR system with its auxiliaries so as to ensure satisfactory, reliable, safe and trouble free performance of SCR system meeting all stipulated technical requirements as well as all guaranteed parameters specified in the Contract for Selective Catalytic Reduction (SCR) System.
 - (b) We, the Collaborator/Technology Licensor shall be specifically responsible for the following:
 - (i) Complete design of SCR system including selection/ design of material, catalyst; complete mass flow balance as well as design of structural/ supporting system including selection of material & accessories etc.
 - (ii) Selection of auxiliaries for SCR System including preparation of purchase specification for critical auxiliaries including catalyst, Ammonia handling & storage system and gas sampling system.
 - (iii) Design of controls, protections and interlocks for all the auxiliaries for SCR System including Catalyst for their safe and reliable operation as integral units with other equipments of the Main Plant.
 - (iv) Providing all design data required by the Contractor to carry out design/ selection of balance equipment/ system including all civil inputs for foundation design, site construction, structural work etc. for SCR System and for their proper interfacing and integration.
 - (v) Provide manufacturing/fabrication drawings for SCR system.

Further, we, the Collaborator/ Technology Licensor shall extend our quality surveillance/ supervision/ quality control to the Contractor during manufacture, erection, commissioning and performance testing, both at Contractor's/Sub-vendor's works and/ or at Employer's project site. Without prejudice to the overall responsibilities of the Collaborator/Technology Licensor for successful commissioning and performance of Selective Catalytic Reduction (SCR) System, the Collaborator/Technology Licensor shall depute its technical experts from time to time to the Contractor's/ Sub-vendor's works/ Employer's project site, as mutually agreed upon between the Employer and the Contractor in accordance with the stipulation of the Contracts.

- (c) We, the Collaborator/Technology Licensor will be fully responsible for the quality of manufacture of all equipments/ main assemblies/ components for incorporation in the Selective Catalytic Reduction (SCR) System.

For the items to be manufactured by the contractor at his/or his vendor's works as per the Collaborator/Technology Licensor design & manufacturing drawings released by us, the Collaborator shall ensure completeness and correctness of the design, data, document and information in every detail provided to the Contractor

Signature of authorized signatory.....

which would result in the same quality of equipment as if manufactured at Collaborator/Technology Licensor or its Sub-vendor's works and shall meet Collaborator/Technology Licensor acceptance.

- (d) We the Collaborator shall be fully responsible for complete design, manufacture, supply, installation so as to ensure satisfactory, reliable, safe and trouble free performance of Selective Catalytic Reduction (SCR) System.

Further, the Collaborator shall depute their technical experts from time to time to the Contractor's/*his sub-vendor's /Employer's project site as required by the Employer and agreed to by Contractor *and *his Sub-Vendor/Collaborator to facilitate the successful performance of the Selective Catalytic Reduction (SCR) System as stipulated in the aforesaid Contract.

Further, the Collaborator shall ensure proper design, manufacture, installation, testing and successful performance of the Selective Catalytic Reduction (SCR) System under the said Contract in accordance with stipulations of Bidding Documents and if necessary, the Collaborator shall advise the Contractor/ *his Sub-Vendor suitable modifications of design and implement necessary corrective measures to discharge the obligations under the contract.

- (e) In the event the Collaborator and the Contractor *and *his Sub-Vendor fail to demonstrate that the Selective Catalytic Reduction (SCR) System meets the guaranteed parameters and demonstration parameters as specified in the contract, the Collaborator and the Contractor and *and *his Sub-Vendor shall promptly carry out all the corrective measures related to engineering services at their own expense and shall promptly provide corrected design to the Employer.
- (f) Implementation of the corrected design and all other necessary repairs, replacements, rectification or modifications to the Selective Catalytic Reduction (SCR) System and payment of financial liabilities and penalties and fulfillment of all other contractual obligations as provided under the contract shall be the joint and severally responsibility of the Contractor *and *his Sub-Vendor and Collaborator.

4. We, the Contractor *and *his Sub-Vendor and the Collaborator do hereby undertake and confirm that this Undertaking shall be irrevocable and shall not be revoked till ninety (90) days after the end of the defect liability period of the last equipment covered under the Contract and further stipulate that the Undertaking herein contained shall terminate after ninety (90) days of satisfactory completion of such defect liability period. In case of delay in completion of defect liability period, the validity of this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be extended by such period of delay. We further agree that this Undertaking shall be without any prejudice to the various liabilities of the Contractor including Contract Performance Security as well as other obligations of the Contractor in terms of the Contract.
5. The Contractor *and *his Sub-Vendor and Collaborator will be fully responsible for the quality of all the equipment/main assemblies/components manufactured at their works or at their Vendors' works or constructed at site, and their repair or replacement, if necessary, for incorporation in the Plant and timely delivery thereof to meet the completion schedule under the Contract.

Signature of authorized signatory.....

6. In case of Award, in addition to the Contract Performance Security furnished by the Contractor, the Collaborator *and *Contractor's Sub-Vendor shall each furnish 'as security' an on demand Performance Bank Guarantee in favour of the Employer as per provisions of the bidding documents. The value of such Bank Guarantee shall be equal to **INR 24 Million (Indian Rupees Twenty Four Million)** and it shall be guarantee towards the faithful performance /compliance of this Letter of support from Collaborator(s) / Licensor / Technology Provider in accordance with the terms and conditions specified herein. The bank guarantee shall be unconditional, irrevocable and valid till ninety (90) days beyond the end of defect liability period of the last equipment covered under the Contract. In case of delay in completion of the defect liability period, the validity of this Bank Guarantee shall be extended by the period of such delay. The guarantee amount shall be promptly paid to the Employer on demand without any demur, reservation, protest or contest.
7. Any dispute that may arise in connection with this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be settled as per arbitration procedure/rules mentioned in the Contract Documents. This Letter of support from Collaborator(s) / Licensor / Technology Provider shall be construed and interpreted in accordance with the Laws of India and the Courts of Delhi shall have exclusive jurisdiction.
8. We, the Collaborator and the Contractor *and *his Sub-Vendor agree that this Undertaking shall form an integral part of the Contracts from the date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider . We further agree that this Undertaking shall continue to be enforceable till its validity.
9. That this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be operative from the effective date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider .

IN WITNESS WHEREOF, the Collaborator and the Contractor *and *his Sub-Vendor through their authorised representatives, have executed these presents and affixed common seal of their respective companies, on the day, month and year first mentioned above.

1. WITNESS	For M/s
	(Contractor)
.....	
(Signature Name)	(Signature of the Authorised Representative)
.....	Name
(Official Address)	Designation
	Common Seal of the Company

Signature of authorized signatory.....

1. WITNESS For M/s
(Collaborator/ Holding Company)
.....
(Signature Name) (Signature of the Authorised Representative)
..... Name
(Official Address) Designation

Common Seal of the Company

1. WITNESS For M/s
(*Contractor's Sub-vendor)
.....
(Signature Name)
(Signature of the Authorised Representative)
..... Name
(Official Address) Designation

Common Seal of the Company

Note :

1. However, in case the Holding Company anticipates change of management control of any of its subsidiaries lending strength/ experience for fulfillment of requirement of clause 4.23.1 of Sub-Section-IA, Part-A, Section-VI, the Holding Company shall arrange for signing of LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER and bank guarantees from all such subsidiaries lending strength / experience to the Holding Company for fulfillment of requirement of clause 4.23.1 of Sub-Section-IA, Part-A, Section-VI, before the change in management control actually occurs.
2. Power of Attorney of the persons signing the said Letter of support from Collaborator(s) / Licensor / Technology Provider is to be furnished.
3. * Strike out, whichever is not applicable.

Signature of authorized signatory.....

4. ** Copy of priced purchase order for the equipment shall be furnished by the Bidder.

7.0.0 Wet Limestone based Flue Gas Desulphurisation System

(A) FOR BIDDER/HIS SUBVENDOR SEEKING QUALIFICATIONS AS PER CLAUSE 4.25.1 OF THE SUB-SECTION-IA, PART-A OF SECTION-VI.

- 1.0 *We/*Proposed sub-vendor, M/s.....,(Qualified Wet Limestone based Flue Gas Desulphurisation System Manufacturer), are seeking Qualification as per clause 4.25.1 [As Qualified Wet Limestone based Flue Gas Desulphurisation System Manufacturer] of sub-section-IA, Part-A of section-VI and to satisfy this requirement, we declare the following :

We confirm that *we/*proposed sub-vendor have executed Wet Limestone based Flue Gas Desulphurisation Systems involving design, engineering, supply, *erection/*supervision of erection and *commissioning / *Supervision of Commissioning having flue gas treatment capacity of not less than 23,00,000 Nm³/hr, with desulphurisation efficiency of at least 90%, operating in pulverized coal fired power plant and which have been in successful operation for a period of not less than one (1) year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder, the details of which are given below:

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
1.	6.	Name, address, e-mail, Tel. No. and Fax No. of the Qualified Wet Limestone based Flue Gas	Desulphurisation System Manufacturer (QFGDM) Name and Designation of the responsible person in QFGDM Name of the reference station
2.			
3.			
4.			
5.			

Signature of authorized signatory.....

n	phone,		
d	fax & e-mail		
i	Flue gas treatment capacity		
t	(Nm ₃ /hr)		
s			
	Desulphurisation efficiency (%)		
l			
o			.
c			
a			
t			
i			
o			
n			
			
N			
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Signature of authorized signatory.....

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
7.	Date of commissioning of Wet Limestone based Flue Gas Desulphurisation Systems	.....	
	(a) date from which the system is in successful operation condition		
	(b) Duration of successful operation prior to the date of techno-commercial bid opening		
8.	Capacity of Unit (MW)	.....	
9.	Capacity of Plant (MW)	.....	
10.	Whether the unit is pulverised coal fired	*Yes/*No.....	
11.	(a) Name & Address of the Contractor (including Phone & Fax No.) on whom the order for executing the reference power station was placed by the Client/Owner of the reference plant.	.....	
	(b) In case the Bidder/sub-vendor is not the Contractor at Sl. No. 11a above, Name and address of the Organisation (including Phone & Fax No.) which placed order for reference plant system on the Bidder/Sub- vendor	.....	
12.	Whether Bidder's/sub-vendors scope of work ' includes		
	(i) Design	*Yes/No.....	
	(ii) Engineering	*Yes/No.....	
	(iii) Supply	*Yes/No.....	
	(iv) *Erection/ *Supervised Erection	*Yes/No.....	
	(v) *Commissioning/ *Supervised Commissioning	*Yes/No.....	

Signature of authorized signatory.....

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
	(**In case the QFGDM has acted as adviser for erection / commissioning of reference Wet Limestone based Flue Gas Desulphurisation System, we shall furnish necessary documents / certificate from client in support of such activity and enclose the same at Annexure... to this Attachment , pursuant to Note No. 2 for clause no. 4.25 of sub-section-IA, Part-A of section-VI.)		
13.	Following documents to be enclosed in support of meeting the QR as per the following categories defined above		
	(a) Pulverised coal fired Power plant details	Any Technical Extract/paper letter/ E-mail from user or contract document or scheme or any document in public domain	
	(b) Flue Gas Desulphurisation System details	Any Technical Extract/paper letter/ E-mail from user or contract document or scheme or any document in public domain	
	(c) Scope of work	Letter of Award or Contract or P.O.	
	(d) Performance details	Certificate/letter/E-Mail from End user	
14.	*We confirm that M/s....., (*We/*Proposed sub-vendor) is / are seeking qualification as holding company (singularly or collectively) with its subsidiaries (held directly or indirectly) as per note No.4 for clause no. 4.25 of sub-section-IA, Part-A of section-VI. Further, the details of the subsidiaries meeting the QR are as follows :		
15.	Bidder and their subsidiary's(ies') Experience Details in respect of meeting requirement for QFGDM as per clause 4.25.1 of sub section-IA, Part-A of section-VI	(To be filled at page _____ to _____ of this Attachment)	
16.	*Name, Address, email, Fax, Tel. No. of the Subsidiary(ies) meeting the QR for QFGDM as per clause 4.25.1 of sub-section-IA, Part-A of section-VI		

*We have submitted the experience details in support of Qualifying Requirement at as per clause **4.25.1** of sub-section-IA, Part-A of section-VI above with reference to above subsidiary(ies). We are attaching the necessary documentary evidence as Annexure..... of this Attachment establishing the relationship between us and above subsidiaries.

Signature of authorized signatory.....

*We have submitted the experience details in support of Qualifying Requirement at as per clause 4.25.1 of sub-section-IA, Part-A of section-VI above with reference to above subsidiary(ies). We are attaching the necessary documentary evidence as Annexure..... of this Attachment establishing the relationship between M/s....., (Qualified Wet Limestone based Flue Gas Desulphurisation System Manufacturer) and above subsidiaries.

We further confirm that notwithstanding anything stated above, the Employer reserves the right to assess the capabilities and capacity of the Bidder or Proposed sub-vendor /his collaborators/ associates/subsidiaries/group companies to perform the contract for the FGD System, should the circumstances warrant such assessment in the overall interest of the Employer.

Date : (Signature).....
Place : (Printed Name).....
(Designation).....
(Common Seal).....

***Strike out whichever is not applicable.**

Signature of authorized signatory.....

**(B) FOR BIDDER/HIS SUBVENDOR SEEKING QUALIFICATIONS AS PER
CLAUSE 4.25.2 OF THE SUB-SECTION-IA, PART-A OF SECTION-VI.**

- 1.0 We confirm that *we/*Proposed sub-vendor meet the qualifying requirements specified under clause 4.25.2 of sub-section-IA, Part-A of section-VI (including requirements specified under sub clauses).
- 2.0 *We/*Proposed sub-vendor have executed Wet Limestone based Flue Gas Desulphurisation Systems involving design, engineering, supply, *erection/*supervision of erection and *commissioning / *Supervision of commissioning having flue gas treatment capacity of not less than 6,00,000 Nm³/hr, with desulphurisation efficiency of at least 85%, operating in pulverized coal fired power plant and which have been in successful operation for a period of not less than one (1) reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder, the details of which are given below:

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
1.	Name of the reference station and its location	.....	
2.	Name of the client/owner with full address, phone, fax & e-mail	.....	
3.	Flue gas treatment capacity (Nm ₃ /hr)	.....	
4.	Desulphurisation efficiency (%)	.....	
5.	Date of commissioning of Wet Limestone based Flue Gas Desulphurisation Systems	.....	
	(a) date from which the system is in successful operation condition	.....	
	(b) Duration of successful operation prior to the date of techno- commercial bid opening	.....	

Signature of authorized signatory.....

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
6.	Capacity of Unit (MW)	.....	
7.	Capacity of Plant (MW)	.....	
8.	Whether the unit is pulverised coal fired	*Yes/*No.....	
9.	(a) Name & Address of the Contractor (including Phone & Fax No.) on whom the order for executing the reference power station was placed by the Client/Owner of the reference plant.	.....	
	(b) In case the Bidder is not the Contractor at Sl. No. 9a above, Name and address of the Organisation (including Phone & Fax No.) which placed order for reference plant system on the Bidder	.....	
10.	Whether Bidder's scope of work includes		
	(i) Design	*Yes/No.....	
	(ii) Engineering	*Yes/No.....	
	(iii) Supply	*Yes/No.....	
	(iv) *Erection / *Supervised Erection	*Yes/No.....	
	(v) *Commissioning / *Supervised Commissioning	*Yes/No.....	
(**In case the Bidder has acted as adviser for erection / commissioning of reference Wet Limestone based Flue Gas Desulphurisation System, Bidder shall furnish necessary documents / certificate from client in support of such activity and enclose the same at Annexure... to this Attachment, pursuant to Note No.2 for clause no. 4.25 of sub-section-IA, Part-A of section-VI.			

Signature of authorized signatory.....

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
11.	Following documents to be enclosed in support of meeting the QR as per the following categories defined above		
	(a) Pulverised coal fired Power plant details	Any Technical Extract/paper letter/ E-mail from user or contract document or scheme or any document in public domain	
	(b) Flue Gas Desulphurisation System details	Any Technical Extract/paper letter/ E-mail from user or contract document or scheme or any document in public domain	
	(c) Scope of work	Letter of Award or Contract or P.O.	
	(d) Performance details	Certificate/letter/E-Mail from End user	

***Strike out whichever is not applicable.**

We further confirm that notwithstanding anything stated above, the Employer reserves the right to assess the capabilities and capacity of the Bidder/proposed sub-vendor/his collaborators/associates/subsidiaries/group companies to perform the contract, should the circumstances warrant such assessment in the overall interest of the Employer.

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common Seal).....

Signature of authorized signatory.....

- 3.0 In line with the qualifying requirements specified in clause 4.25.2 (b) & 4.25.2 (c) of sub-section-IA, Part-A of section-VI, *we/*proposed sub-vendor have valid OngoingCollaboration & Technology Transfer Agreement with M/s..... **(Name of QFGDM)** whose address is **(Address of QFGDM)** (who meets the requirement of clause 4.25.1 of sub-section-IA, Part-A of section-VI and the technology transfer agreement between the with QFGDM necessarily covers transfer of technological knowhow for Wet Limestone based Flue Gas Desulphurisation System in the form of complete transfer of design dossier, design software's, drawings and documentation, quality system manuals and imparting relevant personnel training to the *Bidder/*Contractor/*its sub-vendor, the details of which are given below:

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
1.	Name, address, e-mail, Tel. No. and Fax No. of the Qualified Wet Limestone based Flue Gas Desulphurisation System Manufacturer (QFGDM)	.....	
2.	Name and Designation of the responsible person in QFGDM	.....	
3.	Name of the reference station and its location	.....	
4.	Name of the client/owner with full address, phone, fax & e-mail	.....	
5.	Flue gas treatment capacity (Nm ₃ /hr)	.....	
6.	Desulphurisation efficiency (%)	.....	
7.	Date of commissioning of Wet Limestone based Flue Gas Desulphurisation Systems	.....	
	(a) date from which the system is in successful operation condition		
	(b) Duration of successful operation prior to the date of techno-commercial bid opening		
8.	Capacity of Unit (MW)	.....	
9.	Capacity of Plant (MW)	.....	
10.	Whether the unit is pulverised coal fired	*Yes/*No.....	

Signature of authorized signatory.....

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
11.	(a) Name & Address of the Contractor (including Phone & Fax No.) on whom the order for executing the reference power station was placed by the Client/Owner of the reference plant.	.....	.....
	(b) In case the QFGDM is not the Contractor at Sl.No.11a above, Name and address of the Organisation (including Phone & Fax No.) which placed order for reference plant system on the QFGDM	.....	
12.	Whether QFGDM's scope of work includes		
	(i) Design	*Yes/No.....	
	(ii) Engineering	*Yes/No.....	
	(iii) Supply	*Yes/No.....	
	(iv) *Erection/ * Supervised Erection	*Yes/No.....	
	(v) *Commissioning/ *Supervised Commissioning	*Yes/No.....	
	(**In case the QFGDM has acted as adviser for erection / commissioning of reference Wet Limestone based Flue Gas Desulpharisation System, Bidder shall furnish necessary documents / certificate from client in support of such activity and enclose the same at Annexure... to this Attachment, pursuant to Note No.2 for clause 4.25 of sub-section-IA, Part-A of section-VI.		
13.	Following documents to be enclosed in support of meeting the QR as per the following categories defined above		
	(a) Pulverised coal fired Power plant details	Any Technical Extract/paper letter/ E-mail from user or contract document or scheme or any document in public domain	

Signature of authorized signatory.....

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)

	(b) Flue Gas Desulphurisation System details	Any Technical Extract/paper letter/ E-mail from user or contract document or scheme or any document in public domain	
	(c) Scope of work	Letter of Award or Contract or P.O.	
	(d) Performance details	Certificate/letter/E-Mail from End user	
14. *We confirm that M/s....., (QFGDM) is / are seeking qualification as holding company (singularly or collectively) with its subsidiaries (held directly or indirectly) as per note No.4 for clause 4.25 of sub-section-IA, Part-A of section-VI. Further, the details of the subsidiaries meeting the QR are as follows :
15. QFGDM and their subsidiary's(ies)' Experience Details in respect of meeting requirement for QFGDM (as per clause 4.25.1 of sub-section-IA, Part-A of section-VI) (To be filled at page _____ to _____ of this Attachment)
16. *Name, Address, email, Fax, Tel. No. of the Subsidiary(ies) meeting the QR for QFGDM as per clause 4.25.1 of sub-section-IA, Part-A of section-VI

*We have submitted the experience details in support of Qualifying Requirement at clause 4.25.1 of sub-section-IA, Part-A of section-VI above with reference to above subsidiary(ies). We are attaching the necessary documentary evidence as Annexure..... of this Attachment establishing the relationship between our Associate and above subsidiaries.

*We have submitted the experience details in support of Qualifying Requirement at clause 4.25.1 of sub-section-IA, Part-A of section-VI above with reference to above subsidiary(ies). We are attaching the necessary documentary evidence as Annexure..... of this Attachment establishing the relationship between M/s....., (Qualified Wet Limestone based Flue Gas Desulphurisation System Manufacturer) and above subsidiaries.

Letter of support from Collaborator(s) / Licensor / Technology Provider as per format enclosed at Annexure.....

We further confirm that notwithstanding anything stated above, the Employer reserves the right to assess the capabilities and capacity of the Bidder/his collaborators/associates/subsidiaries/group companies to perform the contract, should the circumstances warrant such assessment in the overall interest of the Employer.

Signature of authorized signatory.....

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common Seal).....

***Strike out whichever is not applicable.**

(C) FOR BIDDER/HIS SUBVENDOR SEEKING QUALIFICATIONS AS PER CLAUSE 4.25.3 (a)(i), (b) & (c) OF THE SUB-SECTION-IA, PART-A OF SECTION-VI.

- 1.0 We confirm that we meet the qualifying requirements specified as per clause 4.25.3 (a)(i) of sub-section-IA, Part-A of section-VI with clause 4.25.3 (b) & clause 4.25.3 (c) of sub-section-IA, Part-A of section-VI.
- 2.0 We have designed, engineered, manufacture, got manufactured *erection/*supervision of erection and *commissioning / *Supervision of commissioning of Pulverised Coal Fired Steam Generator for 200 MW unit or higher capacity Unit or having minimum 600T/hr Steams capacity, which have been in successful operation for a period of not less than one (1) reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder and in support of same, we furnish the details for the following systems:

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
1.	Name of the reference station and its location	.....	
2.	Name of the client/owner with full address, phone, fax & e-mail	.....	
3.	No. of Steam Generator	.....	
4.	Capacity in MW of Unit	.....	
5.	Capacity of Plant (MW)	.....	
6.	Steaming Capacity	.....	
7.	Scheduled date of completion	.....	
8.	Actual date of completion/ successful operation	.....	

Signature of authorized signatory.....

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
9.	Date of commencement of successful operation	.....	
10.	Whether unit is coal fired	*Yes/*No	
11.	Whether Bidder's/sub-vendor scope of work includes		
	(i) Design	*Yes/No.....	
	(ii) Engineering	*Yes/No.....	
	(iii) *Manufacturing/ *Got Manufactured	*Yes/No.....	
	(iv) *Erection/ *Supervised Erection	*Yes/No.....	
	(v) *Commissioning/ *Supervised Commissioning	*Yes/No.....	
12.	Whether the plant is in successful operation for a period of one (1) year (minimum) prior to the date of Techno-Commercial bid opening	*Yes/No.....	

***Strike out whichever is not applicable.**

We further confirm that notwithstanding anything stated above, the Employer reserves the right to assess the capabilities and capacity of the Bidder/his collaborators/associates/subsidiaries/group companies to perform the contract, should the circumstances warrant such assessment in the overall interest of the Employer.

Date: (Signature).....
(Printed Name).....
Place: (Designation).....
(Common Seal).....

Signature of authorized signatory.....

- 3.0 In line with the qualifying requirements specified in clause 4.25.3 (b) & clause 4.25.3 (c) of sub-section-IA, Part-A of section-VI, *we/*proposed sub-vendor have valid OngoingCollaboration & Technology Transfer Agreement with M/s..... **(Name of QFGDM)** whose address is **(Address of QFGDM)** (who meets the requirement of clause 4.25.1 of sub-section-IA, Part-A of section-VI, and the technology transfer agreement with QFGDM necessarily covers transfer of technological knowhow for Wet Limestone based Flue Gas Desulphurisation System in the form of complete transfer of design dossier, design software's, drawings and documentation, quality system manuals and imparting relevant personnel training to the *Bidder/*Contractor/*its sub-vendor, the details of which are given below:

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
1.	Name, address, e-mail, Tel. No. and Fax No. of the Qualified Wet Limestone based Flue Gas Desulphurisation System Manufacturer (QFGDM)	.....	
2.	Name and Designation of the responsible person in QFGDM	.....	
3.	Name of the reference station and its location	.....	
4.	Name of the client/owner with full address, phone, fax & e-mail	.....	
5.	Flue gas treatment capacity (Nm ₃ /hr)	.....	
6.	Desulphurisation efficiency (%)	.....	
7.	Date of commissioning of Wet Limestone based Flue Gas Desulphurisation Systems	.....	
	(a) Date from which the system is in successful operation condition		
	(b) Duration of successful operation prior to the date of techno-commercial bid opening		
8.	Capacity of Unit (MW)	.....	
9.	Capacity of Plant (MW)	.....	
10.	Whether the unit is pulverised coal fired	*Yes/*No.....	

Signature of authorized signatory.....

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
11.	(a) Name & Address of the Contractor (including Phone & Fax No.) on whom the order for executing the reference power station was placed by the Client/Owner of the reference plant	.....	
	(b) In case the QFGDM is not the Contractor at Sl. No. 11a above, Name and address of the Organisation (including Phone & Fax No.) which placed order for reference plant system on the QFGDM	.....	
12.	Whether QFGDM's scope of work includes		
	(i) Design	*Yes/No.....	
	(ii) Engineering	*Yes/No.....	
	(iii) Supply	*Yes/No.....	
	(iv) *Erection/ *Supervised Erection	*Yes/No.....	
	(v) *Commissioning/ *Supervised Commissioning	*Yes/No.....	
	(**In case the QFGDM has acted as adviser for erection / commissioning of reference Wet Limestone based Flue Gas Desulpharisation System, Bidder shall furnish necessary documents / certificate from client in support of such activity and enclose the same at Annexure... to this Attachment , pursuant to Note No.2 for clause 4.25.1 of sub-section-IA, Part-A of section-VI.		
13.	Following documents to be enclosed in support of meeting the QR as per the following categories defined above		
	(a) Pulverised coal fired Power plant details	Any Technical Extract/paper letter/ E-mail from user or contract document or scheme or any document in public domain	

Signature of authorized signatory.....

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
	(b) Flue Gas Desulphurisation System details	Any Technical Extract/paper letter/ E-mail from user or contract document or scheme or any document in public domain	
	(c) Scope of work	Letter of Award or Contract or P.O.	
	(d) Performance details	Certificate/letter/E-Mail from End user	
14.	*We confirm that M/s....., (QFGDM) is / are seeking qualification as holding company (singularly or collectively) with its subsidiaries (held directly or indirectly) as per note No.4 for clause 4.25 of sub-section-IA, Part-A of section-VI. Further, the details of the subsidiaries meeting the QR are as follows :		
15.	QFGDM and their subsidiary's(ies') Experience Details in respect of meeting requirement for QFGDM (as per clause 4.25.1 of sub-section-IA, Part-A of section-VI)	(To be filled at page _____ to _____ of this Attachment)	
16.	*Name, Address, email, Fax, Tel. No. Of the Subsidiary(ies) meeting the QR for QFGDM as per clause 4.25.1 of sub- section-IA, Part-A of section-VI		

*We have submitted the experience details in support of Qualifying Requirement at clause 4.25.1 of sub-section-IA, Part-A of section-VI with reference to above subsidiary(ies). We are attaching the necessary documentary evidence as Annexure..... of this Attachment establishing the relationship between our Associate and above subsidiaries.

*We have submitted the experience details in support of Qualifying Requirement at clause 4.25.1 of sub-section-IA, Part-A of section-VI with reference to above subsidiary(ies). We are attaching the necessary documentary evidence as Annexure..... of this Attachment establishing the relationship between M/s....., [Qualified Wet Limestone based Flue Gas Desulphurisation System Manufacturer (QFGDM) and above subsidiaries].

Letter of support from Collaborator(s) / Licensor / Technology Provider as per format enclosed at Annexure.....

We further confirm that notwithstanding anything stated above, the Employer reserves the right to assess the capabilities and capacity of the Bidder/his collaborators/associates/subsidiaries/group companies to perform the contract, should the circumstances warrant such assessment in the overall interest of the Employer.

Signature of authorized signatory.....

Date:

Place :

(Signature).....
(Printed Name).....
(Designation).....
(Common Seal).....

***Strike out whichever is not applicable.**

Signature of authorized signatory.....

(D) FOR BIDDER/HIS SUBVENDOR SEEKING QUALIFICATIONS AS PER CLAUSE 4.25.3 (a)(ii), (b) & (c) OF THE SUB-SECTION-IA, PART-A OF SECTION-VI.

- 1.0 We confirm that *we/*proposed sub-vendor meet the qualifying requirements specified as per clause 4.25.3 (a)(ii) of sub-section-IA, Part-A of section-VI with clause 4.25.3 (b) & clause 4.25.3 (c) of sub-section-IA, Part-A of section-VI .
- 2.0 We/*Proposed sub-vendor..... (Bidder/JV Company) confirm that we meet the qualifying requirements specified under clause 4.25.3 (a)(ii) of sub-section-IA, Part-A of section-VI with clause 4.25.3 (b) & clause 4.25.3 (c) of sub-section-IA, Part-A of section-VI and are registered in India under Companies Act of India for the purpose of manufacturing/supplying Steam Generator Sets/Flue Gas Desulphurization System.
- 3.0 We confirmed that in our JV Company, the Stakeholder(s) M/s (Majority Stakeholder) having Stake(more than 51%) shall maintain aforesaid equity in JV Company for a lock-in-period of 7 years from the date of incorporation, M/s (Name of Steam Generator manufacturer/ QFGDM) having Stake..... (more than 26%) shall maintain aforesaid equity in JV Company for a lock-in-period of 7 years from the date of incorporation or upto the end of defect liability period of Contract of subject package(in case of Award) and Other Stakeholders, if any, ... (Name of Indian Company registered in India under Companies Act of India) having Stake..... We have executed/executing order, received in last 5 years, with the total value of such projects are INR 5,000 Million or more and in support of same, we furnish the details for the following systems:

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
1.	Name of the reference station and its location	.....	
2.	Name of the client/owner with full address, phone, fax & e-mail	.....	
3.	Value of Work (in Rs)	.....	
4.	Starting date of project	.....	
5.	Scheduled date of completion	.....	
6.	Actual date of completion/ successful operation	.....	
7.	Date of commencement of work	.....	

Signature of authorized signatory.....

***Strike out whichever is not applicable.**

We further confirm that notwithstanding anything stated above, the Employer reserves the right to assess the capabilities and capacity of the Bidder/his collaborators/associates/subsidiaries/group companies to perform the contract, should the circumstances warrant such assessment in the overall interest of the Employer.

Date :

(Signature).....

Place :

(Printed Name).....

(Designation).....

(Common Seal).....

Signature of authorized signatory.....

- 4.0 In line with the qualifying requirements specified in clause 4.25.3 (b) & clause 4.25.3 (c) of sub-section-IA, Part-A of section-VI, *we/*proposed sub-vendor have valid OngoingCollaboration & Technology Transfer Agreement with M/s..... **(Name of QFGDM)** whose address is **(Address of QFGDM)** (who meets the requirement of clause 4.25.1 of sub-section-IA, Part-A of section-VI, and the technology transfer agreement with QFGDM necessarily covers transfer of technological knowhow for Wet Limestone based Flue Gas Desulphurisation System in the form of complete transfer of design dossier, design software's, drawings and documentation, quality system manuals and imparting relevant personnel training to the *Bidder/*Contractor/*its sub-vendor, the details of which are given below:

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
1.	Name, address, e-mail, Tel. No. and Fax No. of the Qualified Wet Limestone based Flue Gas Desulphurisation System Manufacturer (QFGDM)	.....	
2.	Name and Designation of the responsible person in QFGDM	.....	
3.	Name of the reference station and its location	.....	
4.	Name of the client/owner with full address, phone, fax & e-mail	.....	
5.	Flue gas treatment capacity (Nm ₃ /hr)	.....	
6.	Desulphurisation efficiency (%)	.....	
7.	Date of commissioning of Wet Limestone based Flue Gas Desulphurisation Systems	.....	
	(a) Date from which the system is in successful operation condition		
	(b) Duration of successful operation prior to the date of techno-commercial bid opening		
8.	Capacity of Unit (MW)	.....	
9.	Capacity of Plant (MW)	.....	
10.	Whether the unit is pulverised coal fired	*Yes/*No.....	

Signature of authorized signatory.....

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
11.	(a) Name & Address of the Contractor (including Phone & Fax No.) on whom the order for executing the reference power station was placed by the Client/Owner of the reference plant	.....	
	(b) In case the QFGDM is not the Contractor at Sl. No. 11a above, Name and address of the Organisation (including Phone & Fax No.) which placed order for reference plant system on the QFGDM	.....	
12.	Whether QFGDM's scope of work includes		
	(i) Design	*Yes/No.....	
	(ii) Engineering	*Yes/No.....	
	(iii) Supply	*Yes/No.....	
	(iv) *Erection/ *Supervised Erection	*Yes/No.....	
	(v) *Commissioning/ *Supervised Commissioning	*Yes/No.....	
	(**In case the QFGDM has acted as adviser for erection / commissioning of reference Wet Limestone based Flue Gas Desulpharisation System, Bidder shall furnish necessary documents / certificate from client in support of such activity and enclose the same at Annexure... to this Attachment, pursuant to Note No.2 for clause 4.25.1 of sub-section-IA, Part-A of section-VI.		
13.	Following documents to be enclosed in support of meeting the QR as per the following categories defined above		
	(a) Pulverised coal fired Power plant details	Any Technical Extract/paper letter/ E-mail from user or contract document or scheme or any document in public domain	

Signature of authorized signatory.....

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)

(b)	Flue Gas Desulphurisation System details	Any Technical Extract/paper letter/ E- mail from user or contract document or scheme or any document in public domain
(c)	Scope of work	Letter of Award or Contract or P.O.
(d)	Performance details	Certificate/letter/E-Mail from End user

14. *We confirm that M/s....., (QFGDM) is / are seeking qualification as holding company (singularly or collectively) with its subsidiaries (held directly or indirectly) as per note No.4 for clause 4.25.1 of sub-section-IA, Part-A of section-VI. Further, the details of the subsidiaries meeting the QR are as follows :

15. QFGDM and their subsidiary's(ies)
Experience Details in respect of meeting
requirement for QFGDM
(as per for clause 4.25.1 of sub-section-
IA, Part-A of section-VI.

(To be filled at page _____ to _____
of this Attachment)

16. *Name, Address, email, Fax, Tel. No. of
the Subsidiary(ies) meeting the QR for
QFGDM as per for clause 4.25.1 of sub-
section-IA, Part-A of section-VI.

*We have submitted the experience details in support of Qualifying Requirement at clause 4.25.1 of sub-section-IA, Part-A of section-VI. with reference to above subsidiary(ies). We are attaching the necessary documentary evidence as Annexure..... of this Attachment establishing the relationship between our Associate and above subsidiaries.

*We have submitted the experience details in support of Qualifying Requirement at for clause 4.25.1 of sub-section-IA, Part-A of section-VI. with reference to above subsidiary(ies). We are attaching the necessary documentary evidence as Annexure..... of this Attachment establishing the relationship between M/s....., (Qualified Wet Limestone based Flue Gas DesulphurisationSystem Manufacturer) and above subsidiaries.

Letter of support from Collaborator(s) / Licensor / Technology Provider as per format enclosed at Annexure.....

We further confirm that notwithstanding anything stated above, the Employer reserves the right to assess the capabilities and capacity of the Bidder/his collaborators/associates/subsidiaries/group companies to perform the contract, should the circumstances warrant such assessment in the overall interest of the Employer.

Signature of authorized signatory.....

Date :
Place :

(Signature).....
(Printed Name).....
(Designation).....
(Common Seal).....

***Strike out whichever is not applicable.**

Signature of authorized signatory.....

(E) FOR BIDDER/HIS SUBVENDOR SEEKING QUALIFICATIONS AS PER CLAUSE 4.25.3 (a)(iii), (b) & (c) OF THE SUB-SECTION-IA, PART-A OF SECTION-VI.

- 1.0 We (Bidder/*Subsidiary Company of Steam Generator manufacturer/*Subsidiary Company of QFGDM) confirm that we meet the qualifying requirements specified as per clause 4.25.3 (a)(iii) of sub-section-IA, Part-A of section-VI with clause 4.25.3 (b) & clause 4.25.3 (c) of sub-section-IA, Part-A of section-VI and are registered in India under Companies Act of India for the purpose of manufacturing/supplying Steam Generator Sets/Flue Gas Desulphurization System.
- 2.0 We, *Bidder/*Proposed sub-vendor, confirmed that we shall remain *Subsidiary Company of Steam Generator manufacturer/*Subsidiary Company of QFGDM for minimum period of 7 years from the date of incorporation or up to the end of defect liability period of Contract of subject package(in case of Award). We have executed/executing order, received in last 5 years, with the total value of such projects are INR 5,000 Million or more and in support of same, we furnish the details for the following systems:

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
1.	Name of the reference station and its location	.....	
2.	Name of the client/owner with full address, phone, fax & e-mail	.....	
3.	Value of Work (in Rs)	.....	
4.	Starting date of project	.....	
5.	Scheduled date of completion	.....	
6.	Actual date of completion/ successful operation	.....	
7.	Date of commencement of Operation	.....	

Signature of authorized signatory.....

***Strike out whichever is not applicable.**

We further confirm that notwithstanding anything stated above, the Employer reserves the right to assess the capabilities and capacity of the Bidder/his collaborators/associates/subsidiaries/group companies to perform the contract, should the circumstances warrant such assessment in the overall interest of the Employer.

Date :

(Signature).....

Place :

(Printed Name).....

(Designation).....

(Common Seal).....

Signature of authorized signatory.....

- 3.0 In line with the qualifying requirements specified in clause 4.25.3 (b) & clause 4.25.3 (c) of sub-section-IA, Part-A of section-VI, *we/*proposed sub-vendor have valid Ongoing Collaboration & Technology Transfer Agreement with M/s..... **(Name of QFGDM)** whose address is **(Address of QFGDM)** (who meets the requirement of clause 4.25.1 of sub-section-IA, Part-A of section-VI, and the technology transfer agreement with QFGDM necessarily covers transfer of technological knowhow for Wet Limestone based Flue Gas Desulphurisation System in the form of complete transfer of design dossier, design software's, drawings and documentation, quality system manuals and imparting relevant personnel training to the *Bidder/*Contractor/*its sub-vendor, the details of which are given below:

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
1.	Name, address, e-mail, Tel. No. and Fax No. of the Qualified Wet Limestone based Flue Gas Desulphurisation System Manufacturer (QFGDM)	.....	
2.	Name and Designation of the responsible person in QFGDM	.....	
3.	Name of the reference station and its location	.....	
4.	Name of the client/owner with full address, phone, fax & e-mail	.....	
5.	Flue gas treatment capacity (Nm ₃ /hr)	.....	
6.	Desulphurisation efficiency (%)	.....	
7.	Date of commissioning of Wet Limestone based Flue Gas Desulphurisation Systems	.....	
	(a) Date from which the system is in successful operation condition		
	(b) Duration of successful operation prior to the date of techno-commercial bid opening		
8.	Capacity of Unit (MW)	.....	
9.	Capacity of Plant (MW)	.....	
10.	Whether the unit is pulverised coal fired	*Yes/*No.....	

Signature of authorized signatory.....

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
11.	(a) Name & Address of the Contractor (including Phone & Fax No.) on whom the order for executing the reference power station was placed by the Client/Owner of the reference plant	.....	
	(b) In case the QFGDM is not the Contractor at Sl. No. 11a above, Name and address of the Organisation (including Phone & Fax No.) which placed order for reference plant system on the QFGDM	.....	
12.	Whether QFGDM's scope of work includes		
	(i) Design	*Yes/No.....	
	(ii) Engineering	*Yes/No.....	
	(iii) Supply	*Yes/No.....	
	(iv) *Erection/ *Supervised Erection	*Yes/No.....	
	(v) *Commissioning/ *Supervised Commissioning	*Yes/No.....	
	(**In case the QFGDM has acted as adviser for erection / commissioning of reference Wet Limestone based Flue Gas Desulpharisation System, Bidder shall furnish necessary documents / certificate from client in support of such activity and enclose the same at Annexure... to this Attachment, pursuant to Note No.2 for clause 4.25.1 of sub-section-IA, Part-A of section-VI.		
13.	Following documents to be enclosed in support of meeting the QR as per the following categories defined above		
	(a) Pulverised coal fired Power plant details	Any Technical Extract/paper letter/ E-mail from user or contract document or scheme or any document in public domain	

Signature of authorized signatory.....

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)

(b)	Flue Gas Desulphurisation System details	Any Technical Extract/paper letter/ E- mail from user or contract document or scheme or any document in public domain

(c)	Scope of work	Letter of Award or Contract or P.O.

(d)	Performance details	Certificate/letter/E-Mail from End user

14. *We confirm that M/s....., (QFGDM) is / are seeking qualification as holding company (singularly or collectively) with its subsidiaries (held directly or indirectly) as per note No.4 for clause 4.25.1 of sub-section-IA, Part-A of section-VI. Further, the details of the subsidiaries meeting the QR are as follows :

15.	QFGDM and their subsidiary's(ies') Experience Details in respect of meeting requirement for QFGDM (as per clause 4.25.1 of sub-section-IA, Part-A of section-VI)	(To be filled at page _____ to _____ of this Attachment)

16. *Name, Address, email, Fax, Tel. No. of the Subsidiary(ies) meeting the QR for QFGDM as per clause 4.25.1 of sub-section-IA, Part-A of section-VI

*We have submitted the experience details in support of Qualifying Requirement at clause 4.25.1 of sub-section-IA, Part-A of section-VI with reference to above subsidiary(ies). We are attaching the necessary documentary evidence as Annexure..... of this Attachment establishing the relationship between our Associate and above subsidiaries.

*We have submitted the experience details in support of Qualifying Requirement at clause 4.25.1 of sub-section-IA, Part-A of section-VI with reference to above subsidiary(ies). We are attaching the necessary documentary evidence as Annexure..... of this Attachment establishing the relationship between M/s....., (Qualified Wet Limestone based Flue Gas DesulphurisationSystem Manufacturer) and above subsidiaries.

Letter of support from Collaborator(s) / Licensor / Technology Provider as per format enclosed at Annexure.....

We further confirm that notwithstanding anything stated above, the Employer reserves the right to assess the capabilities and capacity of the Bidder/his collaborators/associates/subsidiaries/group companies to perform the contract, should the circumstances warrant such assessment in the overall interest of the Employer.

Signature of authorized signatory.....

Date : (Signature).....
Place : (Printed Name).....
(Designation).....
(Common Seal).....

***Strike out whichever is not applicable.**

(F) FOR BIDDER/HIS SUBVENDOR SEEKING QUALIFICATIONS AS PER CLAUSE 4.25.4 OF THE SUB-SECTION-IA, PART-A OF SECTION-VI.

- 1.0 *We/*Proposed Sub-vendor confirm that we meet the qualifying requirements specified under clause 4.25.4(a), (b) & (c) of sub-section-IA, Part-A of section-VI.
- 2.0 We confirm that we have executed on Engineering, Procurement and Construction (EPC) basis, large industrial projects on EPC basis (with or without civil works) in the area of power, steel, oil & Gas, petrochemical, fertilizer, Flue Gas Desulfurization and/or any other process industry in last 10 years with the total value of such projects are INR 5000 million or more. Further, one of such projects should have a contract value of INR 2000 million or more. These projects have been in successful operation for a period of not less than one (1) year prior to the date of Techno-Commercial bid opening, the details of which are given below:

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
1.	Name of the reference station and its location	.....	
2.	Name of the client/owner with full address, phone, fax & e-mail	.....	
3.	Value of Project (in Rs.)		
4.	Starting date of project	.....	
5.	Scheduled date of commissioning	.....	
6.	Actual date of commissioning/successful operation	.....	
7.	Date of commencement of successful operation	.....	

Signature of authorized signatory.....

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
8.	Whether Bidder's scope of work includes		
	(i) Engineering	*Yes/No.....	
	(ii) Procurement	*Yes/No.....	
	(iii) Construction	*Yes/No.....	
9.	Whether the plant is in successful operation for a period of one (1) year (minimum) prior to the date of Techno-Commercial bid opening	.....	

***Strike out whichever is not applicable.**

We further confirm that notwithstanding anything stated above, the Employer reserves the right to assess the capabilities and capacity of the Bidder/his collaborators/associates/subsidiaries/group companies to perform the contract, should the circumstances warrant such assessment in the overall interest of the Employer.

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common Seal).....

Signature of authorized signatory.....

- 3.0 In line with the qualifying requirements specified in clause 4.25.4 (b) of sub-section-IA, Part-A of section-VI, *we/*proposed sub-vendor have valid OngoingCollaboration & Technology Transfer Agreement with M/s..... **(Name of QFGDM)** whose address is **(Address of QFGDM)** (who meets the requirement of clause 4.25.1 of sub-section-IA, Part-A of section-VI, and the technology transfer agreement with QFGDM necessarily covers transfer of technological knowhow for Wet Limestone based Flue Gas Desulphurisation System in the form of complete transfer of design dossier, design software's, drawings and documentation, quality system manuals and imparting relevant personnel training to the *Bidder/*Contractor/*its sub-vendor, the details of which are given below:

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
1.	Name, address, e-mail, Tel. No. and Fax No. of the Qualified Wet Limestone based Flue Gas Desulphurisation System Manufacturer (QFGDM)	.....	
2.	Name and Designation of the responsible person in QFGDM	.....	
3.	Name of the reference station and its location	.....	
4.	Name of the client/owner with full address, phone, fax & e-mail	.....	
5.	Flue gas treatment capacity (Nm ₃ /hr)	.....	
6.	Desulphurisation efficiency (%)	.....	
7.	Date of commissioning of Wet Limestone based Flue Gas Desulphurisation Systems	.....	
	(a) Date from which the system is in successful operation condition		
	(b) Duration of successful operation prior to the date of techno-commercial bid opening		
8.	Capacity of Unit (MW)	.....	
9.	Capacity of Plant (MW)	.....	
10.	Whether the unit is pulverised coal fired	*Yes/*No.....	

Signature of authorized signatory.....

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)
11.	(a) Name & Address of the Contractor (including Phone & Fax No.) on whom the order for executing the reference power station was placed by the Client/Owner of the reference plant	.....	
	(b) In case the QFGDM is not the Contractor at Sl. No. 11a above, Name and address of the Organisation (including Phone & Fax No.) which placed order for reference plant system on the QFGDM	.....	
12.	Whether QFGDM's scope of work includes		
	(i) Design	*Yes/No.....	
	(ii) Engineering	*Yes/No.....	
	(iii) *Manufacturing/ *Got Manufactured	*Yes/No.....	
	(iv) *Erection/ *Supervised Erection	*Yes/No.....	
	(v) *Commissioning/ * Supervised Commissioning	*Yes/No.....	
	(**In case the QFGDM has acted as adviser for erection / commissioning of reference Wet Limestone based Flue Gas Desulpharisation System, Bidder shall furnish necessary documents / certificate from client in support of such activity and enclose the same at Annexure... to this Attachment, pursuant to Note No.2 for clause 4.25.1 of sub-section-IA, Part-A of section-VI		
13.	Following documents to be enclosed in support of meeting the QR as per the following categories defined above		
	(a) Pulverised coal fired Power plant details	Any Technical Extract/paper letter/ E- mail from user or contract document or scheme or any document in public domain	

Signature of authorized signatory.....

S.No.	Description	Details	Supporting documents for details furnished under column (3)
(1)	(2)	(3)	(4)

(b)	Flue Gas Desulphurisation System details	Any Technical Extract/paper letter/ E- mail from user or contract document or scheme or any document in public domain	
(c)	Scope of work	Letter of Award or Contract or P.O.	
(d)	Performance details	Certificate/letter/E-Mail from End user	
14. *We confirm that M/s....., (QFGDM) is / are seeking qualification as holding company (singularly or collectively) with its subsidiaries (held directly or indirectly) as per note No.4 for clause 4.25.1 of sub-section-IA, Part-A of section-VI. Further, the details of the subsidiaries meeting the QR are as follows :
15. QFGDM and their subsidiary's(ies')
Experience Details in respect of meeting
requirement for QFGDM
(as per clause 4.25.1 of sub-section-
IA, Part-A of section-VI)
- (To be filled at page _____ to _____
of this Attachment)
16. *Name, Address, email, Fax, Tel. No. of
the Subsidiary(ies) meeting the QR for
QFGDM as per clause 4.25.1 of sub-
section-IA, Part-A of section-VI

*We have submitted the experience details in support of Qualifying Requirement at clause 4.25.1 of sub-section-IA, Part-A of section-VI with reference to above subsidiary(ies). We are attaching the necessary documentary evidence as Annexure..... of this Attachment establishing the relationship between our Associate and above subsidiaries.

*We have submitted the experience details in support of Qualifying Requirement at clause 4.25.1 of sub-section-IA, Part-A of section-VI with reference to above subsidiary(ies). We are attaching the necessary documentary evidence as Annexure..... of this Attachment establishing the relationship between M/s....., [Qualified Wet Limestone based Flue Gas Desulphurisation System Manufacturer (QFGDM) and above subsidiaries].

Letter of support from Collaborator(s) / Licensor / Technology Provider as per format enclosed at Annexure.....

We further confirm that notwithstanding anything stated above, the Employer reserves the right to assess the capabilities and capacity of the Bidder/his collaborators/associates/subsidiaries/group companies to perform the contract, should the circumstances warrant such assessment in the overall interest of the Employer.

Signature of authorized signatory.....

Date :

Place : (Printed Name).....

(Signature).....

(Designation).....

(Common Seal).....

***Strike out whichever is not applicable.**

**FORM OF LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR /
TECHNOLOGY PROVIDER FOR THE COMPLETE WET LIMESTONE BASED FLUE GAS**

Signature of authorized signatory.....

**DESULPHURISATION SYSTEM AS PER CLAUSE *4.25.2/*4.25.3, OF SUB-SECTION-I-A,
PART A, SECTION VI**

(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER TO BE EXECUTED BY THE BIDDER/ CONTRACTOR MEETING THE REQUIREMENTS OF CLAUSE *4.25.2/*4.25.3 OF SUB-SECTION-I-A, PART A, SECTION VI AND THE COLLABORATOR & TECHNOLOGY LICENSOR WHO MEETS THE REQUIREMENT OF CLAUSE 4.25.1 OF SUB-SECTION-I-A, PART A, SECTION VI [AS A QUALIFIED WET LIMESTONE BASED FLUE GAS DESULPHURISATION SYSTEM MANUFACTURER (QFGDM)] FOR SUCCESSFUL PERFORMANCE OF THE CONTRACT

The DEED OF UNDERTAKING executed this day of Two thousand by M/s a Company incorporated under having its Registered Office at.....(hereinafter called the "Bidder/Contractor", which expression shall include its successors, administrators, executors and permitted assigns) and

*M/s a Company incorporated under having its Registered Office at(hereinafter called the "Sub-Vendor", which expression shall include its successors, administrators, executors and permitted assigns) AND

M/s a Company registered under the having its Registered Office at (hereinafter called the "Collaborator & Technology Licensor", which expression shall include its successors, administrators, executors and permitted assigns),

in favour of, having its Registered Office at SCCL, Kothagudem Collieries,Bhadrari Kothagudaem Dt, Telangana-507101 INDIA("Employer" which expression shall include its successors, administrators, executors and assigns).

WHEREAS, the Employer invited Bids for design, engineering, manufacture, supply, transportation to site, installation, testing, commissioning and conductance of guarantee

Signature of authorized signatory.....

tests for the **EPC Package for Singareni TPP-II(1x800MW)**(hereinafter referred to as "Plant")
vide its Bidding Document No. .

AND WHEREAS vide clause *4.25.2/*4.25.3 of Sub-Section-IA, Part A, Section VI of bidding documents, it has been specified that bidder who meets the required experience as per clause *4.25.2/*4.25.3 shall also have an ongoing Collaboration agreement / Technology Licensing agreement prior to the date of submission of proposal of sub-vendor, with a Qualified Wet Limestone based Flue Gas Desulphurisation System Manufacturer), who meets the requirement of clause 4.25.1 of Sub-Section-IA, Part A, Section VI and furnish a Letter of support from Collaborator(s) / Licensor / Technology Provider as per the requirement of clause no. *4.25.2(c)/ *4.25.3(c) of Sub-Section-IA, Part-A, Section-VI.

WHEREAS M/s (Bidder/Contractor) has submitted its proposal in response to the aforesaid Invitation for Bid by the Employer bearing No. dated for EPC Package for its Singareni TPP-II(1x800MW)against the Employer's Bidding Documents.

AND WHEREAS M/s..... .(*Bidder/*Contractor/*his sub-vendor) meet the requirements specified at clause no. *4.25.2(a)/*4.25.3(a)(i)/)/*4.25.3(a)(ii)/)/*4.25.3(a)(iii) of Sub-Section-IA, Part A, Section VI and have an on-going collaboration agreement/technology licensing agreement prior to the date of submission of proposal of sub-vendor, with M/s..... (hereinafter referred to as Collaborator & Technology Licensor) who is a manufacturer of Wet Limestone based Flue Gas Desulphurisation System and meets the requirements as specified in clause no. 4.25.1 of Sub-Section-IA, Part A, Section VI, valid minimum up to the end of the defect liability period of the contract.

The *Bidder/*Contractor*and *his Sub-Vendor and the Collaborator & Technology Licensor are required to jointly execute and furnish along with the bid an irrevocable Letter of support from Collaborator(s) / Licensor / Technology Provider and be jointly and severally responsible and bound unto the Employer for successful performance of the Wet Limestone based Flue Gas Desulphurisation Systemand be jointly and severally liable to perform all contractual obligations for the Wet Limestone based Flue Gas Desulphurisation Systemfor **Singareni TPP-II(1x800MW)**, fully meeting the stipulated technical requirements, guaranteed parameters and characteristics as per the Bidding Documents in the event the bid is accepted by the Employer resulting into a Contract.

NOW THEREFORE, THIS DEED WITNESSETH AS UNDER:

1. We the Collaborator & Technology Licensor and the Contractor *and *his Sub-Vendor, do hereby declare and undertake that we shall be jointly and severally responsible to the Employer for the design, execution and successful performance of the complete Wet Limestone Based Flue Gas Desulphurisation System and all the contractual obligations

Signature of authorized signatory.....

including the technical guarantees for the complete Wet Limestone Based Flue Gas Desulphurisation System, as specified under the said Contract(s) to the satisfaction of the Employer.

2. In case of any breach of the Contract committed by the Contractor *and *his Sub-Vendor, we the Collaborator & Technology Licensor do hereby undertake, declare and confirm that we shall be fully responsible for the successful performance of the Wet Limestone Based Flue Gas Desulphurisation System and undertake to carry out all the obligations and responsibilities under this Letter of support from Collaborator(s) / Licensor / Technology Provider in order to discharge the Contractor's obligations stipulated under the Contract. Further, if the Employer sustains any loss or damage on account of any breach of the Contract for the Wet Limestone Based Flue Gas Desulphurisation System, we the Collaborator & Technology Licensor and Contractor *and *his Sub-Vendor jointly and severally undertake to promptly indemnify and pay such loss/damages caused to the Employer on its written demand without any demur, reservation, Contest or protest in any manner whatsoever. This is without prejudice to any rights of the Employer against the Contractor/ *his Sub-Vendor under the Contract and/or guarantees. It shall not be necessary or obligatory for the Employer to first proceed against the Contractor/ *his Sub-Vendor before proceeding against the Collaborator & Technology Licensor nor any extension of time or any relaxation given by the Employer to the Contractor shall prejudice any rights of the Employer under this Letter of support from Collaborator(s) / Licensor / Technology Provider to proceed against the Contractor. The liability of the contractor, his sub-vendor and the associate/collaborator shall be limited to an amount equal to 100% of the value of the contract** between the contractor and the sub supplier for the equipments/systems.
3. Without prejudice to the generality of the Undertaking in paragraph 1 above, the manner of achieving the objectives set forth in paragraph 1 above shall be as follows:
 - (a) We, the Collaborator & Technology Licensor shall be fully responsible for complete engineering, preparation of all designs, design calculations, design documents / drawings and manufacturing drawings for the Absorber including all its internals; preparation of all P&IDs & process flow diagrams; Selection of auxiliaries, and interfacing/ integrating Absorber with their auxiliaries so as to ensure satisfactory, reliable, safe and trouble free performance of all Absorber and auxiliaries meeting all stipulated technical requirements as well as all guaranteed parameters specified in the Contract for Wet Limestone based Flue Gas Desulphurisation System.
 - (b) We, the Collaborator & Technology Licensor shall be specifically responsible for the following:

Signature of authorized signatory.....

- (i) Complete design of Absorber including selection/design of Absorber material, lining & all internals; complete mass flow balance as well as design of structural/supporting system including selection of material & accessories etc.
- (ii) Selection of auxiliaries for Wet Limestone based Flue Gas Desulphurisation System including preparation of purchase specification for critical auxiliaries viz Slurry Recirculation pumps, Oxidation Blowers, Wet limestone Grinding mills, Slurry pumps, Agitators, Hydro-cyclones, Vacuum Belt Filters, slurry valves & piping.
- (iii) Design of controls, protections and interlocks for all the auxiliaries for Wet Limestone based Flue Gas Desulphurisation System including Absorber for their safe and reliable operation as integral units with other equipments of the Main Plant.
- (iv) Providing all design data required by the Contractor to carry out design/ selection of balance equipment/ system including all civil inputs for foundation design, site construction, structural work etc. for Wet Limestone based Flue Gas Desulphurisation System and for their proper interfacing and integration.
- (v) Provide manufacturing/fabrication drawings for absorber including its internals.

Further, we, the Collaborator & Technology Licensor shall extend our quality surveillance/ supervision/ quality control to the Contractor during manufacture, erection, commissioning and performance testing, both at Contractor's/Sub-vendor's works and/ or at Employer's project site. Without prejudice to the overall responsibilities of the Collaborator & Technology Licensor for successful commissioning and performance of Wet Limestone based Flue Gas Desulphurisation System, the Collaborator & Technology Licensor shall depute its technical experts from time to time to the Contractor's/ Sub-vendor's works/ Employer's project site, as mutually agreed upon between the Employer and the Contractor in accordance with the stipulation of the Contracts.

- (c) We, the Collaborator & Technology Licensor will be fully responsible for the quality of manufacture of all equipments/ main assemblies/ components for incorporation in the Wet Limestone based Flue Gas Desulphurisation System.

For the items to be manufactured by the contractor at his/or his vendor's works as per the Collaborator & Technology Licensor design & manufacturing drawings released by us, the Associate / Collaborator shall ensure completeness and correctness of the design, data, document and information in every detail provided to the Contractor which would result in the same quality of equipment as if manufactured at Collaborator & Technology Licensor or its Sub-vendor's works and shall meet Collaborator & Technology Licensor acceptance.

Signature of authorized signatory.....

- (d) We the Collaborator & Technology Licensor shall be fully responsible for complete for design, engineering, supply, installation, putting in to satisfactory operation and carrying out the guarantee tests for Wet Limestone Based Flue Gas Desulphurisation System to the satisfaction of the Employer.

Further, the Collaborator/Technology Licensers shall ensure proper design, manufacture, installation, testing and successful performance of the Wet Limestone Based Flue Gas Desulphurisation System under the said Contract in accordance with stipulations of Bidding Documents and if necessary, the Collaborator/Technology Licensers shall advise the Contractor/* his Sub-Vendor suitable modifications of design and implement necessary corrective measures to discharge the obligations under the contract.

- (e) In the event the Collaborator & Technology Licensor and the Contractor *and *his Sub-Vendor fail to demonstrate that the Wet Limestone Based Flue Gas Desulphurisation System meets the guaranteed parameters and demonstration parameters as specified in the contract, the Collaborator & Technology Licensor and the Contractor and *and *his Sub-Vendor shall promptly carry out all the corrective measures related to engineering services at their own expense and shall promptly provide corrected design to the Employer.

- (f) Implementation of the corrected design and all other necessary repairs, replacements, rectification or modifications to the Wet Limestone Based Flue Gas Desulphurisation System and payment of financial liabilities and penalties and fulfillment of all other contractual obligations as provided under the contract shall be the joint and severally responsibility of the Contractor *and *his Sub-Vendor and Associate/Collaborator.

4. We, the Contractor *and *his Sub-Vendor and the Collaborator & Technology Licensor do hereby undertake and confirm that this Undertaking shall be irrevocable and shall not be revoked till ninety (90) days after the end of the defect liability period of the last equipment covered under the Contract and further stipulate that the Undertaking herein contained shall terminate after ninety (90) days of satisfactory completion of such defect liability period. In case of delay in completion of defect liability period, the validity of this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be extended by such period of delay. We further agree that this Undertaking shall be without any prejudice to the various liabilities of the Contractor including Contract Performance Security as well as other obligations of the Contractor in terms of the Contract.

Signature of authorized signatory.....

5. The Contractor *and *his Sub-Vendor and Collaborator & Technology Licensor will be fully responsible for the quality of all the equipment/main assemblies/components manufactured at their works or at their Vendors' works or constructed at site, and their repair or replacement, if necessary, for incorporation in the Plant and timely delivery thereof to meet the completion schedule under the Contract.
6. In case of Award, in addition to the Contract Performance Security furnished by the Contractor, the Collaborator/Technology Licensor*and *Contractor's Sub-Vendor shall each furnish 'as security' an on demand Performance Bank Guarantee in favour of the Employer as per provisions of the bidding documents. The value of such Bank Guarantee shall be equal to **INR 30 Million (Indian Rupees Thirty Million)** and it shall be guarantee towards the faithful performance /compliance of this Letter of support from Collaborator(s) / Licensor / Technology Provider in accordance with the terms and conditions specified herein. The bank guarantee shall be unconditional, irrevocable and valid till ninety (90) days beyond the end of defect liability period of the last equipment covered under the Contract. In case of delay in completion of the defect liability period, the validity of this Bank Guarantee shall be extended by the period of such delay. The guarantee amount shall be promptly paid to the Employer on demand without any demur, reservation, protest or contest.
7. Any dispute that may arise in connection with this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be settled as per arbitration procedure/rules mentioned in the Contract documents. This Letter of support from Collaborator(s) / Licensor / Technology Provider shall be construed and interpreted in accordance with the Laws of India and the Courts of Delhi shall have exclusive jurisdiction.
8. We, the Collaborator & Technology Licensor and the Contractor *and *his Sub-Vendor agree that this Undertaking shall form an integral part of the Contracts from the date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider . We further agree that this Letter of support from Collaborator(s) / Licensor / Technology Provider shall continue to be enforceable till its validity.
9. That this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be operative from the effective date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider .

IN WITNESS WHEREOF, the Collaborator & Technology Licensor and the Contractor *and *his Sub-Vendor through their authorised representatives, have executed these presents and affixed common seal of their respective companies, on the day, month and year first mentioned above.

Signature of authorized signatory.....

1. WITNESS For M/s
(Contractor)

..... (Signature of the Authorised
(Signature Name & Address) Representative)

.....
(Official Address) Name.....

Designation
Common Seal of the
Company

WITNESS For M/s.....
(*Contractor's Sub-Vendor)

..... (Signature of the Authorised
(Signature Name & Address) Representative)

.....
(Official Address) Name.....

Designation
Common Seal of the
Company

WITNESS For M/s
(Collaborator & Technology Licensor)

..... (Signature of the Authorised
(Signature Name & Address) Representative)

.....

Signature of authorized signatory.....

(Official Address)

Name.....

Designation

Common Seal of the Company

.....

Note : Power of Attorney of the person signing on behalf of Collaborator/Technology Licensor, Contractorand *his sub-vendor is to be furnished by Contractor.

* Bidder/Contractor shall strike out, whichever is not applicable.

** Copy of priced purchase order for the equipment shall be furnished by Bidder.

Signature of authorized signatory.....

**FORM OF LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR /
TECHNOLOGY PROVIDER FOR THE COMPLETE WET LIMESTONE BASED FLUE GAS
DESULPHURISATION SYSTEM AS PER CLAUSE 4.25.4, OF SUB-SECTION-I-A, PART A,
SECTION VI**

(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

**LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY
PROVIDER TO BE EXECUTED BY THE BIDDER/ CONTRACTOR MEETING THE
REQUIREMENTS OF CLAUSE 4.25.4 OF SUB-SECTION-I-A, PART A, SECTION VI AND
THE COLLABORATOR & TECHNOLOGY LICENSOR WHO MEETS THE REQUIREMENT
OF CLAUSE 4.25.1 OF SUB-SECTION-I-A, PART A, SECTION VI [AS A QUALIFIED WET
LIMESTONE BASED FLUE GAS DESULPHURISATION SYSTEM MANUFACTURER
(QFGDM)] FOR SUCCESSFUL PERFORMANCE OF THE CONTRACT**

The DEED OF UNDERTAKING executed this day of Two thousand by M/s
..... a Company incorporated under having its
Registered Office at.....(hereinafter called the "Bidder/Contractor", which
expression shall include its successors, administrators, executors and permitted assigns) and

*M/s a Company incorporated under having its Registered
Office at(hereinafter called the "Sub-Vendor", which expression shall
include its successors, administrators, executors and permitted assigns) AND

M/s a Company registered under the having its Registered Office at
..... (hereinafter called the "Collaborator & Technology Licensor" , which expression
shall include its successors, administrators, executors and permitted assigns),

in favour of, having its Registered Office at SCCL, Kothagudem
Collieries,Bhadrari Kothagudaem Dt, Telangana-507101 INDIA("Employer" which expression shall
include its successors, administrators, executors and assigns).

.

WHEREAS, the Employer invited Bids for design, engineering, manufacture, supply,
transportation to site, installation, testing, commissioning and conductance of guarantee
tests for the **EPC Package** for **Singareni TPP-II(1x800MW)**(hereinafter referred to as "Plant")
vide its Bidding Document No. .

Signature of authorized signatory.....

AND WHEREAS vide clause 4.25.4 (b) of Sub-Section-IA, Part A, Section VI of bidding documents, it has been specified that *bidder/*contractor/*his sub-vendor who meets the required experience as per clause 4.25.4 (a) of Sub-Section-IA, Part A, Section VI of bidding documents shall also have an ongoing Collaboration agreement / Technology Licensing agreement prior to the date of submission of proposal of sub-vendor, with a Qualified Wet Limestone based Flue Gas Desulphurisation System Manufacturer), who meets the requirement of clause 4.25.1 of Sub-Section-IA, Part A, Section VI and furnish a Letter of support from Collaborator(s) / Licensor / Technology Provider as per the requirement of clause no. 4.25.4(c) of Sub-Section-IA, Part-A, Section-VI.

WHEREAS M/s (Bidder/Contractor) has submitted its proposal in response to the aforesaid Invitation for Bid by the Employer bearing No. dated for EPC Package for its Singareni TPP-II(1x800MW)against the Employer's Bidding Documents.

AND WHEREAS M/s..... .(*Contractor/*his sub-vendor) meet the requirements specified at clause no. 4.25.4 of Sub-Section-IA, Part A, Section VI and have an on-going collaboration agreement/technology licensing agreement prior to the date of submission of proposal of sub-vendor, with M/s..... (hereinafter referred to as Collaborator/Technology Licensor) who is a manufacturer of Wet Limestone based Flue Gas Desulphurisation System and meets the requirements as specified in clause no. 4.25.1 of Sub-Section-IA, Part A, Section VI, valid minimum up to the end of the defect liability period of the contract. The *Bidder/*Contractor*and *his Sub-Vendor and the Collaborator & Technology Licensor are required to jointly execute and furnish along with the bid an irrevocable Letter of support from Collaborator(s) / Licensor / Technology Provider and be jointly and severally responsible and bound unto the Employer for successful performance of the Wet Limestone based Flue Gas Desulphurisation Systemand be jointly and severally liable to perform all contractual obligations for the Wet Limestone based Flue Gas Desulphurisation Systemfor**Singareni TPP-II(1x800MW)**, fully meeting the stipulated technical requirements, guaranteed parameters and characteristics as per the Bidding Documents in the event the bid is accepted by the Employer resulting into a Contract.

NOW THEREFORE, THIS DEED WITNESSETH AS UNDER:

1. We the Collaborator & Technology Licensor and the Contractor *and *his Sub-Vendor, do hereby declare and undertake that we shall be jointly and severally responsible to the Employer for the design, execution and successful performance of the complete Wet Limestone Based Flue Gas Desulphurisation System and all the contractual obligations

Signature of authorized signatory.....

including the technical guarantees for the complete Wet Limestone Based Flue Gas Desulphurisation System, as specified under the said Contract(s) to the satisfaction of the Employer.

2. In case of any breach of the Contract committed by the Contractor *and *his Sub-Vendor, we the Collaborator & Technology Licensor do hereby undertake, declare and confirm that we shall be fully responsible for the successful performance of the Wet Limestone Based Flue Gas Desulphurisation System and undertake to carry out all the obligations and responsibilities under this Letter of support from Collaborator(s) / Licensor / Technology Provider in order to discharge the Contractor's obligations stipulated under the Contract. Further, if the Employer sustains any loss or damage on account of any breach of the Contract for the Wet Limestone Based Flue Gas Desulphurisation System, we the Collaborator & Technology Licensor and Contractor *and *his Sub-Vendor jointly and severally undertake to promptly indemnify and pay such loss/damages caused to the Employer on its written demand without any demur, reservation, Contest or protest in any manner whatsoever. This is without prejudice to any rights of the Employer against the Contractor/ *his Sub-Vendor under the Contract and/or guarantees. It shall not be necessary or obligatory for the Employer to first proceed against the Contractor/ *his Sub-Vendor before proceeding against the Collaborator & Technology Licensor nor any extension of time or any relaxation given by the Employer to the Contractor shall prejudice any rights of the Employer under this Letter of support from Collaborator(s) / Licensor / Technology Provider to proceed against the Contractor. The liability of the contractor, his sub-vendor and the associate/collaborator shall be limited to an amount equal to 100% of the value of the contract** between the contractor and the sub supplier for the equipments/systems.
3. Without prejudice to the generality of the Undertaking in paragraph 1 above, the manner of achieving the objectives set forth in paragraph 1 above shall be as follows:
 - (a) We, the Collaborator & Technology Licensor shall be fully responsible for complete engineering, preparation of all designs, design calculations, design documents / drawings and manufacturing drawings for the Absorber including all its internals; preparation of all P&IDs & process flow diagrams; Selection of auxiliaries, and interfacing/ integrating Absorber with their auxiliaries so as to ensure satisfactory, reliable, safe and trouble free performance of all Absorber and auxiliaries meeting all stipulated technical requirements as well as all guaranteed parameters specified in the Contract for Wet Limestone based Flue Gas Desulphurisation System.
 - (b) We, the Collaborator & Technology Licensor shall be specifically responsible for the following:

Signature of authorized signatory.....

- (i) Complete design of Absorber including selection/design of Absorber material, lining & all internals; complete mass flow balance as well as design of structural/supporting system including selection of material & accessories etc.
- (ii) Selection of auxiliaries for Wet Limestone based Flue Gas Desulphurisation System including preparation of purchase specification for critical auxiliaries viz Slurry Recirculation pumps, Oxidation Blowers, Wet limestone Grinding mills, Slurry pumps, Agitators, Hydro-cyclones, Vacuum Belt Filters, slurry valves & piping.
- (iii) Design of controls, protections and interlocks for all the auxiliaries for Wet Limestone based Flue Gas Desulphurisation System including Absorber for their safe and reliable operation as integral units with other equipments of the Main Plant.
- (iv) Providing all design data required by the Contractor to carry out design/ selection of balance equipment/ system including all civil inputs for foundation design, site construction, structural work etc. for Wet Limestone based Flue Gas Desulphurisation System and for their proper interfacing and integration.
- (v) Provide manufacturing/fabrication drawings for absorber including its internals.

Further, we, the Collaborator & Technology Licensor shall extend our quality surveillance/ supervision/ quality control to the Contractor during manufacture, erection, commissioning and performance testing, both at Contractor's/Sub-vendor's works and/ or at Employer's project site. Without prejudice to the overall responsibilities of the Collaborator & Technology Licensor for successful commissioning and performance of Wet Limestone based Flue Gas Desulphurisation System, the Collaborator & Technology Licensor shall depute its technical experts from time to time to the Contractor's/ Sub-vendor's works/ Employer's project site, as mutually agreed upon between the Employer and the Contractor in accordance with the stipulation of the Contracts.

- (c) We, the Collaborator & Technology Licensor will be fully responsible for the quality of manufacture of all equipments/ main assemblies/ components for incorporation in the Wet Limestone based Flue Gas Desulphurisation System and shall ensure that they are manufactured as per the drawings released by us.

For the items to be manufactured by the contractor at his/or his vendor's works as per the Collaborator & Technology Licensor design & manufacturing drawings released by us, the Associate / Collaborator shall ensure completeness and correctness of the design, data, document and information in every detail provided to the Contractor which would result in the same quality of equipment as if manufactured at Collaborator & Technology Licensor or its Sub-vendor's works and shall meet Collaborator & Technology Licensor acceptance.

Signature of authorized signatory.....

- (d) We the Collaborator & Technology Licensor shall be fully responsible for complete for design, engineering, supply, installation, putting in to satisfactory operation and carrying out the guarantee tests for Wet Limestone Based Flue Gas Desulphurisation System to the satisfaction of the Employer.

Further, the Collaborator/Technology Licensers shall ensure proper design, manufacture, installation, testing and successful performance of the Wet Limestone Based Flue Gas Desulphurisation System under the said Contract in accordance with stipulations of Bidding Documents and if necessary, the Collaborator/Technology Licensers shall advise the Contractor/* his Sub-Vendor suitable modifications of design and implement necessary corrective measures to discharge the obligations under the contract.

- (e) In the event the Collaborator & Technology Licensor and the Contractor *and *his Sub-Vendor fail to demonstrate that the Wet Limestone Based Flue Gas Desulphurisation System meets the guaranteed parameters and demonstration parameters as specified in the contract, the Collaborator & Technology Licensor and the Contractor and *and *his Sub-Vendor shall promptly carry out all the corrective measures related to engineering services at their own expense and shall promptly provide corrected design to the Employer.

- (f) Implementation of the corrected design and all other necessary repairs, replacements, rectification or modifications to the Wet Limestone Based Flue Gas Desulphurisation System and payment of financial liabilities and penalties and fulfillment of all other contractual obligations as provided under the contract shall be the joint and severally responsibility of the Contractor *and *his Sub-Vendor and Associate/Collaborator.

4. We, the Contractor *and *his Sub-Vendor and the Collaborator & Technology Licensor do hereby undertake and confirm that this Undertaking shall be irrevocable and shall not be revoked till ninety (90) days after the end of the defect liability period of the last equipment covered under the Contract and further stipulate that the Undertaking herein contained shall terminate after ninety (90) days of satisfactory completion of such defect liability period. In case of delay in completion of defect liability period, the validity of this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be extended by such period of delay. We further agree that this Undertaking shall be without any prejudice to the various liabilities of the Contractor including Contract Performance Security as well as other obligations of the Contractor in terms of the Contract.

Signature of authorized signatory.....

5. The Contractor *and *his Sub-Vendor and Collaborator & Technology Licensor will be fully responsible for the quality of all the equipment/main assemblies/components manufactured at their works or at their Vendors' works or constructed at site, and their repair or replacement, if necessary, for incorporation in the Plant and timely delivery thereof to meet the completion schedule under the Contract.
6. In case of Award, in addition to the Contract Performance Security furnished by the Contractor, the Collaborator/Technology Licensor*and *Contractor's Sub-Vendor shall each furnish 'as security' an on demand Performance Bank Guarantee in favour of the Employer as per provisions of the bidding documents. The value of such Bank Guarantee shall be equal to **INR 30 Million (Indian Rupees Thirty Million)** and it shall be guarantee towards the faithful performance /compliance of this Letter of support from Collaborator(s) / Licensor / Technology Provider in accordance with the terms and conditions specified herein. The bank guarantee shall be unconditional, irrevocable and valid till ninety (90) days beyond the end of defect liability period of the last equipment covered under the Contract. In case of delay in completion of the defect liability period, the validity of this Bank Guarantee shall be extended by the period of such delay. The guarantee amount shall be promptly paid to the Employer on demand without any demur, reservation, protest or contest.
7. Any dispute that may arise in connection with this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be settled as per arbitration procedure/rules mentioned in the Contract documents. This Letter of support from Collaborator(s) / Licensor / Technology Provider shall be construed and interpreted in accordance with the Laws of India and the Courts of Delhi shall have exclusive jurisdiction.
8. We, the Associate/Collaborator and the Contractor *and *his Sub-Vendor agree that this Undertaking shall form an integral part of the Contracts from the date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider . We further agree that this Letter of support from Collaborator(s) / Licensor / Technology Provider shall continue to be enforceable till its validity.
9. That this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be operative from the effective date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider .

IN WITNESS WHEREOF, the Collaborator & Technology Licensor and the Contractor *and *his Sub-Vendor through their authorised representatives, have executed these presents and affixed common seal of their respective companies, on the day, month and year first mentioned above.

1.	WITNESS	For M/s
		(Contractor)
	.....	(Signature of the Authorised
	(Signature Name & Address)	Representative)
		Signature of authorized signatory.....

.....	
(Official Address)	Name.....
	Designation
	Common Seal of the
	Company
WITNESS	For M/s.....
	(*Contractor's Sub-Vendor)
.....	(Signature of the Authorised
(Signature Name & Address)	Representative)
.....	
(Official Address)	Name.....
	Designation
	Common Seal of the
	Company
WITNESS	For M/s
	(Collaborator & Technology Licensor)
.....	(Signature of the Authorised
(Signature Name & Address)	Representative)
.....	
(Official Address)	Name.....
	Designation
	Common Seal of the Company
	Signature of authorized signatory.....

.....

Note : Power of Attorney of the person signing on behalf of Collaborator/Technology Licensor, Contractor and *his sub-vendor is to be furnished by Contractor.

* Bidder/Contractor shall strike out, whichever is not applicable.

** Copy of priced purchase order for the equipment shall be furnished by Bidder.

Signature of authorized signatory.....

**FORM OF LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR /
TECHNOLOGY PROVIDER FOR THE COMPLETE WET LIMESTONE BASED FLUE GAS
DESULPHURISATION SYSTEM AS PER CLAUSE *4.25.2/*4.25.3, OF SUB-SECTION-I-A,
PART A, SECTION VI ALONGWITH NOTE 4 OF CLAUSE 4.25.1 OF SUB-SECTION-I-A,
PART A, SECTION VI**

(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

**LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY
PROVIDER TO BE EXECUTED BY THE BIDDER/ CONTRACTOR MEETING THE
REQUIREMENTS OF CLAUSE *4.25.2/*4.25.3 OF SUB-SECTION-I-A, PART A, SECTION VI
AND THE COLLABORATOR & TECHNOLOGY LICENSOR (A HOLDING COMPANY ALONG
WITH ITS SUBSIDIARIES) WHO MEETS THE REQUIREMENT OF CLAUSE 4.25.1 OF SUB-
SECTION-I-A, PART A, SECTION VI [AS A QUALIFIED WET LIMESTONE BASED FLUE
GAS DESULPHURISATION SYSTEM MANUFACTURER (QFGDM)] FOR SUCCESSFUL
PERFORMANCE OF THE CONTRACT**

The DEED OF UNDERTAKING executed this day of Two thousand by M/s
..... a Company incorporated under having its
Registered Office at.....(hereinafter called the "Bidder/Contractor", which
expression shall include its successors, administrators, executors and permitted assigns) and

*M/s a Company incorporated under having its Registered
Office at(hereinafter called the "Sub-Vendor", which expression shall
include its successors, administrators, executors and permitted assigns) AND

M/s a Holding Company registered under the having its Registered
Office at (hereinafter called the "Collaborator/Technology Licensor/Holding
Company" , which expression shall include its successors, administrators, executors and
permitted assigns),

M/s a Company registered under having its
Registered Office at, M/s a Company
registered under having its Registered Office at
and M/s a Company registered under having its
Registered Office at (the Subsidiary(ies) of the Collaborator &
Technology Licensor who are lending strength/ experience to the Holding Company for meeting
the requirements stipulated in clause 4.25.1 of Sub-Section-IA, Part A, Section VI and
hereinafter collectively called the "Subsidiary(ies)", which expression shall include its
successors, administrators, executors and permitted assigns)

Signature of authorized signatory.....

in favour of, having its Registered Office at SCCL, Kothagudem Collieries, Bhadrari Kothagudaem Dt, Telangana-507101 INDIA ("Employer" which expression shall include its successors, administrators, executors and assigns).

WHEREAS, the Employer invited Bids for design, engineering, manufacture, supply, transportation to site, installation, testing, commissioning and conductance of guarantee tests for the **EPC Package** for **Singareni TPP-II(1x800MW)** (hereinafter referred to as "Plant") vide its Bidding Document No. .

AND WHEREAS vide clause *4.25.2/*4.25.3 of Sub-Section-IA, Part A, Section VI of bidding documents, it has been specified that bidder who meets the required experience as per clause *4.25.2/*4.25.3 shall also have an ongoing Collaboration agreement / Technology Licensing agreement prior to the date of submission of proposal of sub-vendor, with a Qualified Wet Limestone based Flue Gas Desulphurisation System Manufacturer), who meets the requirement of clause 4.25.1 of Sub-Section-IA, Part A, Section VI and furnish a Letter of support from Collaborator(s) / Licensor / Technology Provider as per the requirement of clause no. *4.25.2(c)/ *4.25.3(c) of Sub-Section-IA, Part-A, Section-VI.

WHEREAS M/s (Bidder/Contractor) has submitted its proposal in response to the aforesaid Invitation for Bid by the Employer bearing No. dated for EPC Package for its Singareni TPP-II(1x800MW) against the Employer's Bidding Documents.

AND WHEREAS M/s.....>(*Bidder/*Contractor/*his sub-vendor) meet the requirements specified at clause no. *4.25.2(a)/*4.25.3(a)(i)/ */*4.25.3(a)(ii)/ */*4.25.3(a)(iii) of Sub-Section-IA, Part A, Section VI and have an on-going collaboration agreement/technology licensing agreement prior to the date of submission of proposal of sub-vendor, with M/s..... (hereinafter referred to as Collaborator/Technology Licensor) who is a manufacturer of Wet Limestone based Flue Gas Desulphurisation System and meets the requirements as specified in clause no. 4.25.1 of Sub-Section-IA, Part A, Section VI, valid minimum up to the end of the defect liability period of the contract.

The *Bidder/*Contractor*and *his Sub-Vendor and the Collaborator & Technology Licensor are required to jointly execute and furnish along with the bid an irrevocable Letter of support from Collaborator(s) / Licensor / Technology Provider and be jointly and severally responsible and bound unto the Employer for successful performance of the Wet Limestone based Flue Gas Desulphurisation System and be jointly and severally liable to perform all contractual obligations for the Wet Limestone based Flue Gas Desulphurisation System for **Singareni TPP-II(1x800MW)**, fully meeting the stipulated technical requirements, guaranteed parameters and characteristics as per the Bidding Documents in the event the bid is accepted by the Employer resulting into a Contract.

NOW THEREFORE, THIS DEED WITNESSETH AS UNDER:

1. We the Collaborator & Technology Licensor and the Contractor *and *his Sub-Vendor, do hereby declare and undertake that we shall be jointly and severally responsible to the Employer for the design, execution and successful performance of the complete Wet

Signature of authorized signatory.....

Limestone Based Flue Gas Desulphurisation System and all the contractual obligations including the technical guarantees for the complete Wet Limestone Based Flue Gas Desulphurisation System, as specified under the said Contract(s) to the satisfaction of the Employer.

2. In case of any breach of the Contract committed by the Contractor *and *his Sub-Vendor, we the Collaborator & Technology Licensor do hereby undertake, declare and confirm that we shall be fully responsible for the successful performance of the Wet Limestone Based Flue Gas Desulphurisation System and undertake to carry out all the obligations and responsibilities under this Letter of support from Collaborator(s) / Licensor / Technology Provider in order to discharge the Contractor's obligations stipulated under the Contract. Further, if the Employer sustains any loss or damage on account of any breach of the Contract for the Wet Limestone Based Flue Gas Desulphurisation System, we the Collaborator & Technology Licensor and Contractor *and *his Sub-Vendor jointly and severally undertake to promptly indemnify and pay such loss/damages caused to the Employer on its written demand without any demur, reservation, Contest or protest in any manner whatsoever. This is without prejudice to any rights of the Employer against the Contractor/ *his Sub-Vendor under the Contract and/or guarantees. It shall not be necessary or obligatory for the Employer to first proceed against the Contractor/ *his Sub-Vendor before proceeding against the Collaborator & Technology Licensor nor any extension of time or any relaxation given by the Employer to the Contractor shall prejudice any rights of the Employer under this Letter of support from Collaborator(s) / Licensor / Technology Provider to proceed against the Contractor. The liability of the contractor, his sub-vendor and the associate/collaborator shall be limited to an amount equal to 100% of the value of the contract** between the contractor and the sub supplier for the equipments/systems.
3. Without prejudice to the generality of the Undertaking in paragraph 1 above, the manner of achieving the objectives set forth in paragraph 1 above shall be as follows:
 - (a) We, the Collaborator & Technology Licensor shall be fully responsible for complete engineering, preparation of all designs, design calculations, design documents / drawings and manufacturing drawings for the Absorber including all its internals; preparation of all P&IDs & process flow diagrams; Selection of auxiliaries, and interfacing/ integrating Absorber with their auxiliaries so as to ensure satisfactory, reliable, safe and trouble free performance of all Absorber and auxiliaries meeting all stipulated technical requirements as well as all guaranteed parameters specified in the Contract for Wet Limestone based Flue Gas Desulphurisation System.
 - (b) We, the Collaborator & Technology Licensor shall be specifically responsible for the following:
 - (i) Complete design of Absorber including selection/design of Absorber material, lining & all internals; complete mass flow balance as well as design of structural/supporting system including selection of material & accessories etc.
 - (ii) Selection of auxiliaries for Wet Limestone based Flue Gas Desulphurisation System including preparation of purchase specification for critical auxiliaries viz Slurry Recirculation pumps, Oxidation Blowers, Wet limestone Grinding mills, Slurry pumps, Agitators, Hydro-cyclones, Vacuum Belt Filters, slurry valves & piping.
 - (iii) Design of controls, protections and interlocks for all the auxiliaries for Wet Limestone based Flue Gas Desulphurisation System including Absorber for their

Signature of authorized signatory.....

safe and reliable operation as integral units with other equipments of the Main Plant.

- (iv) Providing all design data required by the Contractor to carry out design/ selection of balance equipment/ system including all civil inputs for foundation design, site construction, structural work etc. for Wet Limestone based Flue Gas Desulphurisation System and for their proper interfacing and integration.
- (v) Provide manufacturing/fabrication drawings for absorber including its internals.

Further, we, the Collaborator & Technology Licensor shall extend our quality surveillance/ supervision/ quality control to the Contractor during manufacture, erection, commissioning and performance testing, both at Contractor's/Sub-vendor's works and/ or at Employer's project site. Without prejudice to the overall responsibilities of the Collaborator & Technology Licensor for successful commissioning and performance of Wet Limestone based Flue Gas Desulphurisation System, the Collaborator & Technology Licensor shall depute its technical experts from time to time to the Contractor's/ Sub-vendor's works/ Employer's project site, as mutually agreed upon between the Employer and the Contractor in accordance with the stipulation of the Contracts.

- (c) We, the Collaborator & Technology Licensor will be fully responsible for the quality of manufacture of all equipments/ main assemblies/ components for incorporation in the Wet Limestone based Flue Gas Desulphurisation System.

For the items to be manufactured by the contractor at his/or his vendor's works as per the Collaborator & Technology Licensor design & manufacturing drawings released by us, the Associate / Collaborator shall ensure completeness and correctness of the design, data, document and information in every detail provided to the Contractor which would result in the same quality of equipment as if manufactured at Collaborator & Technology Licensor or its Sub-vendor's works and shall meet Collaborator & Technology Licensor acceptance.

- (d) We the Collaborator & Technology Licensor shall be fully responsible for complete design, engineering, supply, installation, putting in to satisfactory operation and carrying out the guarantee tests for Wet Limestone Based Flue Gas Desulphurisation System to the satisfaction of the Employer.

Further, the Collaborator & Technology Licensor shall depute their technical experts from time to time to the Contractor's/*his sub-vendor's /Employer's project site as required by the Employer and agreed to by Contractor *and *his Sub-Vendor/ Collaborator & Technology Licensor to facilitate the successful performance of the Wet Limestone Based Flue Gas Desulphurisation System as stipulated in the aforesaid Contract.

- (e) In the event the Collaborator & Technology Licensor and the Contractor *and *his Sub-Vendor fail to demonstrate that the Wet Limestone Based Flue Gas Desulphurisation System meets the guaranteed parameters and demonstration parameters as specified in the contract, the Collaborator & Technology Licensor and the Contractor and *and *his

Signature of authorized signatory.....

Sub-Vendor shall promptly carry out all the corrective measures related to engineering services at their own expense and shall promptly provide corrected design to the Employer.

- (f) Implementation of the corrected design and all other necessary repairs, replacements, rectification or modifications to the Wet Limestone Based Flue Gas Desulphurisation System and payment of financial liabilities and penalties and fulfillment of all other contractual obligations as provided under the contract shall be the joint and severally responsibility of the Contractor *and *his Sub-Vendor and Associate/Collaborator.
4. We, the Contractor *and *his Sub-Vendor and the Collaborator & Technology Licensor do hereby undertake and confirm that this Undertaking shall be irrevocable and shall not be revoked till ninety (90) days after the end of the defect liability period of the last equipment covered under the Contract and further stipulate that the Undertaking herein contained shall terminate after ninety (90) days of satisfactory completion of such defect liability period. In case of delay in completion of defect liability period, the validity of this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be extended by such period of delay. We further agree that this Undertaking shall be without any prejudice to the various liabilities of the Contractor including Contract Performance Security as well as other obligations of the Contractor in terms of the Contract.
5. The Contractor *and *his Sub-Vendor and Collaborator & Technology Licensor will be fully responsible for the quality of all the equipment/main assemblies/components manufactured at their works or at their Vendors' works or constructed at site, and their repair or replacement, if necessary, for incorporation in the Plant and timely delivery thereof to meet the completion schedule under the Contract.
6. In case of Award, in addition to the Contract Performance Security furnished by the Contractor, the Collaborator/Technology Licensor*and *Contractor's Sub-Vendor shall each furnish 'as security' an on demand Performance Bank Guarantee in favour of the Employer as per provisions of the bidding documents. The value of such Bank Guarantee shall be equal to **INR 30 Million (Indian Rupees Thirty Million)** and it shall be guarantee towards the faithful performance /compliance of this Letter of support from Collaborator(s) / Licensor / Technology Provider in accordance with the terms and conditions specified herein. The bank guarantee shall be unconditional, irrevocable and valid till ninety (90) days beyond the end of defect liability period of the last equipment covered under the Contract. In case of delay in completion of the defect liability period, the validity of this Bank Guarantee shall be extended by the period of such delay. The guarantee amount shall be promptly paid to the Employer on demand without any demur, reservation, protest or contest.
7. Any dispute that may arise in connection with this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be settled as per arbitration procedure/rules mentioned in the Contract documents. This Letter of support from Collaborator(s) / Licensor / Technology Provider shall be construed and interpreted in accordance with the Laws of India and the Courts of Delhi shall have exclusive jurisdiction.
8. We, the Collaborator & Technology Licensor and the Contractor *and *his Sub-Vendor agree that this Undertaking shall form an integral part of the Contracts from the date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider . We

Signature of authorized signatory.....

further agree that this Letter of support from Collaborator(s) / Licensor / Technology Provider shall continue to be enforceable till its validity.

9. That this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be operative from the effective date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider .

IN WITNESS WHEREOF, the Collaborator & Technology Licensor and the Contractor *and *his Sub-Vendor through their authorised representatives, have executed these presents and affixed common seal of their respective companies, on the day, month and year first mentioned above.

1. WITNESS For M/s
(Contractor)

..... (Signature of the Authorised
(Signature Name & Address) Representative).....
.....
(Official Address) Name.....

Designation

Common Seal of the

Company

WITNESS For M/s.....
(*Contractor's Sub-Vendor)

..... (Signature of the Authorised
(Signature Name & Address) Representative)
.....
(Official Address) Name.....

Designation

Common Seal of the
Company

Signature of authorized signatory.....

WITNESS

For M/s

(Collaborator & Technology Licensor
i.e Holding Company)

.....

(Signature of the Authorised

(Signature Name & Address)

Representative)

.....

(Official Address)

Name.....

Designation

Common Seal of the Company

.....

WITNESS

For M/s

(SUBSIDIARY 1 OF HOLDING COMPANY)

.....

(Signature of the Authorised

(Signature Name & Address)

Representative)

.....

(Official Address)

Name.....

Designation

Common Seal of the Company

.....

WITNESS

For M/s

(SUBSIDIARY 2 OF HOLDING COMPANY)

.....

(Signature of the Authorised

(Signature Name & Address)

Representative)

Signature of authorized signatory.....

.....

(Official Address)

Name.....

Designation

Common Seal of the Company

.....

WITNESS

For M/s

(SUBSIDIARY 3 OF HOLDING COMPANY)

.....

(Signature Name & Address)

(Signature of the Authorised

Representative)

.....

(Official Address)

Name.....

Designation

Common Seal of the Company

.....

Note : Power of Attorney of the person signing on behalf of Collaborator/Technology Licensor, Contractor and *his sub-vendor is to be furnished by Contractor.

* Bidder/Contractor shall strike out, whichever is not applicable.

** Copy of priced purchase order for the equipment shall be furnished by Bidder.

Signature of authorized signatory.....

Signature of authorized signatory.....

**FORM OF LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR /
TECHNOLOGY PROVIDER FOR THE COMPLETE WET LIMESTONE BASED FLUE GAS
DESULPHURISATION SYSTEM AS PER CLAUSE 4.25.4, OF SUB-SECTION-I-A, PART A,
SECTION VI ALONGWITH NOTE 4 OF CLAUSE 4.25.1 OF SUB-SECTION-I-A, PART A,
SECTION VI**

(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

**LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY
PROVIDER TO BE EXECUTED BY THE BIDDER/ CONTRACTOR MEETING THE
REQUIREMENTS OF CLAUSE 4.25.4 OF SUB-SECTION-I-A, PART A, SECTION VI AND
THE COLLABORATOR & TECHNOLOGY LICENSOR (A HOLDING COMPANY ALONG
WITH ITS SUBSIDIARIES) WHO MEETS THE REQUIREMENT OF CLAUSE 4.25.1 OF SUB-
SECTION-I-A, PART A, SECTION VI [AS A QUALIFIED WET LIMESTONE BASED FLUE
GAS DESULPHURISATION SYSTEM MANUFACTURER (QFGDM)] FOR SUCCESSFUL
PERFORMANCE OF THE CONTRACT**

The DEED OF UNDERTAKING executed this day of Two thousand by M/s
..... a Company incorporated under having its
Registered Office at.....(hereinafter called the "Bidder/Contractor", which
expression shall include its successors, administrators, executors and permitted assigns) and

*M/s a Company incorporated under having its Registered
Office at(hereinafter called the "Sub-Vendor", which expression shall
include its successors, administrators, executors and permitted assigns) AND

M/s a Holding Company registered under the having its Registered
Office at (herein after called the "Collaborator & Technology Licensor/Holding
Company" , which expression shall include its successors, administrators, executors and
permitted assigns),

M/s a Company registered under having its
Registered Office at, M/s a Company
registered under having its Registered Office at
and M/s a Company registered under having its
Registered Office at (the Subsidiary(ies) of the Collaborator &
Technology Licensor who are lending strength/ experience to the Holding Company for meeting
the requirements stipulated in clause 4.25.1 of Sub-Section-IA, Part A, Section VI and
hereinafter collectively called the "Subsidiary(ies)", which expression shall include its
successors, administrators, executors and permitted assigns)

in favour of, having its Registered Office at SCCL, Kothagudem
Collieries,Bhadrari Kothagudaem Dt, Telangana-507101 INDIA("Employer" which expression shall
include its successors, administrators, executors and assigns).

Signature of authorized signatory.....

WHEREAS, the Employer invited Bids for design, engineering, manufacture, supply, transportation to site, installation, testing, commissioning and conductance of guarantee tests for the **EPC Package** for **Singareni TPP-II(1x800MW)**(hereinafter referred to as "Plant") vide its Bidding Document No. .

AND WHEREAS vide clause 4.25.4 (b) of Sub-Section-IA, Part A, Section VI of bidding documents, it has been specified that *bidder/*contractor/*his sub-vendor who meets the required experience as per clause 4.25.4 (a) of Sub-Section-IA, Part A, Section VI of bidding documents shall also have an ongoing Collaboration agreement / Technology Licensing agreement prior to the date of submission of proposal of sub-vendor, with a Qualified Wet Limestone based Flue Gas Desulphurisation System Manufacturer), who meets the requirement of clause 4.25.1 of Sub-Section-IA, Part A, Section VI and furnish a Letter of support from Collaborator(s) / Licensor / Technology Provider as per the requirement of clause no. 4.25.4(c) of Sub-Section-IA, Part-A, Section-VI.

WHEREAS M/s (Bidder/Contractor) has submitted its proposal in response to the aforesaid Invitation for Bid by the Employer bearing No. dated for EPC Package for its Singareni TPP-II(1x800MW)against the Employer's Bidding Documents.

AND WHEREAS M/s..... .(*Contractor/*his sub-vendor) meet the requirements specified at clause no. 4.25.4 of Sub-Section-IA, Part A, Section VI and have an on-going collaboration agreement/technology licensing agreement prior to the date of submission of proposal of sub-vendor, with M/s..... (hereinafter referred to as Collaborator/Technology Licensor) who is a manufacturer of Wet Limestone based Flue Gas Desulphurisation System and meets the requirements as specified in clause no. 4.25.1 of Sub-Section-IA, Part A, Section VI, valid minimum up to the end of the defect liability period of the contract. The *Bidder/*Contractor*and *his Sub-Vendor and the Collaborator & Technology Licensor are required to jointly execute and furnish along with the bid an irrevocable Letter of support from Collaborator(s) / Licensor / Technology Provider and be jointly and severally responsible and bound unto the Employer for successful performance of the Wet Limestone based Flue Gas Desulphurisation Systemand be jointly and severally liable to perform all contractual obligations for the Wet Limestone based Flue Gas Desulphurisation Systemfor**Singareni TPP-II(1x800MW)**, fully meeting the stipulated technical requirements, guaranteed parameters and characteristics as per the Bidding Documents in the event the bid is accepted by the Employer resulting into a Contract.

Signature of authorized signatory.....

NOW THEREFORE, THIS DEED WITNESSETH AS UNDER:

1. We the Collaborator & Technology Licensor and the Contractor *and *his Sub-Vendor, do hereby declare and undertake that we shall be jointly and severally responsible to the Employer for the design, execution and successful performance of the complete Wet Limestone Based Flue Gas Desulphurisation System and all the contractual obligations including the technical guarantees for the complete Wet Limestone Based Flue Gas Desulphurisation System, as specified under the said Contract(s) to the satisfaction of the Employer.
2. In case of any breach of the Contract committed by the Contractor *and *his Sub-Vendor, we the Collaborator & Technology Licensor do hereby undertake, declare and confirm that we shall be fully responsible for the successful performance of the Wet Limestone Based Flue Gas Desulphurisation System and undertake to carry out all the obligations and responsibilities under this Letter of support from Collaborator(s) / Licensor / Technology Provider in order to discharge the Contractor's obligations stipulated under the Contract. Further, if the Employer sustains any loss or damage on account of any breach of the Contract for the Wet Limestone Based Flue Gas Desulphurisation System, we the Collaborator & Technology Licensor and Contractor *and *his Sub-Vendor jointly and severally undertake to promptly indemnify and pay such loss/damages caused to the Employer on its written demand without any demur, reservation, Contest or protest in any manner whatsoever. This is without prejudice to any rights of the Employer against the Contractor/ *his Sub-Vendor under the Contract and/or guarantees. It shall not be necessary or obligatory for the Employer to first proceed against the Contractor/ *his Sub-Vendor before proceeding against the Collaborator & Technology Licensor nor any extension of time or any relaxation given by the Employer to the Contractor shall prejudice any rights of the Employer under this Letter of support from Collaborator(s) / Licensor / Technology Provider to proceed against the Contractor. The liability of the contractor, his sub-vendor and the associate/collaborator shall be limited to an amount equal to 100% of the value of the contract** between the contractor and the sub supplier for the equipments/systems.
3. Without prejudice to the generality of the Undertaking in paragraph 1 above, the manner of achieving the objectives set forth in paragraph 1 above shall be as follows:
 - (a) We, the Collaborator & Technology Licensor shall be fully responsible for complete engineering, preparation of all designs, design calculations, design documents / drawings and manufacturing drawings for the Absorber including all its internals; preparation of all P&IDs & process flow diagrams; Selection of auxiliaries, and interfacing/ integrating Absorber with their auxiliaries so as to ensure satisfactory, reliable, safe and trouble free performance of all Absorber and auxiliaries meeting all stipulated technical requirements as well as all guaranteed parameters specified in the Contract for Wet Limestone based Flue Gas Desulphurisation System.
 - (b) We, the Collaborator & Technology Licensor shall be specifically responsible for the following:

Signature of authorized signatory.....

- (i) Complete design of Absorber including selection/design of Absorber material, lining & all internals; complete mass flow balance as well as design of structural/supporting system including selection of material & accessories etc.
- (ii) Selection of auxiliaries for Wet Limestone based Flue Gas Desulphurisation System including preparation of purchase specification for critical auxiliaries viz Slurry Recirculation pumps, Oxidation Blowers, Wet limestone Grinding mills, Slurry pumps, Agitators, Hydro-cyclones, Vacuum Belt Filters, slurry valves & piping.
- (iii) Design of controls, protections and interlocks for all the auxiliaries for Wet Limestone based Flue Gas Desulphurisation System including Absorber for their safe and reliable operation as integral units with other equipments of the Main Plant.
- (iv) Providing all design data required by the Contractor to carry out design/ selection of balance equipment/ system including all civil inputs for foundation design, site construction, structural work etc. for Wet Limestone based Flue Gas Desulphurisation System and for their proper interfacing and integration.
- (v) Provide manufacturing/fabrication drawings for absorber including its internals.

Further, we, the Collaborator & Technology Licensor shall extend our quality surveillance/ supervision/ quality control to the Contractor during manufacture, erection, commissioning and performance testing, both at Contractor's/Sub-vendor's works and/ or at Employer's project site. Without prejudice to the overall responsibilities of the Collaborator & Technology Licensor for successful commissioning and performance of Wet Limestone based Flue Gas Desulphurisation System, the Collaborator & Technology Licensor shall depute its technical experts from time to time to the Contractor's/ Sub-vendor's works/ Employer's project site, as mutually agreed upon between the Employer and the Contractor in accordance with the stipulation of the Contracts.

- (c) We, the Collaborator & Technology Licensor will be fully responsible for the quality of manufacture of all equipments/ main assemblies/ components for incorporation in the Wet Limestone based Flue Gas Desulphurisation System and shall ensure that they are manufactured as per the drawings released by us.

For the items to be manufactured by the contractor at his/or his vendor's works as per the Collaborator & Technology Licensor design & manufacturing drawings released by us, the Associate / Collaborator shall ensure completeness and correctness of the design, data, document and information in every detail provided to the Contractor which would result in the same quality of equipment as if manufactured at Collaborator & Technology Licensor or its Sub-vendor's works and shall meet Collaborator & Technology Licensor acceptance.

- (d) We the Collaborator & Technology Licensor shall be fully responsible for complete for design, engineering, supply, installation, putting in to satisfactory operation and carrying

Signature of authorized signatory.....

out the guarantee tests for Wet Limestone Based Flue Gas Desulphurisation System to the satisfaction of the Employer.

Further, the Collaborator & Technology Licensers shall ensure proper design, manufacture, installation, testing and successful performance of the Wet Limestone Based Flue Gas Desulphurisation System under the said Contract in accordance with stipulations of Bidding Documents and if necessary, the Collaborator/Technology Licensers shall advise the Contractor/* his Sub-Vendor suitable modifications of design and implement necessary corrective measures to discharge the obligations under the contract.

- (e) In the event the Collaborator & Technology Licensor and the Contractor *and *his Sub-Vendor fail to demonstrate that the Wet Limestone Based Flue Gas Desulphurisation System meets the guaranteed parameters and demonstration parameters as specified in the contract, the Collaborator & Technology Licensor and the Contractor and *and *his Sub-Vendor shall promptly carry out all the corrective measures related to engineering services at their own expense and shall promptly provide corrected design to the Employer.
 - (f) Implementation of the corrected design and all other necessary repairs, replacements, rectification or modifications to the Wet Limestone Based Flue Gas Desulphurisation System and payment of financial liabilities and penalties and fulfillment of all other contractual obligations as provided under the contract shall be the joint and severally responsibility of the Contractor *and *his Sub-Vendor and Associate/Collaborator.
- 4. We, the Contractor *and *his Sub-Vendor and the Collaborator & Technology Licensor do hereby undertake and confirm that this Undertaking shall be irrevocable and shall not be revoked till ninety (90) days after the end of the defect liability period of the last equipment covered under the Contract and further stipulate that the Undertaking herein contained shall terminate after ninety (90) days of satisfactory completion of such defect liability period. In case of delay in completion of defect liability period, the validity of this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be extended by such period of delay. We further agree that this Undertaking shall be without any prejudice to the various liabilities of the Contractor including Contract Performance Security as well as other obligations of the Contractor in terms of the Contract.
 - 5. The Contractor *and *his Sub-Vendor and Collaborator & Technology Licensor will be fully responsible for the quality of all the equipment/main assemblies/components manufactured at their works or at their Vendors' works or constructed at site, and their repair or replacement, if necessary, for incorporation in the Plant and timely delivery thereof to meet the completion schedule under the Contract.
 - 6. In case of Award, in addition to the Contract Performance Security furnished by the Contractor, the Collaborator/Technology Licensor*and *Contractor's Sub-Vendor shall each furnish 'as security' an on demand Performance Bank Guarantee in favour of the Employer as per provisions of the bidding documents. The value of such Bank Guarantee shall be equal to **INR 30 Million (Indian Rupees Thirty Million)** and it shall be guarantee towards

Signature of authorized signatory.....

the faithful performance /compliance of this Letter of support from Collaborator(s) / Licensor / Technology Provider in accordance with the terms and conditions specified herein. The bank guarantee shall be unconditional, irrevocable and valid till ninety (90) days beyond the end of defect liability period of the last equipment covered under the Contract. In case of delay in completion of the defect liability period, the validity of this Bank Guarantee shall be extended by the period of such delay. The guarantee amount shall be promptly paid to the Employer on demand without any demur, reservation, protest or contest.

7. Any dispute that may arise in connection with this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be settled as per arbitration procedure/rules mentioned in the Contract documents. This Letter of support from Collaborator(s) / Licensor / Technology Provider shall be construed and interpreted in accordance with the Laws of India and the Courts of Delhi shall have exclusive jurisdiction.
8. We, the Collaborator & Technology Licensor and the Contractor *and *his Sub-Vendor agree that this Undertaking shall form an integral part of the Contracts from the date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider . We further agree that this Letter of support from Collaborator(s) / Licensor / Technology Provider shall continue to be enforceable till its validity.
9. That this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be operative from the effective date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider .

IN WITNESS WHEREOF, the Collaborator & Technology Licensor and the Contractor *and *his Sub-Vendor through their authorised representatives, have executed these presents and affixed common seal of their respective companies, on the day, month and year first mentioned above.

1.	WITNESS	For M/s
		(Contractor)
	.....	(Signature of the Authorised
	(Signature Name & Address)	Representative)
		
	(Official Address)	Name.....
		Designation
		Common Seal of the
		Company
	WITNESS	For M/s.....
		(*Contractor's Sub-Vendor)
		Signature of authorized signatory.....

.....
(Signature Name & Address) (Signature of the Authorised Representative)
.....
(Official Address) Name.....

Designation
Common Seal of the
Company

WITNESS For M/s

(Collaborator & Technology Licenser
i.e Holding Company)

.....
(Signature Name & Address) (Signature of the Authorised Representative)
.....
(Official Address) Name.....

Designation
Common Seal of the Company
.....

WITNESS For M/s

(SUBSIDIARY 1 OF HOLDING COMPANY)

.....
(Signature Name & Address) (Signature of the Authorised Representative)
.....
(Official Address) Name.....

Designation

Signature of authorized signatory.....

Common Seal of the Company

.....

WITNESS

For M/s

(SUBSIDIARY 2 OF HOLDING COMPANY)

.....

(Signature Name & Address)

.....

(Official Address)

(Signature of the Authorised

Representative)

Name.....

Designation

Common Seal of the Company

.....

WITNESS

For M/s

(SUBSIDIARY 3 OF HOLDING COMPANY)

.....

(Signature Name & Address)

.....

(Official Address)

(Signature of the Authorised

Representative)

Name.....

Designation

Common Seal of the Company

.....

Signature of authorized signatory.....

Note : Power of Attorney of the person signing on behalf of Collaborator/Technology Licensor, Contractor and *his sub-vendor is to be furnished by Contractor.

* Bidder/Contractor shall strike out, whichever is not applicable.

** Copy of priced purchase order for the equipment shall be furnished by Bidder.

Signature of authorized signatory.....

**CRITICAL EQUIPMENT, AUXILIARIES, SYSTEMS & BOUGHT OUT ITEMS FOR
FLUE GAS DESULPHURISATION (FGD) SYSTEM**

Summary of Critical Equipment indicated under clause 4.26, sub-section-IA, Part-A of Section-VI.

Equipment Name	Sub-Vendor Name	Collaborator's Name, if applicable	Seeking Qualification as per clause..... Sub-Section-I, Part-A of Section-VI
*Slurry Recirculation Pumps			*4.26.1 /*4.26.2 /*4.26.6
Oxidation Blowers			*4.26.1 /*4.26.2 /*4.26.3
Slurry Pumps			*4.26.1/*4.26.2
Agitators			*4.26.1 /*4.26.2 /*4.26.5

1. If qualification sought as per clause 4.26.1 then the details of the sub vendor (manufacturer) shall be filled by the bidder in the format A to F.
2. If the qualification sought as per the clause 4.26.2, then the details of JV/Subsidiary Company formed for manufacturing of such equipments in India shall be furnished individually for each equipment by the bidder such as,
 - i) Copy of document of incorporation of JV/Subsidiary company in India
 - ii) Copy of collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such equipment in India with the collaborator or technology licensor who meets the requirement stipulated at 3.1.
 - iii) Copy of document of at least 26% equity participation of qualified equipment manufacturer in the Indian JV company/subsidiary company directly or indirectly through its holding company /Subsidiary company, which shall be maintained for a lock -in period of seven (7) years from the date of incorporation of such JV/subsidiary or up to the end of defect liability period of the contract which ever is later.

Further, the details of collaborator or technology licensor or technology provider of the qualified equipment manufacturer who meets the requirement stipulated at 4.26.1, sub-section-IA, Part-A of Section-VI shall be filled by the Bidder in the format A to F (format given at 1.00.00). In addition to that, the sub vendor along with the Indian JV company/subsidiary company, qualified equipment manufacturer and its holding company/subsidiary company as applicable shall furnish the LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER .

Signature of authorized signatory.....

* strike out whichever is not applicable.

1.00.00 (Applicable for Bidder/his sub vendors seeking qualification as per clause no. 4.26.1, Sub section-IA, Part-A of Section-VI. Bidder shall furnish the required data only for those equipments / auxiliaries which are proposed to be sourced under this route.)

We, hereby furnish the data on proveness criteria for critical equipment, auxiliaries, systems and Bought Out Items such as Slurry Recirculation Pumps, Oxidation Blowers, Wet Limestone Grinding Mills, Slurry Pumps, & Agitators which have been designed (either by self manufacturer or under Collaboration/Licencing Agreement), *manufactured/ *got manufactured and supplied by us /Manufacturer (or manufactured/ got manufactured & supplied by our proposed sub-vendors) and these are in successful operation in at least one (1) plant for a period not less than one year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder. The details of type and minimum equipment rating of such equipment are given below:

A. Slurry Recirculation Pumps: We declare that, we/our Sub-Vendor, have manufactured and supplied at least one (1) number of Slurry Recirculation Pumps of minimum 80% of the flow & 100% of the head of the offered Slurry Recirculation Pump, Centrifugal type working in a Wet Limestone based FGD application in Coal fired power plant and which has been in successful operation for minimum one (1) year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder, as per the details furnished below:

Sl. No.	Description	Reference Work
1.	Name of the reference plant & location:	
2.	Client name and his address:	
3.	No. of units and capacity in MW of unit:	
4.	Whether operating in a Wet Limestone based FGD application in Coal fired power plant	- *Yes/*No
5.	Name of equipment manufacturer & address:	
6.	Date of commission of the equipments:	
7.	Model no. of the equipment:	
8.	Brief Technical particulars of the equipments:	

Signature of authorized signatory.....

Sl. No.	Description	Reference Work
9.	Flow-	m ³ /h
10.	Head-	meters of liquid column
11.	Whether the equipment(s) are in successful operation in atleast one (01) plant for a period not less than one(01) year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder	- *Yes/*No
12.	Flue gas Desulphurization system details:	*Technical extract/ *paper letter/ *email/ *Drwaing from user or *contract document or *scheme or *any document in public domain enclosed at annexure.....to Attachment-3K
13.	Scope of Work:	*Letter of Award or *Contract or *P.O. enclosed at Annexure.....to Attachment-3K
14.	Performance details:	*Certificate/*Letter/*E- mail from End user enclosed at Annexure.....to Attachment-3K

*** Strike off whichever is not applicable.**

Signature of authorized signatory.....

- B. Oxidation Blowers:** We declare that, we/our Sub-Vendor, have manufactured and supplied at least one (1) number of Oxidation Blower of minimum 80% of the flow & 100% of the head of the offered Oxidation Blower, Centrifugal/positive displacement type working in FGD application in Coal fired power plant and which has been in successful operation for minimum one (1) year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder, as per the details furnished below:

Sl. No.	Description	Reference Work
1.	Name of the reference plant & location:	
2.	Client name and his address:	
3.	No. of units and capacity in MW of unit:	
4.	Whether power plant is coal fired	-*Yes/*No
5.	Whether operating in a Wet Limestone based FGD application in Coal fired power plant	-*Yes/*No
6.	Name of equipment manufacturer & address:	
7.	Date of commission of the equipments:	
8.	Model no. of the equipment:	
9.	Brief Technical particulars of the equipments:	
10.	Flow-	Nm ³ /h
11.	Head-	 mmWC
12.	Whether the equipment(s) are in successful operation in atleast one (01) plant for a period not less than one (01) year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder	-*Yes/*No
13.	Flue gas Desulphurization system details:	*Technical extract/ *paper letter/ *email/ *Drawing from user or *contract document or *scheme or *any ocument in public domain enclosed at annexure.....to Attachment-3K

Signature of authorized signatory.....

14. Scope of Work:

*Letter of Award or
*Contract or *P.O.
enclosed at Annexure.....to
Attachment-3K

15. Performance details:

*Certificate/*Letter/*E-mail
from End user enclosed at
Annexure.....to Attachment-
3K

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*** Strike off whichever is not applicable.**

Signature of authorized signatory.....

- C. D. Slurry Pumps:** We declare that, we/our Sub-Vendor, have manufactured and supplied at least one (1) number of Slurry Pump of minimum 80% of the flow & 100% of the head of the offered Slurry Pump(s), Centrifugal type working in Wet Limestone based FGD application or ash slurry application in coal fired power plant and which has been in successful operation for minimum one (1) year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder, as per the details furnished below:

Sl. No.	Description	Reference Work
1.	Name of the reference plant & location:	
2.	Client name and his address:	
3.	No. of units and capacity in MW of unit:	
4.	Whether operating in a Wet Limestone based FGD application or similar process/duty application	-*Yes/*No
5.	Whether operating in a similar process/duty application	-*Yes/*No....(indicate industry type)
6.	Name of equipment manufacturer & address:	
7.	Date of commission of the equipments:	
8.	Model no. of the equipment:	
9.	Brief Technical particulars of the equipments:	
10.	Flow-	m ³ /h
11.	Head- liquid column	 meters of
12.	Whether the equipment(s) are in successful operation in atleast one(01) plant for a period not less than one(01) year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder	-*Yes/*No
13.	Flue gas Desulphurization system details:	*Technical extract/ *paper letter/ *email/*Drawing from user or *contract document or *scheme or *any document in public domain enclosed at annexure....to Attachment-3K

Signature of authorized signatory.....

Sl. No.	Description	Reference Work
14.	Scope of Work:	*Letter of Award or *Contract or *P.O. enclosed at Annexure.....to Attachment-3K
15.	Performance details:	*Certificate/*Letter/*E- mail from End user enclosed at Annexure.....to Attachment-3K

*** Strike off whichever is not applicable.**

Signature of authorized signatory.....

- E. Agitators:** We declare that, we/our Sub-Vendor, have manufactured and supplied at least one (1) number of Agitators with rating not less than that supplied for 500 MW or higher size unit for similar application, Vertical/Horizontal type working in Wet Limestone based FGD application in Coal fired power plant and which has been in successful operation for minimum one(1) year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder, as per the details furnished below::

Sl. No.	Description	Reference Work
1.	Name of the reference plant & location:	
2.	Client name and his address:	
3.	No. of units and capacity in MW of unit:	
4.	Whether power plant is coal fired	-*Yes/*No
5.	Whether operating in a Wet Limestone based FGD application in coal fired power plant	-*Yes/*No
6.	Name of equipment manufacturer & address:	
7.	Date of commission of the equipments:	
8.	Model no. of the equipment:	
9.	Brief Technical particulars of the equipments:	
10.	Agitators supplied for	MW unit size
11.	Whether the equipment(s) are in successful operation in atleast one(01) plant for a period not less than one(01) year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder	-*Yes/*No
12.	Flue gas Desulphurization system details:	*Technical extract/ *paper letter/ *email/ *Drawing from user or *contract document or *scheme or *any document in public domain enclosed at annexure.....to Attachment-3K
13.	Scope of Work:	*Letter of Award or *Contract or *P.O. enclosed at Annexure.....to Attachment-3K
14.	Performance details:	*Certificate/*Letter/*E-mail from End user enclosed at Annexure.....to Attachment-3K

*** Strike off whichever is not applicable.**

Signature of authorized signatory.....

F.

***2.00.00 Applicable for JV Company/Subsidiary Company meeting provenness criteria as per clause no. 4.26.2, Sub section-IA, Part-A of Section-VI.**

2.01.00 We, hereby confirm that JV company/ Subsidiary company (Strike off whichever is not applicable) formed for manufacturing and supply of equipment(s) (*Slurry Recirculation Pumps, *Oxidation Blowers, * *Slurry Pumps, *Agitators) has a valid collaboration or licensing agreement for design, engineering, manufacturing of such equipment(s) in India with a qualified equipment manufacturer who meets the requirements stipulated at clause 4.26.1 of sub-section-IA, Part-A, Section VI of bidding documents (or the technology provider of the qualified equipment manufacturer). Further, in such a case, such qualified equipment manufacturers is having, directly or indirectly through its holding company/subsidiary company, at least 26% equity participation in the Indian Joint Venture Company/subsidiary company, which shall be maintained for a lock-in period of seven (7) years from the date of incorporation of such Joint Venture / Subsidiary or up to the end of defect liability period of the contract, whichever is later. Further, JV / Subsidiary Company (Strike off whichever is not applicable) before resorting to design, engineering, manufacturing of such proven equipment(s) (*Slurry Recirculation Pumps, *Oxidation Blowers, *, *Slurry Pumps, *Agitators) by himself should *have sourced /*shall source such proven equipment(s) (*Slurry Recirculation Pumps, *Oxidation Blowers, *Wet , *Slurry Pumps, *Agitators) for at least the first 800 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment(s) (*Slurry Recirculation Pumps, *Oxidation Blowers, *Slurry Pumps,*Agitators), the *we/ *our sub vendor(s) *will create /*have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system.

In addition, the Bidder along with the Indian *Joint Venture Company/ *Subsidiary Company, qualified equipment manufacturers and its holding/ subsidiary Company, as applicable, shall furnish LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER in which executant of the LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed.

***3.00.00 Applicable for Bidder/his sub vendors seeking provenness criteria as per clause no. 4.26.3, Sub section-I, Part-A of Section-VI.**

3.01.00 We, hereby confirm that *we/*our sub-vendors is a manufacturer of Blowers/compressors for minimum 50 NM³/min capacity. (Details of references enclosed at Annexure)

(Data to be furnished in line with format given at 1.00.00 of this Attachment))

3.02.00 We further confirm that details in respect of collaboration / valid licencing agreement for the Oxidation Blower between *us/*our sub-vendors, as per 3.01.00 above, and with qualified Oxidation Blower manufacturer, who meets the requirement

Signature of authorized signatory.....

stipulated at clause **4.26.1**, sub-section-IA, Part-A, Section-VI are enclosed as per **Annexure.....** to this Attachment. The data in respect of proveneness criteria for the qualified Oxidation Blower manufacturer, which are in successful operation in at least one (1) plant for a period not less than one reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder are furnished below. We further confirm that we/ our sub vendor(s) have created manufacturing and testing facilities at our/ their works as per collaborator's/ Licensor's design, manufacturing & quality control system for the Oxidation Blowers.

Further, *we/*our sub-vendors before resorting to design, engineering, manufacturing of Oxidation Blower by itself *have sourced /*shall source Oxidation Blower for at least the first 800 MW unit completely from such qualified manufacturer who meets the requirement stipulated at clause **4.26.1**, sub-section-IA, Part-A, Section-VI. We further confirm that we/ our sub vendor(s) for subsequent units before taking up the manufacturing of such Oxidation Blower *we/ *our sub vendor(s) *will create /*have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system.

In addition, the Bidder along with the Indian *Joint Venture Company/ *Subsidiary Company, qualified equipment manufacturers and its holding/ subsidiary Company, as applicable, shall furnish LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER in which executant of the LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed.

(Data to be furnished in line with format given at 1.00.00 of this Attachment)

***4.00.00**

***5.00.00 Applicable for Bidder/his sub vendors seeking proveneness criteria as per clause no. 4.26.5, Sub section-IA, Part-A of Section-VI.**

5.01.00 We, hereby confirm that *we/*our sub-vendors is a manufacturer of a manufacturer of Agitators for similar process/duty application in petrochemical or metals and mining industry. (Details of references enclosed at Annexure)

(Data to be furnished in line with format given at 1.00.00 of this Attachment))

5.02.00 We further confirm that details in respect of collaboration / valid licencing agreement for the Agitator between *us/*our sub-vendors, as per 5.01.00 above, and with qualified Agitator manufacturer, who meets the requirement stipulated at clause **4.26.1**, sub-section-IA, Part-A, Section-VI are enclosed as per **Annexure-.....** to this Attachment. The data in respect of proveneness criteria for the qualified Agitator manufacturer, which is in successful operation in at least one (1) plant for a period not less than one reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder are furnished below.

(Data to be furnished in line with format given at 1.00.00 of this Attachment)

Signature of authorized signatory.....

Further, *we/*our sub-vendors before resorting to design, engineering, manufacturing of Agitator by itself *have sourced /*shall source Oxidation Blower for at least the first 800 MW unit completely from such qualified manufacturer who meets the requirement stipulated at clause **4.26.1**, sub-section-IA, Part-A, Section-VI. We further confirm that we/ our sub vendor(s) for subsequent units before taking up the manufacturing of such Agitator, *we/ *our sub vendor(s) *will create /*have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system.

In addition, the Bidder along with our sub-vendors, as per 5.01.00 above (if applicable) and the qualified Agitator manufacturer and its holding/ subsidiary Company, as applicable, shall furnish LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER in which executant of the LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed.

***6.00.00 Applicable for Bidder/his sub vendors seeking provenness criteria as per clause no. 4.26.6, Sub section-IA, Part-A of Section-VI.**

6.01.00 We, hereby confirm that *we/*our sub-vendors is a manufacturer of a manufacturer of Slurry Pumps who meets the requirements stipulated at clause 4.26.1 (d), sub-section-IA, Part-A, Section-VI.
(Details of references enclosed at Annexure)

(Data to be furnished in line with format given at 1.00.00 of this Attachment)

6.02.00 We further confirm that details in respect of collaboration / valid licencing agreement for the Slurry Recirculation Pumps, between *us/*our sub-vendors, as per 6.01.00 above, and with qualified Slurry Recirculation Pump manufacturer, who meets the requirement stipulated at clause **4.26.1**, sub-section-I, Part-A, Section-VI are enclosed as per **Annexure-.....** to this Attachment. The data in respect of provenness criteria for the qualified Slurry Recirculation Pump manufacturer, which is in successful operation in at least one (1) plant for a period not less than one reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder are furnished below.

(Data to be furnished in line with format given at 1.00.00 of this Attachment)

Further, *we/*our sub-vendors before resorting to design, engineering, manufacturing of Slurry Recirculation Pumps by itself *have sourced /*shall source Oxidation Blower for at least the first 800 MW unit completely from such qualified manufacturer who meets the requirement stipulated at clause **4.26.1**, sub-section-IA, Part-A, Section-VI. We further confirm that we/ our sub vendor(s) for subsequent units before taking up the manufacturing of such Slurry Recirculation Pumps, *we/ *our sub vendor(s) *will create /*have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system.

In addition, the Bidder along with our sub-vendors, as per 6.01.00 above (if applicable) and the qualified Slurry Recirculation Pumps manufacturer and its holding/ subsidiary Company, as applicable, shall furnish LETTER OF SUPPORT

Signature of authorized signatory.....

FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER in which
executant of the LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR
/ TECHNOLOGY PROVIDER shall be jointly and severally liable for the successful
performance of the equipment as per the format enclosed.

Signature of authorized signatory.....

**FORM OF LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR /
TECHNOLOGY PROVIDER TO BE PROVIDED
FOR(NAME OF EQUIPMENT)
AS PER CLAUSE 4.26.2 OF SUB-SECTION-I-A, PART A, SECTION VI**

(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER TO BE EXECUTED BY THE BIDDER/CONTRACTOR, *INDIAN JOINT VENTURE COMPANY/*SUBSIDIARY COMPANY MEETING THE REQUIREMENTS SPECIFIED AT CLAUSE NO. 4.26.2 OF SUB-SECTION-I-A, PART A, SECTION VI ALONGWITH QUALIFIED EQUIPMENT MANUFACTURER OF..... (NAME OF EQUIPMENT) MEETING THE REQUIREMENTS AS PER CLAUSE 4.26.1 OF SUB-SECTION-I-A, PART A, SECTION VI AND ITS *HOLDING/*SUBSIDIARY COMPANY, AS APPLICABLE FOR SUCCESSFUL PERFORMANCE OF (NAME OF EQUIPMENT), IN WHICH EXECUTANT OF THE LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER ARE JOINTLY AND SEVERALLY LIABLE FOR THE SUCCESSFUL PERFORMANCE OF THE.....(NAME OF EQUIPMENT)

The DEED OF UNDERTAKING executed this day of Two thousand by M/s a Company incorporated under having its Registered Office at (hereinafter called the "Bidder/Contractor", which expression shall include its successors, administrators, executors and permitted assigns) AND

****M/s, a (Name of Equipment) Supplier/Manufacturer as per the requirement of Item 4.26.2 of sub-section-IA, Part-A, Section-VI, incorporated under having its Registered Office at (hereinafter called the "*Indian JV/*Subsidiary Company)", which expression shall include its successors, administrators, executors and permitted assigns) AND**

M/s a Company registered under the having its Registered Office at (hereinafter called the "Qualified Equipment Manufacturer", which expression shall include its successors, administrators, executors and permitted assigns) AND

*M/s a Company registered under the having its Registered Office at (hereinafter called the "*Holding/*Subsidiary Company of Qualified Equipment Manufacturer", which expression shall include its successors, administrators, executors and permitted assigns),

in favour of, having its Registered Office at SCCL, Kothagudem Collieries,Bhadrari Kothagudaem Dt, Telangana-507101 INDIA("Employer" which expression shall include its successors, administrators, executors and assigns).

WHEREAS, the Employer invited Bids for design, engineering, manufacture, supply, transportation to site, construction, installation, testing, commissioning and conductance of guarantee tests for the **EPC Package for Singareni TPP-II(1x800MW)**(hereinafter referred to as "Plant") vide its Bidding Document No. .

AND WHEREAS vide clause 4.26.2 of Sub-Section-I-A, Part A, Section VI of bidding documents, it has been specified that a JV / Subsidiary Company formed for manufacturing and

Signature of authorized signatory.....

supply of equipment(s) in India as listed at clause no. 4.26.1 of Sub-Section-I-A, Part A, Section VI can also manufacture such equipments, provided that it has a valid collaboration or licensing agreement for design, engineering, manufacturing of such equipment(s) in India with a qualified equipment manufacturer who meets the requirements stipulated at clause 4.26.1 of Sub-Section-I-A, Part-A, Section-VI of bidding documents (or the technology provider of the qualified equipment manufacturer). Further, in such a case, such qualified equipment manufacturers should have, directly or indirectly through its holding company/ subsidiary company, atleast 26% equity participation in the Indian Joint Venture Company/ Subsidiary Company, which shall be maintained for a lock-in period of seven (7) years from the date of incorporation of such Joint Venture/ Subsidiary or upto the end of defect liability period of the contract, whichever is later. Further, the JV / Subsidiary Company before resorting to design, engineering, manufacturing of such proven equipment(s) listed at clause no. 4.26.1 of Sub-Section-IA, Part-A, Section-VI of bidding documents by himself should have sourced / shall source such proven equipment(s) for at least the first 800 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment(s), the bidder/ his sub-vendor(s) must create /have created manufacturing facilities at his works as per collaborator's/ licensor's design, manufacturing and quality control system for such equipment(s) In addition, the Bidder/Contractor along with the Indian Joint Venture Company/ Subsidiary Company, qualified equipment manufacturers and its holding/ subsidiary Company, as applicable, shall furnish LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER for each equipment in which executant of the LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER shall be jointly and severally liable for the successful performance of the equipment.

WHEREAS M/s (Bidder/Contractor) has submitted its proposal in response to the aforesaid Invitation for Bid by the Employer bearing No. dated for **EPC Package** for its **Singareni TPP-II(1x800MW)**(hereinafter referred to as "Plant") against the Employer's Bidding Document No. .

AND WHEREAS M/s (*Indian JV/*Subsidiary Company) has been formed for manufacturing and supply of equipment(s) as listed at clause no. 4.26.1 of Sub-Section-IA, Part A, Section-VI who has a valid collaboration or licensing agreement for design, engineering, manufacturing of(Name Of Equipment) in India with M/s who meets the requirements stipulated at clause 4.26.1 of Sub-Section-IA, Part A, Section-VI of bidding documents (or the technology provider of the qualified equipment manufacturer).

AND WHEREAS M/s (Qualified Equipment Manufacturer) is having, *directly *or *indirectly through its *holding company M/s...../ *subsidiary company M/s....., atleast 26% equity participation in the Indian *Joint Venture Company/ *Subsidiary Company, which shall be maintained for a lock-in period of seven (7) years from the date of incorporation of such Joint Venture Company/ Subsidiary Company or upto the end of defect liability period of the contract, whichever is later.

The Bidder/Contractor along with the Indian Joint Venture Company/Subsidiary Company, Qualified Equipment Manufacturers and its Holding / Subsidiary Company, as applicable, are required to jointly execute and furnish at the time of placement of order on the approved Joint Venture Company/ Subsidiary Company of (Name of equipment), an irrevocable Letter of support from Collaborator(s) / Licensor / Technology Provider and be jointly and severally responsible and bound unto the Employer for successful performance of the (Name of Equipment) for **Singareni TPP-II(1x800MW)**, fully meeting

Signature of authorized signatory.....

the stipulated technical requirements, guaranteed parameters and characteristics as per the Bidding Documents, in the event the bid is accepted by the Employer resulting into a Contract.

NOW THEREFORE, THIS DEED WITNESSETH AS UNDER:

1. We the Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer and Indian *JV/*Subsidiary Company and the Bidder/Contractor, do hereby declare and undertake that we shall be jointly and severally responsible to the Employer for the successful performance of the (Name of Equipment).
2. In case of any breach of the Contract committed by the Indian *JV/*Subsidiary Company, we the Bidder/Contractor and Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer do hereby undertake, declare and confirm that we shall be fully responsible for the successful performance of the (Name of Equipment) and undertake to carryout all the obligations and responsibilities under this Letter of support from Collaborator(s) / Licensor / Technology Provider in order to discharge the Indian *JV/*Subsidiary Company's obligations stipulated under the Contract. Further, if the Employer sustains any loss or damage on account of any breach of the Contract for the (Name of Equipment), we the Bidder/Contractor and Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer jointly and severally undertake to promptly indemnify and pay such loss/damages caused to the Employer on its written demand without any demur, reservation, Contest or protest in any manner whatsoever. This is without prejudice to any rights of the Employer against the Contractor/ his Sub-Vendor under the Contract and/or guarantees. It shall not be necessary or obligatory for the Employer to first proceed against the Indian *JV/*Subsidiary Company / **Bidder/Contractor before proceeding against the Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer nor any extension of time or any relaxation given by the Employer to the Indian *JV/*Subsidiary Company / **Bidder/Contractor shall prejudice any rights of the Employer under this Letter of support from Collaborator(s) / Licensor / Technology Provider to proceed against the Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer. The liability of the contractor, his sub-vendor and the associate/collaborator shall be limited to an amount equal to 100% of the value of the contract** between the contractor and the sub supplier for the equipments/systems.
3. Without prejudice to the generality of the Undertaking in paragraph 1 above, the manner of achieving the objective set forth in paragraph 1 above shall be as follows:
 - (a) We the Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of the Qualified Equipment Manufacturer shall ensure that complete design, manufacturing, quality assurance and installation of the (Name of Equipment) is carried out inline with our manufacturing & quality drawings and procedures and shall be fully responsible for its compliance so as to ensure satisfactory, reliable, safe and trouble free performance of (Name of Equipment).

Signature of authorized signatory.....

Further, we, the Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer shall extend our quality surveillance/ supervision/ quality control to the Contractor during manufacture, erection, commissioning and performance testing, both at Indian *JV/*Subsidiary Company's works and/ or at Employer's project site.

Further, the Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer shall depute their technical experts from time to time to the Indian *JV/*Subsidiary Company works/ Employer's project site as required by the Employer and agreed to by Indian *JV/*Subsidiary Company to facilitate the successful performance of the (Name of Equipment) as stipulated in the aforesaid Contract.

Further, the Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer shall ensure proper design, manufacture, installation, testing and successful performance of the (Name of Equipment) under the said Contract in accordance with stipulations of Bidding Documents and if necessary, the Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer shall advise the Indian *JV/*Subsidiary Company suitable modifications of design and implement necessary corrective measures to discharge the obligations under the contract.

- (b) In the event Indian *JV/*Subsidiary Company/**Contractor fail to demonstrate that the (Name of Equipment) meets the guaranteed parameters and demonstration parameters as specified in the contract, the Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer shall promptly carry out all the corrective measures related to engineering services at their own expense and shall promptly provide corrected design to the Employer.
 - (c) Implementation of the corrected design and all other necessary repairs, replacements, rectification or modifications to the (Name of Equipment) and payment of financial liabilities and penalties and fulfillment of all other contractual obligations as provided under the contract shall be the joint and severally responsibility of the **Contractor and Indian *JV/*Subsidiary Company and Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer.
4. We, the **Bidder/Contractor and Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer and Indian *JV/*Subsidiary Company do hereby undertake and confirm that this Undertaking shall be irrevocable and shall not be revoked till ninety (90) days after the end of the defect liability period of the equipment covered under the Contract and further stipulate that the Undertaking herein contained shall terminate after ninety (90) days of satisfactory completion of such defect liability period. In case of delay in completion of defect liability period, the validity of this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be extended by such period of delay. We further agree that this Undertaking shall be without any prejudice to the various liabilities of the Contractor including Contract Performance Security as well as other obligations of the Contractor in terms of the Contract.

Signature of authorized signatory.....

5. The **Bidder/Contractor and Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer and Indian *JV/*Subsidiary Company will be fully responsible for the quality of all the equipment/main assemblies/components manufactured at their works or at their Vendors' works or constructed at site, and their repair or replacement, if necessary, for incorporation in the Plant and timely delivery thereof to meet the completion schedule under the Contract.
6. In case of Award, in addition to the Contract Performance Security for the Contract, the Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer and Indian *JV/*Subsidiary Company shall each furnish 'as security' an on demand Performance Bank Guarantee in favour of the Employer as per provisions of the bidding documents. The value of such Bank Guarantee shall be equal to **INR 1.5 Million (Indian Rupees One and Half Million)** and it shall be guarantee towards the faithful performance /compliance of this Letter of support from Collaborator(s) / Licensor / Technology Provider in accordance with the terms and conditions specified herein. The bank guarantee shall be unconditional, irrevocable and valid till ninety (90) days beyond the end of defect liability period of the last equipment covered under the Contract. In case of delay in completion of the defect liability period, the validity of this Bank Guarantee shall be extended by the period of such delay. The guarantee amount shall be promptly paid to the Employer on demand without any demur, reservation, protest or contest.
7. Any dispute that may arise in connection with this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be settled as per arbitration procedure/rules mentioned in the Contract Documents. This Letter of support from Collaborator(s) / Licensor / Technology Provider shall be construed and interpreted in accordance with the Laws of India and the Courts of Delhi shall have exclusive jurisdiction.
8. We, the Bidder/Contractor and Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer and Indian *JV/*Subsidiary Company agree that this Undertaking shall form an integral part of the Contracts from the date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider . We further agree that this Letter of support from Collaborator(s) / Licensor / Technology Provider shall continue to be enforceable till its validity.
9. That this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be operative from the effective date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider .

IN WITNESS WHEREOF, the Bidder/Contractor and Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer and *Indian Joint Venture Company/ *Subsidiary Company Vendor through their authorised representatives, have executed these presents and affixed common seal of their respective companies, on the day, month and year first mentioned above.

1. WITNESS For M/s
(Bidder/Contractor)

..... (Signature of the Authorised

Signature of authorized signatory.....

(Signature Name)

Representative)

.....
(Official Address)

Name

Designation

Common Seal of the
Company

1.

WITNESS

For M/s
(Indian *JV/*Subsidiary Company)

.....
(Signature Name)

(Signature of the Authorised
Representative)

.....
(Official Address)

Name.....

Designation

Common Seal of the
Company

1.

WITNESS

For M/s
(Qualified Equipment Manufacturer)

.....
(Signature Name)

(Signature of the Authorised
Representative)

.....
(Official Address)

Name.....

Designation

Common Seal of the
Company

1.

WITNESS

*For M/s
(*Holding/*Subsidiary Company of
Qualified Equipment Manufacturer)

.....
(Signature Name)

(Signature of the Authorised
Representative)

.....
(Official Address)

Name.....

Designation

Signature of authorized signatory.....

Common Seal of the
Company

Note : Power of Attorney of the persons signing the said Letter of support from Collaborator(s) / Licensor / Technology Provider is to be furnished.

* Contractor/Sub-Vendor shall strike out, whichever is not applicable.

** Copy of priced purchase order for the equipment shall be furnished by Bidder.

**FORM OF LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR /
TECHNOLOGY PROVIDER TO BE PROVIDED
FOR(NAME OF EQUIPMENT)
AS PER CLAUSE *4.26.3/*4.26.4/*4.26.5/*4.26.6 OF SUB-SECTION-I-A, PART A, SECTION
VI**

(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

**LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY
PROVIDER TO BE EXECUTED BY THE BIDDER/CONTRACTOR, QUALIFIED INDIAN
MANUFACTURING COMPANY MEETING THE REQUIREMENTS SPECIFIED AT CLAUSE
NO. *4.26.3/*4.26.4/*4.26.5/*4.26.6 OF SUB-SECTION-I-A, PART A, SECTION VI
ALONGWITH QUALIFIED EQUIPMENT MANUFACTURER OF.....
(NAME OF EQUIPMENT) MEETING THE REQUIREMENTS AS PER CLAUSE 4.26.1 OF
SUB-SECTION-I-A, PART A, SECTION VI FOR SUCCESSFUL PERFORMANCE OF
..... (NAME OF EQUIPMENT), IN WHICH EXECUTANT OF THE
LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY
PROVIDER ARE JOINTLY AND SEVERALLY LIABLE FOR THE SUCCESSFUL
PERFORMANCE OF THE.....(NAME OF EQUIPMENT)**

The DEED OF UNDERTAKING executed this day of Two thousand
.....by M/s a Company incorporated under having its
Registered Office at (hereinafter called the "Bidder/Contractor", which
expression shall include its successors, administrators, executors and permitted assigns) AND

**M/s, a (Name of Equipment)
Manufacturer as per the requirement of Item *4.26.3/*4.26.4/*4.26.5/*4.26.6 of sub-section-IA,
Part-A, Section-VI, incorporated under having its Registered
Office at (hereinafter called the "Qualified Indian Manufacturing
Company"), which expression shall include its successors, administrators, executors and
permitted assigns) AND

M/s a Company registered under the having its
Registered Office at (hereinafter called the "Qualified Equipment
Manufacturer", which expression shall include its successors, administrators, executors and
permitted assigns) AND

in favour of, having its Registered Office at SCCL, Kothagudem
Collieries, Bhadrari Kothagudaem Dt, Telangana-507101 INDIA("Employer" which expression
shall include its successors, administrators, executors and assigns).

Signature of authorized signatory.....

WHEREAS, the Employer invited Bids for design, engineering, manufacture, supply, transportation to site, construction, installation, testing, commissioning and conductance of guarantee tests for the **EPC Package** for **Singareni TPP-II(1x800MW)**(hereinafter referred to as "Plant") vide its Bidding Document No. .

AND WHEREAS vide clause *4.26.3/*4.26.4/*4.26.5/*4.26.6 of Sub-Section-I-A, Part A, Section VI of bidding documents, it has been specified that a Qualified Indian Manufacturing Company can also manufacture equipment(s) listed at clause no. 4.26.1 of Sub-Section-I-A, Part A, Section VI for which it is qualified, provided that it has a valid collaboration or licensing agreement for design, engineering, manufacturing of such equipment(s) in India with a qualified equipment manufacturer who meets the requirements stipulated at clause 4.26.1 of Sub-Section-I-A, Part-A, Section-VI of bidding documents. Further, the Qualified Indian Manufacturing Company before resorting to design, engineering, manufacturing of such proven equipment(s) listed at clause no. 4.26.1 of Sub-Section-IA, Part-A, Section-VI of bidding documents by himself should have sourced / shall source such proven equipment(s) for at least the first 800 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment(s), the bidder/ his sub-vendor(s) must create /have created manufacturing facilities at his works as per collaborator's/ licensor's design, manufacturing and quality control system for such equipment(s) In addition, the Bidder/Contractor along with the Qualified Indian Manufacturing Company, qualified equipment manufacturers shall furnish LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER for each equipment in which executant of the LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER shall be jointly and severally liable for the successful performance of the equipment.

WHEREAS M/s (Bidder/Contractor) has submitted its proposal in response to the aforesaid Invitation for Bid by the Employer bearing No. dated for **EPC Package** for its **Singareni TPP-II(1x800MW)**(hereinafter referred to as "Plant") against the Employer's Bidding Document No. .

AND WHEREAS M/s (Qualified Indian Manufacturing Company) meets the requirement of clause *4.26.3/*4.26.4/*4.26.5/*4.26.6 of sub-section-IA, Part-A, Section-VI and has a valid collaboration or licensing agreement for design, engineering, manufacturing, supply of(Name Of Equipment) in India with M/s who meets the requirements stipulated at clause 4.26.1 of Sub-Section-IA, Part A, Section-VI of bidding documents.

AND WHEREAS M/s (Qualified Equipment Manufacturer) meets the requirements of clause 4.26.1 of sub-section-IA, Part-A, Section-VI for(Name Of Equipment).

The Bidder/Contractor along with the *Qualified Indian Manufacturing Company , Qualified Equipment Manufacturers, are required to jointly execute and furnish at the time of placement of order for..... (Name of equipment), an irrevocable Letter of support from Collaborator(s) / Licensor / Technology Provider and be jointly and severally responsible and bound unto the Employer for successful performance of the (Name of Equipment) for **Singareni TPP-II(1x800MW)**, fully meeting the stipulated technical requirements, guaranteed parameters and characteristics as per the Bidding Documents, in the event the bid is accepted by the Employer resulting into a Contract.

NOW THEREFORE, THIS DEED WITNESSETH AS UNDER:

Signature of authorized signatory.....

1. We the Qualified Equipment Manufacturer and the Qualified Indian Manufacturing Company and the Bidder/Contractor, do hereby declare and undertake that we shall be jointly and severally responsible to the Employer for the successful performance of the (Name of Equipment).
2. In case of any breach of the Contract committed by the Qualified Indian Manufacturing Company, we the Bidder/Contractor and Qualified Equipment Manufacturer do hereby undertake, declare and confirm that we shall be fully responsible for the successful performance of the (Name of Equipment) and undertake to carry out all the obligations and responsibilities under this Letter of support from Collaborator(s) / Licensor / Technology Provider in order to discharge the Qualified Indian Manufacturing Company obligations stipulated under the Contract. Further, if the Employer sustains any loss or damage on account of any breach of the Contract for the (Name of Equipment), we the Bidder/Contractor and Qualified Equipment Manufacturer jointly and severally undertake to promptly indemnify and pay such loss/damages caused to the Employer on its written demand without any demur, reservation, Contest or protest in any manner whatsoever. This is without prejudice to any rights of the Employer against the Contractor/ his Sub-Vendor under the Contract and/or guarantees. It shall not be necessary or obligatory for the Employer to first proceed against the Indian Qualified Indian Manufacturing Company / Bidder/Contractor before proceeding against the Qualified Equipment Manufacturer nor any extension of time or any relaxation given by the Employer to the Qualified Indian Manufacturing Company / **Bidder/Contractor shall prejudice any rights of the Employer under this Letter of support from Collaborator(s) / Licensor / Technology Provider to proceed against the Qualified Equipment Manufacturer. The liability of the contractor, his sub-vendor and the associate/collaborator shall be limited to an amount equal to 100% of the value of the contract** between the contractor and the sub supplier for the equipments/systems.
3. Without prejudice to the generality of the Undertaking in paragraph 1 above, the manner of achieving the objective set forth in paragraph 1 above shall be as follows:
 - (a) We the Qualified Equipment Manufacturer shall ensure that complete design, manufacturing, quality assurance and installation of the (Name of Equipment) is carried out inline with our manufacturing & quality drawings and procedures and shall be fully responsible for its compliance so as to ensure satisfactory, reliable, safe and trouble free performance of (Name of Equipment).

Further, we, the Qualified Equipment Manufacturer shall extend our quality surveillance/ supervision/ quality control to the Contractor during manufacture, erection, commissioning and performance testing, both at Qualified Indian Manufacturing Company's works and/ or at Employer's project site.

Further, the Qualified Equipment Manufacturer shall depute their technical experts from time to time to the Qualified Indian Manufacturing Company's works/ Employer's project site as required by the Employer and agreed to by Qualified Indian Manufacturing Company to facilitate the successful performance of the (Name of Equipment) as stipulated in the aforesaid Contract.

Signature of authorized signatory.....

Further, the Qualified Equipment Manufacturer shall ensure proper design, manufacture, installation, testing and successful performance of the (Name of Equipment) under the said Contract in accordance with stipulations of Bidding Documents and if necessary, the Qualified Equipment Manufacturer shall advise the Qualified Indian Manufacturing Company suitable modifications of design and implement necessary corrective measures to discharge the obligations under the contract.

- (b) In the event Indian Qualified Indian Manufacturing Company /Contractor fail to demonstrate that the (Name of Equipment) meets the guaranteed parameters and demonstration parameters as specified in the contract, the Qualified Equipment Manufacturer shall promptly carry out all the corrective measures related to engineering services at their own expense and shall promptly provide corrected design to the Employer.
 - (c) Implementation of the corrected design and all other necessary repairs, replacements, rectification or modifications to the (Name of Equipment) and payment of financial liabilities and penalties and fulfillment of all other contractual obligations as provided under the contract shall be the joint and severally responsibility of the Contractor and Qualified Indian Manufacturing Company and Qualified Equipment Manufacturer.
4. We, the Bidder/Contractorand Qualified Equipment Manufacturer and the Qualified Indian Manufacturing Company do hereby undertake and confirm that this Undertaking shall be irrevocable and shall not be revoked till ninety (90) days after the end of the defect liability period of the equipment covered under the Contract and further stipulate that the Undertaking herein contained shall terminate after ninety (90) days of satisfactory completion of such defect liability period. In case of delay in completion of defect liability period, the validity of this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be extended by such period of delay. We further agree that this Undertaking shall be without any prejudice to the various liabilities of the Contractor including Contract Performance Security as well as other obligations of the Contractor in terms of the Contract.
5. The Bidder/Contractorand Qualified Equipment Manufacturer will be fully responsible for the quality of all the equipment/main assemblies/components manufactured at their works or at their Vendors' works or constructed at site, and their repair or replacement, if necessary, for incorporation in the Plant and timely delivery thereof to meet the completion schedule under the Contract.
6. In case of Award, in addition to the Contract Performance Security for the Contract, the Qualified Equipment Manufacturer shall furnish 'as security' an on demand Performance Bank Guarantee in favour of the Employer as per provisions of the bidding documents. The value of such Bank Guarantee shall be equal to **INR 1.5 Million (Indian Rupees One and Half Million)** and it shall be guarantee towards the faithful performance /compliance of this Letter of support from Collaborator(s) / Licensor / Technology Provider in accordance with the terms and conditions specified herein. The bank guarantee shall be unconditional, irrevocable and valid till ninety (90) days beyond the end of defect liability period of the last equipment covered under the Contract. In case of delay in completion of the defect liability period, the validity of this Bank Guarantee shall be extended by the period of such delay. The guarantee amount shall be promptly paid to the Employer on demand without any demur, reservation, protest or contest.

Signature of authorized signatory.....

7. Any dispute that may arise in connection with this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be settled as per arbitration procedure/rules mentioned in the Contract Documents. This Letter of support from Collaborator(s) / Licensor / Technology Provider shall be construed and interpreted in accordance with the Laws of India and the Courts of Delhi shall have exclusive jurisdiction.
8. We, the Bidder/Contractor and Qualified Equipment Manufacturer and the Qualified Indian Manufacturing Company shall form an integral part of the Contracts from the date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider . We further agree that this Letter of support from Collaborator(s) / Licensor / Technology Provider shall continue to be enforceable till its validity.
9. That this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be operative from the effective date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider .

IN WITNESS WHEREOF, the Bidder/Contractor and Qualified Equipment Manufacturer and the Qualified Indian Manufacturing Company through their authorised representatives, have executed these presents and affixed common seal of their respective companies, on the day, month and year first mentioned above.

1.	WITNESS	For M/s
		(Bidder/Contractor)
	 (Signature Name)	(Signature of the Authorised Representative)
	 (Official Address)	Name
		Designation
		Common Seal of the Company
1.	WITNESS	For M/s
		(Qualified Indian Manufacturing Company)
	 (Signature Name)	(Signature of the Authorised Representative)
	 (Official Address)	Name.....
		Designation

Signature of authorized signatory.....

Common Seal of the
Company

1. WITNESS

For M/s
(Qualified Equipment Manufacturer)

.....
(Signature Name) (Signature of the Authorised
Representative)

.....
(Official Address) Name.....

Designation

Common Seal of the
Company

Note : Power of Attorney of the persons signing the said Letter of support from Collaborator(s) /
Licensor / Technology Provider is to be furnished.

* Contractor/Sub-Vendor shall strike out, whichever is not applicable.

** Copy of priced purchase order for the equipment shall be furnished by Bidder.

SINGARENI TPP STAGE-I (1X800 MW), EPC PACKAGE
BIDDING DOCUMENT NO. CW-CM-11159-C-O-M-001

(Experience Details - Applicable to all the Bidders)

Bidder's Name and Address :

To
SCCL
Kothagudem 507101

Details of Provenness for the offered Steam Turbine as per Clause No. 1.0, Sub-Section-I-A,
Part-A, Section-VI of Bidding Documents.

S.No.	Item Description	Plant Name	Module No.	Operating Steam para- meters i.e. Initial Pre- ssure, Initial Temperature & Reheat Steam Temperature	Date of Comm- encement of Successful Operation

1. Provenness of
HP Turbine
Module

Signature of authorized signatory.....

2. Provenness of
IP Turbine
Module
3. Provenness of
Combined HP
and IP Turbine
Module
(if applicable)
4. Provenness of LP
Turbine(s) Module

(Bidder to furnish details of reference turbine module as per Annexure-I to this attachment)

Certified that the offered Steam Turbine Set shall be built up using above proven HP, IP and LP turbine modules of M/s..... (Name of Steam Turbine Manufacturer). The Turbine to be supplied under this contract shall be manufactured assembled and tested at (Name of the Factory) where turbine of atleast 500 MW rating have been manufactured in past/the Indian manufacturing company under supervision of (Qualified Steam Turbine Manufacturer).

Certificate(s) from Owner that the aforesaid Steam Turbine Modules are in successful operation for atleast one (1) year prior to the date of Techno-Commercial bid opening and caused no serious problem in past, are furnished alongwith techno-commercial Bid at **Annexure 1 to this Attachment-3K**.

Date	:	(Signature).....
Place	:	(Printed Name).....
		(Designation).....
		(Common Seal).....

Signature of authorized signatory.....

ANNEXURE-I TO ATTACHMENT-3K

Details of Module of the reference Turbine

S.No.	Item Description	Reference module	Offered module
HP Turbine			
1	Type of steam admission (Full arc/ partial arc)		
2	Number of steam admission points		
3	Number of exhausts		
4	Bearing span		
5	Outer casing barrel or not		
6	Steam flow direction (single flow/double flow/opposed flow)		
7	Minimum/Maximum inner casing diameter		
8	Minimum/Maximum outer casing diameter		
IP Turbine			
1	Type of steam admission (Full arc/ partial arc)		
2	Number of steam admission points		
3	Number of exhausts		
4	Bearing span		
5	Steam flow direction (single flow /double flow)		
6	Minimum/Maximum inner casing diameter		

Signature of authorized signatory.....

S.No.	Item Description	Reference module	Offered module

7	Minimum/Maximum outer casing diameter		

LP Turbine

1	Bearing span		
2	Steam flow direction (single flow /double flow)		
3	Exhaust area provided / maximum possible		

Signature of authorized signatory.....

**SINGARENI TPP STAGE-I (1X800 MW), EPC PACKAGE
BIDDING DOCUMENT NO. CW-CM-11159-C-O-M-001
(Experience Details - Applicable to all the Bidders)**

Bidder's Name and Address :

To
SCCL
Kothagudem 507101

Summary of Critical Equipment indicated under clause 3.0 & 4.0, sub-section-I-A, Part-A of Section-VI

Equipment Name	Sub-Vendor Name	Collaborator's Name, if applicable	Seeking Qualification as per clause..... Sub-Section-IA, Part-A of Section-VI
Name of equipment	Name of proposed Sub-Vendor	Name of Proven	Clause (i.e. 3.1 equipment manufacturer. (If the proposed sub-vendor himself does not meet the provenness criteria) or 3.2 or 3.3 of sub-section-IA Section-VI, Part-A) under which Qualification of sub-vendor is sought
Condenser	Sub-vendor- 1		3.1* /3.2* /3.3*
	Sub-vendor- 2		3.1* /3.2* /3.3*
	Sub-vendor- 3		3.1* /3.2* /3.3*
	Sub-vendor- 4		3.1* /3.2* /3.3*
Condensate Extraction Pumps (CEP)	Sub-vendor- 1		3.1* /3.2* /3.3*
	Sub-vendor- 2		3.1* /3.2* /3.3*
	Sub-vendor- 3		3.1* /3.2* /3.3*
	Sub-vendor- 4		3.1* /3.2* /3.3*
Condenser Air	Sub-vendor- 1		3.1* /3.2* /3.3*
	Sub-vendor- 2		3.1* /3.2* /3.3*
Evacuation Pump	Sub-vendor- 3		3.1* /3.2* /3.3*
	Sub-vendor- 4		3.1* /3.2* /3.3*

Signature of authorized signatory.....

Name of equipment	Name of proposed Sub-Vendor	Name of Proven equipment manufacturer. (If the proposed sub-vendor himself does not meet the provenness criteria)	Clause (i.e. 3.1 or 3.2 or 3.3 of sub-section-IA Section-VI, Part-A) under which Qualification of sub-vendor is sought
Feed Water	Sub-vendor- 1		3.1* /3.2* /3.3*
Low	Sub-vendor- 2		3.1* /3.2* /3.3*
Pressure	Sub-vendor- 3		3.1* /3.2* /3.3*
Heaters	Sub-vendor- 4		3.1* /3.2* /3.3*
Feed water	Sub-vendor- 1		3.1* /3.2* /3.3*
High	Sub-vendor- 2		3.1* /3.2* /3.3*
Pressure	Sub-vendor- 3		3.1* /3.2* /3.3*
Heaters	Sub-vendor- 4		3.1* /3.2* /3.3*
Deaerator	Sub-vendor- 1		3.1* /3.2* /3.3*
	Sub-vendor- 2		3.1* /3.2* /3.3*
	Sub-vendor- 3		3.1* /3.2* /3.3*
	Sub-vendor- 4		3.1* /3.2* /3.3*
Boiler Feed	Sub-vendor- 1		3.1* /3.2* /3.3*
Pumps	Sub-vendor- 2		3.1* /3.2* /3.3*
(BFP)	Sub-vendor- 3		3.1* /3.2* /3.3*
	Sub-vendor- 4		3.1* /3.2* /3.3*
HP Bypass	Sub-vendor- 1		3.1* /3.2* /3.3*
system	Sub-vendor- 2		3.1* /3.2* /3.3*
	Sub-vendor- 3		3.1* /3.2* /3.3*
	Sub-vendor- 4		3.1* /3.2* /3.3*
LP Bypass	Sub-vendor- 1		3.1* /3.2* /3.3*
system	Sub-vendor- 2		3.1* /3.2* /3.3*
	Sub-vendor- 3		3.1* /3.2* /3.3*
	Sub-vendor- 4		3.1* /3.2* /3.3*

1. If qualification sought as per clause 3.1 then the details of the Bidder / Sub-vendor (manufacturer) shall be filled by the bidder in the format A to F.
2. If the qualification sought as per the clause 3.2, then the details of Bidder / proposed Sub- vendor (i.e manufacturer of such equipments for at least 500MW unit rating) shall be filled individually for each equipment by the bidder in the format A to F and the details of collaborator or technology licensor who meets the requirement stipulated at 3.1 shall also be filled by the bidder in the format A to F separately. Further, in case of qualification vide clause 3.2 a copy of collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such equipment in India with the collaborator or technology licensor who meets the requirement stipulated at 3.1, sub-section-IA, Part-A, Section-VI of Bidding Document shall also be furnished.

Signature of authorized signatory.....

3. If the qualification sought as per the clause 3.3, then the details of JV/Subsidiary Company formed for manufacturing of such equipments in India shall be furnished individually for each equipment by the bidder such as,

- i) Copy of document of incorporation of JV/Subsidiary company in India
- ii) Copy of collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such equipment in India with the collaborator or technology licensor who meets the requirement stipulated at 3.1.
- iii) Copy of document of at least 26% equity participation of qualified equipment manufacturer in the Indian JV company/subsidiary company directly or indirectly through its holding company /Subsidiary company, which shall be maintained for a lock -in period of seven (7) years from the date of incorporation of such JV/subsidiary or up to the end of defect liability period of the contract which ever is later.

Further, the details of collaborator or technology licensor or technology provider of the qualified equipment manufacturer who meets the requirement stipulated at 3.1, sub-section-IA, Part-A, Section-VI of Bidding Document shall be filled by the Bidder in the format A to F (format given at 1.00.00).

*** strike out whichever is not applicable.**

Signature of authorized signatory.....

**SINGARENI TPP STAGE-I (1X800 MW), EPC PACKAGE
BIDDING DOCUMENT NO. CW-CM-11159-C-O-M-001**

Bidder's Name and Address :

To
SCCL
Kothagudem 507101

S. No.	Item Description	Installation-1
1.00.00	Details of manufacturer of equipment for units of atleast 500 MW rating as per clause 3.2 of Sub-Section-I-A, Section-VI, Part-A.	
1.01.01	Name and Address of Sub-Vendor	
1.01.02	Name and Address telephone No. & Fax No. of responsible persons of the Sub-Vendor	
1.01.03	Name of the equipment to be supplied by the Sub-Vendor	
1.02.00	Details of Reference Plant	
1.02.01	Name of the Station and its Location	
1.02.02	Client Name and its Address, Fax No. & Tel.Nos.	
1.02.03	Name and Designation of the responsible person in Client's Organisation	
1.02.04	Contract No. & Date	
1.02.05	Capacity in MW of Unit and no. of Units	
1.02.06	Starting Date of Work/ Date of Order	

Signature of authorized signatory.....

S. No.	Item Description	Installation-1
1.02.07	Scheduled Date of Completion	
1.02.08	Actual Date of Completion	
1.02.09	Date of Commissioning of System/Package	
	Whether the system/equipments are in successful operation prior to the date of techno-commercial bid opening	Yes/No
1.02.10	Date of Commencement of Successful Operation	
1.02.11	Brief Scope of Work	
1.02.12	M/s (Name of the Sub-vendor) is a regular manufacturer of (Name of the equipment) for units of atleast 500 MW rating	Yes/No
1.02.13	Certificate from such Owner that aforesaid equipment has been supplied by the sub-vendor and is running satisfactorily prior to the date of techno-commercial bid opening is enclosed to this Attachment at Annexure.....	Yes/No
1.02.14	The proposed sub-vendor M/s. has a collaboration/valid licensing agreement for design, engineering, manufacturing, supply of (Name of the equipment) in India with M/s (Name of Collaborator) who meets the requirement at clause no. 3.1 of sub-section-IA, Part-A, Section-VI & the relevant details are furnished at relevant Attachment (as applicable)	Yes/No
	Also the copy of Collaboration/Licensing agreement is enclosed to this Attachment at Annexure.....	Yes/No

Signature of authorized signatory.....

S. No.	Item Description	Installation-1
2.00.00	Details of Subsidiary/JV Company proposed for manufacturing of critical equipment as per Clause 3.3 of Sub-section-1A, Section-VI, Part-A	
2.01.00	Name and Address with Telephone Number of the Indian Subsidiary / JV Company proposed for manufacturing of (Name of the equipment).	
2.02.00	Name and Address with Telephone No. of the promoter(s) of the Subsidiary/ JV Company	
2.03.00	% of the Equity held by the promoter(s)	
2.04.00	Equity lock in period (from the date of incorporation of JV/Subsidiary Company)	
2.05.00	Name and Address with Telephone No. of a promoter of Subsidiary / JV Company formed at 2.01.00 above who meets the requirement of Clause 3.1 Sub-section-I-A, Section-VI, Part-A (Please furnish experience details as per relevant Attachment 3K)	
2.06.00	M/s. (the subsidiary/ JV Company) has a collaboration or valid licensing agreement with M/s (subsidiary/JV promotor) for design, Engineering, Manufacturing& Supply of (Name of the equipment) in India. Also the copy of Collaboration/Licensing agreement is enclosed to this Attachment at Annexure.....	Yes/No

Signature of authorized signatory.....

S. No.	Item Description	Installation-1
2.07.00	If equity held by the Qualified Equipment Manufacturer (as per clause 3.1)	
2.08.00	Whether equity held directly or indirectly ?	
2.09.00	If indirectly then furnish the relationship tree alongwith all relevant subsidiaries and holding company	
2.10.00	Please furnish the committment for lock in period as per requirement	
2.11.00	Bidder to furnish documentary evidence in support of above data	

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common Seal).....

Signature of authorized signatory.....

SINGARENI TPP STAGE-I (1X800 MW), EPC PACKAGE
(Experience List of Bidder - Applicable to all the Bidders)

Bidder's Name and Address :

Dept

To
Corp Material Procurement

SCCL
Kothagudem 507101

3.00.00 Details of manufacturer of proven equipments.

S. No.	Item Description	Station-I

A. CONDENSER

1.00.00	Name, Address & Telephone No. of the manufacturer
1.01.00	Name of the Station and its Location
1.02.00	Client Name and its Address, Fax No. & Tel. Nos.
1.03.00	Name and Designation of the responsible person in Client's Organisation
1.03.00	Contract No. & Date
1.04.00	Capacity in MW of Unit and no. of Units
1.05.00	Starting Date of Work/ Date of Order
1.06.00	Scheduled Date of Completion
1.07.00	Actual Date of Completion
1.08.00	Date of Commissioning of System/Package

Signature of authorized signatory.....

S. No.	Item Description	Station-I
1.09.00	Whether the System/Equipments are in Successful Operation for a minimum period of one (1) year	Yes/No
1.10.00	Date of Commencement of Successful Operation	
1.11.00	Brief Scope of Work	
1.12.00	Brief Technical Particulars of the System/Package/Equipments :	
	(i) Designed by	
	(ii) Manufactured by	
	(iii) Type :Water cooled surface condenser or any other type &nos per TG Units	
	(iv) Design Standard and Nos of passes	
	(v) Rated Heat Load (G Kal/hr.)	
	(vi) Design CW Inlet temp. (deg.c)	
	(vii) CW flow (cu.m/hr)	
	(viii) Condenser Pressure [mm of Hg(a)]	
	(ix) Overall Heat Transfer Coefficient (Kcal/hrsq.m. deg.C)	
	(x) Surface Area (sq.m.)	
	(xi) Tube Material	
	(xii) Make	
	(xiii) Type of condenser support	
	(xiv) Condenser water box preesure	

Signature of authorized signatory.....

S. No.	Item Description	Station-I
1.13.00	Is these condenser(s) are running with steam turbine generator sets	Yes/No
B.	CONDENSATE EXTRACTION PUMP	
1.00.00	Name Address and Telephone No. of the manufacturer	
1.01.00	Name of the Station and its Location	
1.02.00	Client Name and its Address, Fax No. & Tel. Nos.	
1.03.00	Name and Designation of the responsible person in Client's Organisation	
1.04.00	Contract No. & Date	
1.05.00	Capacity in MW of Unit and no. of Units	
1.06.00	Starting Date of Work/Date or Order	
1.07.00	Scheduled Date of Completion	
1.08.00	Actual Date of Completion	
1.09.00	Date of Commissioning of System/Package	
1.10.00	Whether the System/Equipments are in successful operation for a minimum period of one (1) year	Yes/No

Signature of authorized signatory.....

S. No.	Item Description	Station-I
1.11.00	Date of Commencement of Successful Operation	
1.12.00	Brief Scope of Work	
1.13.00	Brief Technical Particulars of the System/Package/Equipments :	
	(i) Designed by	
	(ii) Manufactured by	
	(iii) Make / Model No.	
	(iv) Rated Flow (T/hr)	
	(v) Rated Head (kg/cm ² (abs)	
	(vi) Rated Speed (rpm)	
	(vii) KW Rating of Motor	
	(viii) No. CEP(s) per Unit	
	(ix) Pump Efficiency	
	(x) Type	
	- Vertical/Horizontal	
	- Cannister with double suction first stage impeller	
	(xi) Whether drip pumps are used in Turbine cycle ?	Yes/No
1.14.00	Are these CEPs running with Steam Turbine Generator Sets	Yes/No

Signature of authorized signatory.....

S. No.	Item Description	Station-I
C.	FEED WATER HEATERS (LOW PRESSURE HEATERS HIGH PRESSURE HEATERS AND DEAERATOR)	
	1. H.P Heaters	
1.00.00	Name, Address and Telephone No. of the manufacturer	
1.01.00	Name of the Station and its Location	
1.02.00	Client Name and its Address, Fax No. & Tel. Nos.	
1.03.00	Name and Designation of the responsible person in Client's Organisation	
1.04.00	Contract No. & Date	
1.05.00	Capacity in MW of Unit and No. of Units	
1.06.00	Starting Date of Work/Date of Order	
1.07.00	Scheduled Date of Completion	
1.08.00	Actual Date of Completion	
1.09.00	Date of Commissioning of System/Package	
1.10.00	Whether the System/Equip- ments are in Successful Operation for a minimum period of one (1) year	Yes/No
1.11.00	Date of Commencement of Successful Operation	

Signature of authorized signatory.....

S. No.	Item Description	Station-I
1.12.00	Brief Scope of Work	
1.13.00	Brief Technical Particulars of the System/Package/Equipments :	
	(i) Designed by	
	(ii) Manufactured by	
	(iii) No. of HP Heaters	
	(iv) Type of HP Heaters	
	(a) Horizontal/Vertical	
	(b) U-Tube/Straight Tube/ Spiral, etc.	
	(c) Tube Material	
	(d) Type of Tubes (Seamless/Welded)	
	(e) Whether Integral Desuperheating, Condensing and Drain Cooling Zones are provided	(Yes/No)
	(f) Whether 50% or 100% HP Heaters	
	(v) Rated Feed Water Flow for each string (T/hr) (Indicate for each HP heater)	
	(vi) Tube Side Design and Operating Pressure (ata)	
	(vii) Make	
1.14.00	Whether the heaters are operating for Steam Turbine Generator Sets	Yes/No

Signature of authorized signatory.....

S. No.	Item Description	Station-I
2.	L.P. Heaters	
1.00.00	Name, Address & Telephone No. of manufacturer	
1.01.00	Name of the Station and its Location	
1.02.00	Client Name and its Address, Fax No. & Tel. Nos.	
1.03.00	Name and Designation of the responsible person in Client's Organisation	
1.04.00	Contract No. & Date	
1.05.00	Capacity in MW of Unit and No. of Units	
1.06.00	Starting Date of Work/Date of Order	
1.07.00	Scheduled Date of Completion	
1.08.00	Actual Date of Completion	
1.09.00	Date of Commissioning of System/Package	
1.10.00	Whether the System/Equipments are in Successful Operation for a minimum period of one (1) year	Yes/No
1.11.00	Date of Commencement of Successful Operation	
1.12.00	Brief Scope of Work	
1.13.00	Brief Technical Particulars of the System/Package/Equipments :	
	(i) Designed by	
	(ii) Manufactured by	

Signature of authorized signatory.....

S. No.	Item Description	Station-I
	(iii) No. of LP Heaters	
	(iv) Type of LP Heaters	
	(a) Horizontal/Vertical	
	(b) U-Tube / Straight Tube/ Spiral etc.	
	(c) Tube Material	
	(d) Type of Tubes (Seamless/Welded)	
	(e) Whether Condensing and Drain Cooling Zones are provided	(Yes/No)
	(v) Rated Feed Water Flow (T/hr) (Indicate for each heater)	
	(vi) Tube Side Design and Operating Pressure (ata)	
	(vii) Make	
1.14.00	Are these LP Heaters running with Steam Turbine Generator Sets	Yes/No
3. DEAERATORS		
1.00.00	Name, Address and Telephone Number of manufacturer	
1.01.00	Name of the Station and its Location	
1.02.00	Client Name and its Address, Fax No. & Tel. Nos.	
1.03.00	Name and Designation of the responsible person in Client's Organisation	

Signature of authorized signatory.....

S. No.	Item Description	Station-I
1.04.00	Contract No. & Date	
1.05.00	Capacity in MW of Unit and no. of Units	
1.06.00	Starting Date of Work/Date of Order	
1.07.00	Scheduled Date of Completion	
1.08.00	Actual Date of Completion	
1.09.00	Date of Commissioning of System/Package	
1.10.00	Whether the System/Equipments are in Successful Operation for a minimum period of one (1) year	Yes/No
1.11.00	Date of Commencement of Successful Operation	
1.12.00	Brief Scope of Work	
1.13.00	Brief Technical Particulars of the System/Package/Equipments	
	(i) Designed by	
	(ii) Manufactured by	
	(iii) Type of Deaerator	
	(a) Whether Direct Contact Type	Yes/No
	(b) Horizontal/Vertical	
	(iv) Spray Type/Spray cum Tray Type	
	(v) Oxygen Level at Deaerator Outlet (cc/litre)	
	(vi) Feed Water Flow from Deaerator (T/hr)	

Signature of authorized signatory.....

S. No.	Item Description	Station-I
	(vii) Storage Capacity (Cu.m.)	
	(viii) Design Pressure [Kg/sq.cm(g)]	
	(ix) Make	
1.14.00	Is this Deaerator running with Steam Turbine Generator Sets	Yes/No
D.	BOILER FEED PUMPS	
1.00.00	Name, Address and Telephone No. of manufacturer	
1.01.00	Name of the Station and its Location	
1.02.00	Client Name and its Address, Fax No. & Tel. Nos.	
1.03.00	Name and Designation of the responsible person in Client's Organisation	
1.04.00	Contract No. & Date	
1.05.00	Capacity in MW of Unit and No. of Units	
1.06.00	Starting Date of Work/ Date of Order	
1.07.00	Scheduled Date of Completion	
1.08.00	Actual Date of Completion	
1.09.00	Date of Commissioning of System/Package	
1.10.00	Whether the System/Equipments are in Successful Operation for a minimum period of one (1) year	Yes/No
1.11.00	Date of Commencement of Successful Operation	

Signature of authorized signatory.....

S. No.	Item Description	Station-I
1.12.00	Brief Scope of Work	
1.13.00	Brief Technical Particulars of the System/Package/Equipments	
	(i) Designed by	
	(ii) Manufactured by	
	(iii) Make / Model No.	
	(iv) No. of TDBFPs/MDBFP per TG Unit	
	(v) Rated Flow per Pump (T/hr)	
	(vi) Rated TDH kg/cm ² (abs)	
	(vii) Speed (rpm)	
	(viii) KW Rating of Motor	
	(ix) Pump Efficiency	
	(x) Head Developed per stage	
	(xi) Type	
	- Horizontal	
	- Centrifugal	
	- Multistage	
	- Outer casing barrel type with end rotor removal	
1.14.00	Are the BFPs running with supercritical Steam Turbine Generator Sets	Yes/No

Signature of authorized signatory.....

S. No.	Item Description	Station-I
E.	HP-LP BYPASS SYSTEM	
	1. HP Bypass System	
1.01.00	Name, Address and Telephone No. of manufacturer	
1.02.00	Name of the Station and its Location	
1.03.00	Client Name and its Address, Fax No. & Tel. Nos.	
1.04.00	Name and Designation of the responsible person in Client's Organisation	
1.05.00	Contract No. & Date	
1.06.00	Capacity in MW of Unit and No. of Units	
1.07.00	Starting Date of Work/Date of Order	
1.08.00	Scheduled Date of Completion	
1.09.00	Actual Date of Completion	
1.10.00	Date of Commissioning of System/Package	
1.11.00	Whether the System/Equipments are in Successful Operation for a minimum period of one (1) year	Yes/No
1.12.00	Date of Commencement of Successful Operation	
1.13.00	Brief Scope of Work	
1.14.00	Brief Technical Particulars of the System/Package/Equipments	
	(i) Designed by	
	(ii) Manufactured by	

Signature of authorized signatory.....

S. No.	Item Description	Station-I
	(iii) BMCR of Boiler (T/hr)	
	(iv) No. of Valves per Unit	
	(v) Type/Size	
	(vi) Rated Steam Flow through each HP Bypass Valve (T/hr)	
	(vii) Rated Steam Parameters	
	(a) Steam Pressure at Inlet/Outlet [Kg/sq.cm. (g)]	
	(b) Steam Inlet/Outlet Temp. (deg.C)	
	(viii) Design Spray Water Flow (T/hr)	
	(ix) Spray Water Press/Temp. (ata/deg.)	
	(x) Type of Actuator	
	(xi) Control System designed by and manufactured by	
	(xii) Location of Valves	
	(xiii) Make / Model No.	
1.15.00	Is this HP Bypass system running with Supercritical Steam Turbine Generator Sets	Yes/No
	2. LP Bypass System	
1.01.00	Name, Address, Telephone Number of manufacturer	
1.02.00	Name of the Station and its Location	
1.03.00	Client Name and its Address, Fax No. & Tel. Nos.	

Signature of authorized signatory.....

S. No.	Item Description	Station-I
1.04.00	Name and Designation of the responsible person in Client's Organisation	
1.05.00	Contract No. & Date	
1.06.00	Capacity in MW of Unit and No. of Units	
1.07.00	Starting Date of Work/Date of Order	
1.08.00	Scheduled Date of Completion	
1.09.00	Actual Date of Completion	
1.10.00	Date of Commissioning of System/Package	
1.11.00	Whether the System/Equipments are in Successful Operation for a minimum period of one (1) year	Yes/No
1.12.00	Date of Commencement of Successful Operation	
1.13.00	Brief Scope of Work	
1.14.00	Brief Technical Particulars of the System/Package/Equipments	
	(i) Designed by	
	(ii) Manufactured by	
	(iii) No. of Valves per Unit	
	(iv) Type/Size	
	(v) Rated Steam Flow through each LP Bypass Valve (T/hr)	

Signature of authorized signatory.....

S. No.	Item Description	Station-I
	(vi) Rated Steam Parameters	
	(a) Steam Pressure at Inlet/Outlet [Kg/sq.cm. (g)]	
	(b) Steam Inlet/Outlet Temp. (deg.C)	
	(vii) Design Spray Water Flow (T/hr)	
	(viii) Spray Water Press/Temp. (ata/deg.)	
	(ix) Type of Actuator	
	(x) Control System designed by and manufactured by	
	(xi) Whether actuation is by Governing Oil System or not	
	(xii) Make / Model No.	
1.15.00	Is this LP Bypass system running with Steam Turbine Generator Sets	Yes/No
F.	CONDENSER AIR EVACUATION PUMPS	
1.01.00	Name, Address, Telephone No. of manufacturer	
1.02.00	Name of the Station and its Location	
1.03.00	Client Name and its Address, Fax No. & Tel.Nos.	
1.04.00	Name and Designation of the responsible person in Client's Organisation	

Signature of authorized signatory.....

S. No.	Item Description	Station-I
1.05.00	Contract No. & Date	
1.06.00	Capacity in MW of Unit and No. of Units	
1.07.00	Starting Date of Work/ Date of Order	
1.08.00	Scheduled Date of Completion	
1.09.00	Actual Date of Completion	
1.10.00	Date of Commissioning of System/Package	
1.11.00	Whether the System/Equipments are in Successful Operation for a minimum period of one (1) year	Yes/No
1.12.00	Date of Commencement of Successful Operation	
1.13.00	Brief Scope of Work	
1.14.00	Brief Technical Particulars of the System/Package/Equipments :	
	(i) Designed by	
	(ii) Manufactured by	
	(iii) Type (Liquid Ring Type or any other type)	
	(iv) Make / Model No.	
	(v) Number per T.G. Unit	
	(vi) Rated free Dry Air Capacity in SCFM [at 25.4 mm Hg (abs) Suction Pressure at 21.1°C] of each Pump	

Signature of authorized signatory.....

S. No.	Item Description	Station-I
	(vii) Hogging Capacity of each Pump (at 254mm Hg (abs) Suction Pressure in SCFM	
	(viii) I.T.D. (deg.C)	
	(ix) Temp. of Cooling Water to Vacuum Pump Heat Exchanger (deg.C)	
	(x) Type of Heat Exchanger (Shell & Tube Type/Plate Type)	
	(xi) No. of Stages	
	(xii) Whether Air Ejector is provided or not	
	(xiii) Impeller Material	
	(xiv) Casing Material	
1.15.00	Are these Condenser Air Evacuation Pumps running with Steam Turbine Generator Sets	Yes/No
G.	TURBINE HALL EOT CRANES	
1.00.00	Name, Address and Telephone No. of manufacturer	
1.01.00	Name of the station and its location	
1.01.01	Client name and its address Fax No. & Tel. No.	

Signature of authorized signatory.....

S. No.	Item Description	Station-I
1.01.02	Name and Designation of the responsible person in client's organisation	
1.01.03	Contract No. & Date	
1.01.04	Capacity in MW of Unit and No. of Units	
1.01.05	Starting date of work/Date of work	
1.01.06	Schedule date of completion	
1.01.07	Actual date of completion	
1.01.08	Date of Commissioning of System/Package	
1.01.09	Whether the System/Equipments are in Successful Operation for a minimum period of one (1) year	Yes/No
1.01.10	Date of Commencement of Successful Operation	
1.01.11	Brief Scope of Work	
1.01.12	Brief Technical Particulars of the system/Package/equipment:	
	(i) Designed by	
	(ii) Manufactured by	
	(iii) Erected by	
	(iv) Commissioned by	
	(v) Main hoist capacity (T)	

Signature of authorized signatory.....

S. No.	Item Description	Station-I
(vi)	Aux. hoist capacity (T)	
vii)	Span (m)	
viii)	Make	

*** Bidder to strike out whichever is not applicable**

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common Seal).....

Signature of authorized signatory.....

**H. CONDENSER ON LOAD
TUBE CLEANING SYSTEM (COLTCS)**

(Refer Cl. 4.16, sub-section-IA,, Part-A,
Section-VI of Bid Documents)

1.01.00	Name, Address, Telephone No. manufacturer	
1.02.00	Name of the Station and its Location	
1.03.00	Client Name and its Address, Fax No. &Tel.Nos.	
1.04.00	Name and Designation of the responsible person in Client's Organisation	
1.05.00	Contract No. & Date	
1.06.00	Capacity in MW of Unit and No. of Units	
1.07.00	Starting Date of Work/ Date of Order	
1.08.00	Scheduled Date of Completion	
1.09.00	Actual Date of Completion	
1.10.00	Date of Commissioning of System/Package	
1.11.00	Whether the System/Equipments are in Successful Operation for a minimum period of one (1) year	Yes/No

S. No.	Item Description	Installation-1

1.12.00	Date of Commencement of Successful Operation
1.13.00	Brief Scope of Work

Signature of authorized signatory.....

1.14.00 Brief Technical Particulars of
the System/Package/Equipments :

- (i) Designed by
- (ii) Manufactured by
- (iii) Erected by
- (iv) Commissioned by

- (v) C.W Flow through
Condenser (cum/hr.)
- (vi) No. of Balls per Charge

- (vii) Whether separate system
provided for each Condenser
Half
- (viii) Method of Ball Sorting
- (ix) Ball Collecting Strainer
diameter (mm)
- (x) Make

Signature of authorized signatory.....

S. No.	Item Description	Installation-1

**I. ONLINE BLADE VIBRATION MONITORING
SYSTEM FOR LOW PRESSURE (LP) TURBINES
(IN CASE FREE STANDING BLADES ARE
OFFERED)**

(Refer Cl. 4.18, sub-section-IA,, Part-A,
Section-VI of Bid Documents)

1.01.00	Name, Address, Telephone No. manufacturer
1.02.00	Name of the Station and its Location
1.03.00	Client Name and its Address, Fax No. & Tel. Nos.
1.04.00	Name and Designation of the responsible person in Client's Organisation
1.05.00	Contract No. & Date
1.06.00	a) Capacity in MW of Unit and No. of Units of steam turbine generator set b) Capacity in MW of Gas turbine generator set (In case of combined cycle gas station)
1.07.00	a) Whether system installed in Steam turbine Generator set b) Whether system installed in Compressor/Turbine of Gas Turbine generator set
1.08.00	Starting Date of Work/ Date of Order
1.09.00	Scheduled Date of Completion
1.10.00	Actual Date of Completion
1.11.00	Date of Commissioning of System/Package

Signature of authorized signatory.....

1.12.00	a) Whether the System/Equipments are in Successful Operation for at least 7000 operating hours prior to the LOA Date of EPC Package b) End user certificate for successful operation is attached at Annexure_____	Yes*/No*
1.13.00	Date of Commencement of Successful Operation	
1.14.00	Brief Scope of Work	
1.15.00	Brief Technical Particulars of the System/Package/Equipments :	
	(i) Designed by	
	(ii) Manufactured by	
	(iii) Engineered by	
	(iv) Supplied by	
	(iv) Erected/Installed by	
	(iv) Commissioned by	
	(v) Type of sensor used	
	(vi) Whether VMS is on line	Yes*/No*
	(vii) Whether VMS is integrated	Yes*/No*
	(viii) Whether VMS is for health monitoring Or crack detection	

*** Bidder to strike out whichever is not applicable**

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common Seal).....

Signature of authorized signatory.....

Signature of authorized signatory.....

**LETTER OF SUPPORT FOR SATISFACTORY PERFORMANCE OF
..... (TG & Aux. area related Equipments Name) FOR
SINGARENI TPP STAGE-I (1x800 MW)
EPC PACKAGE**

TO:
[EMPLOYERS NAME & ADDRESS]

Sub: Letter of Support submitted From (name of the Collaborator*/Technology provider*/Licensor*/Qualified equipment manufacturer*) undertaking the responsibility for satisfactory performance of(name of the equipment).

Dear Sirs,

1. In accordance with the Award of the Contract by (Name of the Contractor) to M/s. (Name of the sub-vendor), we the aforesaid Collaborator*/Technology provider*/Licensor*/Qualified equipment manufacturer*, (M/s) shall be fully responsible for the satisfactory performance of the (Equipment name).
2. Further, the manner of achieving the objective set forth in point 1. above shall be as follows:
For (Equipment name):
 - (a) We shall provide design, manufacturing and assembly drawings of..... (Equipment name). (Equipment name) shall be manufactured and supplied as per above design provided by us and the drawings approved by Employer.
 - (b) We shall depute technical experts to Bidder's/sub-vendor's works for supervision during manufacturing, assembly, erection, commissioning and final testing (as and when necessary) of the..... (Equipment name).
 - (c) We shall promptly carry out all the corrective measures and shall promptly provide corrected design and shall undertake replacements, rectifications or modifications to the equipment as required in case the equipment fails to demonstrate successful performance as per contract at site.
 - (d) We shall participate in Technical Co-ordination meetings (TCMs) from time to time, asand when required by the Employer.
3. We, the Collaborator*/Technology provider*/Licensor*/Qualified equipment manufacturer* do hereby undertake and confirm that this Letter of Support shall be valid till the end of the defect liability period of the contract.

Signature of the Authorised Representative:.....
For M/s

(*Collaborator*/Technology provider*/Licensor/ Qualified equipment manufacturer*)

Name
Designation
Date:.....
Common Seal of the Company

*: **Strike off whichever is not applicable.**

Signature of authorized signatory.....

PROVENNESS OF CW PUMPS A) A) Applicable to Bidder/its Sub-vendor seeking qualification as per Clause no. 4.2.1..... of Sub-section-IA, Part-A of Technical Specification

In terms of Clause no. 4.2.1..... of sub-section-IA, Part-A of Technical Specification, we confirm that, we have designed by *our selves / *through our Collaborator / Associate, *manufactured / *got manufactured, supplied, *erected/*supervised erection and *commissioned / *supervised commissioning of at least one (1) no. vertical wet pit pump or one (1) no. concrete volute pump or one (1) no. metallic volute pump with concrete encasement, each of rated capacity 42,000 cum/hr or offered rated capacity whichever is lower, having specific speed in the range of 4000–7000 (**) (US units) which have been in successful operation for at least one (1) year.

We further confirm that reference pumps are of same type i.e..... (*vertical wet pit type pump or *concrete volute type pump or *metallic volute pump with concrete encasement) as is being offered by us. The details in support of above is furnished below:

* Bidder/its Sub-vendor has to mention the option whichever is applicable.

Sl. No.	Description	Reference Installation#1	Reference Installation#2

1. Name of the client

2. Complete Address of Client
with Name of Contract Person(s),
Tel No. & Fax No.

3. Name & Location of Plant

4. Make of the Pumps

5. Rated Capacity of the pump (m³/hr.)

6. Capacity of Pump (m³/hr.)
at Best Efficiency Point (BEP)

7. Head (mwc) at BEP

8. Speed (rpm)

9. Specific Speed (U.S. units) at BEP

10. Type of Pumps supplied/installed in
the reference installation
(*Vertical wet pit pumps/*concrete
volute pumps/*metallic volute pumps
with concrete encasement)

11. Date of Commissioning

Signature of authorized signatory.....

12. No. of years of successful operation
prior to Techno-Commercial bid
opening date

13. Whether the pump is in operation
as on date of Techno-Commercial
bid opening (mention YES or NO
as applicable)

Yes*/No*

Yes*/No*

14. Whether bidder's scope included
(mention YES or NO as applicable)

a Design

b Manufacturing

c Got Manufactured

d Supply

e Erection

f Supervision of Erection

g Commissioning

h Supervision of commissioning

Note : In case bidder's answer is 'No' in any of the above cases, the name of the agency which
carried out the work should be indicated.

15 Documentary evidence/certificate in
support of above is enclosed at
Annexure ____ to this Attachment-3K.

Bidder to mention Annexure no in the
blank space provided in the columns.

**** Specific speed as stipulated above is the specific speed calculated at the best
efficiency point of the pumps as defined in Hydraulic Institute Standards (HIS).**

**Bidder/Sub-vendor to ensure submission of documentary evidences in the form of
copies of letter of award, purchase order, clients performance/completion certificate, etc.
for each contract to establish that they have designed themselves or through their
Collaborator/Associate, manufactured/got manufactured, supplied, erected/supervised
erection & commissioned/supervised commissioning the CW Pumps including the
engineered supporting documents of commissioning dates as mentioned at Sl. No. 11
above etc. in support of the above declarations.**

Signature of authorized signatory.....

Note : If Bidder proposes to supply CW Pumps through its Sub-vendor meeting the requirements at clause **...4.2.1.....**, Sub-Section- IA, Part-A, Section-VI of Bid document, the details of reference plant executed by the Sub-vendor shall be filled in here.

B) I. Applicable to Bidder/its Sub-vendor seeking qualification as per Clause no. 4.2.2..... of Sub-section-IA, Part-A of Technical Specification

In terms of Clause no. 4.2.2..... of sub-section-IA, Part-A of Technical Specification, we confirm that, we have designed by ourself, manufactured/got manufactured, supplied, erected/supervised erection, and commissioned/supervised commissioning of at least one (1) no. vertical wet pit pump or one (1) no. concrete volute pump or one (1) no. metallic volute pump with concrete encasement, each of rated capacity 15,000 cum./hr or more, having a specific speed in the range of 4000–7000 (*) (US units) which have been in successful operation for at least one (1) year.

We further confirm that reference pumps are of same type i.e..... (*vertical wet pit type pump or *concrete volute type pump or *metallic volute pump with concrete encasement) as is being offered by us. The details in support of above is furnished below:

* Bidder/its Sub-vendor has to mention the option whichever is applicable.

Sl. No.	Description	Reference Installation#1	Reference Installation#2

1. Name of the client

2. Complete Address of Client
with Name of Contract Person(s),
Tel No. & Fax No.

3. Name & Location of Plant

4. Make of the Pumps

5. Rated Capacity of the pump (m³/hr.)

6. Capacity of Pump (m³/hr.)
at Best Efficiency Point (BEP)

7. Head (mwc) at BEP

8. Speed (rpm)

9. Specific Speed (U.S. units) at BEP

10. Type of Pumps supplied/installed in
the reference installation
(*Vertical wet pit pumps/*concrete
volute pumps/*metallic volute pumps
with concrete encasement)

Signature of authorized signatory.....

11. Date of Commissioning

12. No. of years of successful operation
prior to Techno-Commercial bid
opening date

13. Whether the pump is in operation
as on date of Techno-Commercial
bid opening (mention YES or NO
as applicable)

Yes*/No*

Yes*/No*

14. Whether bidder's scope included
(mention YES or NO as applicable)

a Design

b Manufacturing

c Got Manufactured

d Supply

e Erection

f Supervision of Erection

g Commissioning

h Supervision of commissioning

Note : In case bidder's answer is 'No' in any of the above cases, the name of the agency which carried out the work should be indicated.

15 Documentary evidence/certificate in
support of above is enclosed at
Annexure ____ to this Attachment-3K.

Bidder to mention Annexure no in the
blank space provided in the columns.

**** Specific speed as stipulated above is the specific speed calculated at the best efficiency point of the pumps as defined in Hydraulic Institute Standards (HIS).**

Bidder/Sub-vendor to ensure submission of documentary evidences in the form of copies of letter of award, purchase order, clients performance/completion certificate, etc. for each contract to establish that they have designed themselves or through their Collaborator/Associate, manufactured/got manufactured, supplied, erected/supervised erection & commissioned/supervised commissioning the CW Pumps including the engineered supporting documents of commissioning dates as mentioned at SI. No. 11 above etc. in support of the above declarations.

Signature of authorized signatory.....

B) II. In terms of Clause no. 4.2.2..... of sub-section-IA, Part-A of Technical Specification, we confirm that, our Associate/Collaborator (M/s.....) have designed by *themselves / *through their Collaborator / Associate, *manufactured / *got manufactured, supplied, *erected/*supervised erection and *commissioned / *supervised commissioning of at least one (1) no. vertical wet pit pump or one (1) no. concrete volute pump or one (1) no. metallic volute pump with concrete encasement, each of rated capacity 42,000 cum/hr or offered rated capacity whichever is lower, having specific speed in the range of 4000–7000 (**) (US units) which have been in successful operation for at least one (1) year.

We further confirm that reference pumps are of same type i.e..... (*vertical wet pit type pump or *concrete volute type pump or *metallic volute pump with concrete encasement) as is being offered by us. The details in support of above is furnished below:

* Bidder/its Sub-vendor has to mention the option whichever is applicable.

Sl.	Description	Reference Installation#1	Reference Installation#2
No.			

1. Name of the client

2. Complete Address of Client
with Name of Contract Person(s),
Tel No. & Fax No.

3. Name & Location of Plant

4. Make of the Pumps

5. Rated Capacity of the pump (m³/hr.)

6. Capacity of Pump (m³/hr.)
at Best Efficiency Point (BEP)

7. Head (mwc) at BEP

8. Speed (rpm)

9. Specific Speed (U.S. units) at BEP

10. Type of Pumps supplied/installed in
the reference installation
(*Vertical wet pit pumps/*concrete
volute pumps/*metallic volute pumps
with concrete encasement)

Signature of authorized signatory.....

11. Date of Commissioning

12. No. of years of successful operation
prior to Techno-Commercial bid
opening date

13. Whether the pump is in operation
as on date of Techno-Commercial
bid opening (mention YES or NO
as applicable)

Yes*/No*

Yes*/No*

14. Whether bidder's scope included
(mention YES or NO as applicable)

a Design

b Manufacturing

c Got Manufactured

d Supply

e Erection

f Supervision of Erection

g Commissioning

h Supervision of commissioning

Note : In case bidder's answer is 'No' in any of the above cases, the name of the agency which
carried out the work should be indicated.

15 Documentary evidence/certificate in
support of above is enclosed at
Annexure ____ to this Attachment-3K.

16 We confirm to submitted the Deed
Of Joint undertaking at the time of placement
Of order on approved sub-vendor
And also furnish an on demand bank
Guarantee for from our/our's Sub-vendor's
Collaborator/associate

**** Specific speed as stipulated above is the specific speed calculated at the best
efficiency point of the pumps as defined in Hydraulic Institute Standards (HIS).**

**Bidder/Sub-vendor to ensure submission of documentary evidences in the form of
copies of letter of award, purchase order, clients performance/completion certificate, etc.
for each contract to establish that they have designed themselves or through their
Collaborator/Associate, manufactured/got manufactured, supplied, erected/supervised**

Signature of authorized signatory.....

erection & commissioned/supervised commissioning the CW Pumps including the engineered supporting documents of commissioning dates as mentioned at Sl. No. 11 above etc. in support of the above declarations.

C) I. Applicable to Bidder/its Sub-vendor seeking qualification as per Clause no.4.2.3 of Sub-section-IA, Part-A of Technical Specification

In terms of Clause no. 4.2.3..... of sub-section-IA, Part-A of Technical Specification, we confirm that, we are a wholly or partially (with minimum 51% holding) held Indian subsidiary of a firm who in turn meets the requirements of clause 4.2.1..... Further, we confirm that we have executed/are executing atleast one (1) Contract involving design, manufacture/got manufactured, supply, erection/supervision of erection, and commissioning/ supervision of commissioning of at least one (1) no. vertical wet pit pump or one (1) no. of concrete volute pump or one (1) no. of metallic volute pump with concrete encasement, each of rated capacity 15,000 cum/hr or more.

We further confirm that reference pumps are of same type i.e..... (*vertical wet pit type pump or *concrete volute type pump or *metallic volute pump with concrete encasement) as is being offered by us. The details in support of above is furnished below:

* Bidder/its Sub-vendor has to mention the option whichever is applicable.

Sl. No.	Description	Reference Installation#1	Reference Installation#2

1. Name of the client

2. Complete Address of Client
with Name of Contract Person(s),
Tel No. & Fax No.

3. Name & Location of Plant

4. Make of the Pumps

5. Rated Capacity of the pump (m³/hr.)

6. Capacity of Pump (m³/hr.)
at Best Efficiency Point (BEP)

7. Head (mwc) at BEP

8. Speed (rpm)

Signature of authorized signatory.....

9. Specific Speed (U.S. units) at BEP

10. Type of Pumps supplied/installed in the reference installation
(*Vertical wet pit pumps/*concrete volute pumps/*metallic volute pumps with concrete encasement)

11. Date of Commissioning

12. No. of years of successful operation prior to Techno-Commercial bid opening date

13. Whether the pump is in operation as on date of Techno-Commercial bid opening (mention YES or NO as applicable)

Yes*/No*

Yes*/No*

14. Whether bidder's scope included (mention YES or NO as applicable)

a Design

b Manufacturing

c Got Manufactured

d Supply

e Erection

f Supervision of Erection

g Commissioning

h Supervision of commissioning

Note : In case bidder's answer is 'No' in any of the above cases, the name of the agency which carried out the work should be indicated.

15 Documentary evidence/certificate in support of above is enclosed at Annexure ____ to this Attachment-3K.

Bidder to mention Annexure no in the blank space provided in the columns.

**** Specific speed as stipulated above is the specific speed calculated at the best efficiency point of the pumps as defined in Hydraulic Institute Standards (HIS).**

Signature of authorized signatory.....

Bidder/Sub-vendor to ensure submission of documentary evidences in the form of copies of letter of award, purchase order, clients performance/completion certificate, etc. for each contract to establish that they have designed themselves or through their Collaborator/Associate, manufactured/got manufactured, supplied, erected/supervised erection & commissioned/supervised commissioning the CW Pumps including the engineered supporting documents of commissioning dates as mentioned at Sl. No. 11 above etc. in support of the above declarations.

C) II. In terms of Clause no. 4.2.3..... of sub-section-IA, Part-A of Technical Specification, we confirm that, our Holding Company (M/s.....) have designed by *themselves / *through their Collaborator / Associate, *manufactured / *got manufactured, supplied, *erected/*supervised erection and *commissioned / *supervised commissioning of at least one (1) no. vertical wet pit pump or one (1) no. concrete volute pump or one (1) no. metallic volute pump with concrete encasement, each of rated capacity 36,000 cum/hr or offered rated capacity whichever is lower, having specific speed in the range of 4000–7000 (**) (US units) which have been in successful operation for at least one (1) year.

We further confirm that reference pumps are of same type i.e..... (*vertical wet pit type pump or *concrete volute type pump or *metallic volute pump with concrete encasement) as is being offered by us. The details in support of above is furnished below:

* Bidder/its Sub-vendor has to mention the option whichever is applicable.

Sl. No.	Description	Reference Installation#1	Reference Installation#2
-----	-----	-----	-----

1. Name of the client

2. Complete Address of Client
with Name of Contract Person(s),
Tel No. & Fax No.

3. Name & Location of Plant

4. Make of the Pumps

5. Rated Capacity of the pump (m³/hr.)

6. Capacity of Pump (m³/hr.)
at Best Efficiency Point (BEP)

7. Head (mwc) at BEP

8. Speed (rpm)

Signature of authorized signatory.....

9. Specific Speed (U.S. units) at BEP

10. Type of Pumps supplied/installed in the reference installation
(*Vertical wet pit pumps/*concrete volute pumps/*metallic volute pumps with concrete encasement)

11. Date of Commissioning

12. No. of years of successful operation prior to Techno-Commercial bid opening date

13. Whether the pump is in operation as on date of Techno-Commercial bid opening (mention YES or NO as applicable)

Yes*/No*

Yes*/No*

14. Whether bidder's scope included (mention YES or NO as applicable)

a Design

b Manufacturing

c Got Manufactured

d Supply

e Erection

f Supervision of Erection

g Commissioning

h Supervision of commissioning

Note : In case bidder's answer is 'No' in any of the above cases, the name of the agency which carried out the work should be indicated.

15 Documentary evidence/certificate in support of above is enclosed at Annexure _____ to this Attachment-3K.

16 We confirm to submitted the Deed Of Joint undertaking at the time of placement Of order on approved sub-vendor And also furnish an on demand bank Guarantee for from our/our's Sub-vendor's Holding Company

Signature of authorized signatory.....

**** Specific speed as stipulated above is the specific speed calculated at the best efficiency point of the pumps as defined in Hydraulic Institute Standards (HIS).**

Bidder/Sub-vendor to ensure submission of documentary evidences in the form of copies of letter of award, purchase order, clients performance/completion certificate, etc. for each contract to establish that they have designed themselves or through their Collaborator/Associate, manufactured/got manufactured, supplied, erected/supervised erection & commissioned/supervised commissioning the CW Pumps including the engineered supporting documents of commissioning dates as mentioned at Sl. No. 11 above etc. in support of the above declarations.

Signature of authorized signatory.....

FORMAT FOR FILLING THE DETAILS OF PROVENNESS

LETTER OF SUPPORT FOR SATISFACTORY PERFORMANCE OF
CW pumps (Name of Equipment/system*) FOR
SINGARENI TPP-II(1X800MW)

TO

[EMPLOYER' S NAME & ADDRESS]

Sub: Letter of Technical Support submitted From (name of the Associate*/Collaborator*/ Technology provider* / Licensor* / Holding Company*) undertaking the responsibility for satisfactory performance of (Name of the equipment/system*).

Dear Sirs,

1. In accordance with the Award of the Contract by (Name of the Contractor) to M/s.

..... (Name of the sub-vendor), we, the aforesaid Associate*/Collaborator*/Technology provider*/Licensor*/Holding Company, (M/s) shall be fully responsible for the satisfactory performance of the (Name of the equipment/system*).

2. Further, the manner of achieving the objective set forth in point 1 above shall be as follows

For (Name of the equipment/system*) :

(a) We shall be fully responsible for design, engineering & commissioning and extending all necessary support for putting in to satisfactory operation and carrying out the Guarantee Tests for (Name of the equipment/system*) to the satisfaction of the Employer.

(b) We shall depute technical experts to Bidder' s/sub-vendor' s works for supervision during manufacturing, assembly, inspection, as and when required by Employer. We shall participate in site erection, commissioning and final testing (as and when necessary) of the (Name of the equipment/system*).

(c) We shall participate in Technical Co-ordination meetings (TCMs) from time to time, as and when required by Employer.

(d) We shall promptly carry out all the corrective measures and shall promptly provide corrected design and shall undertake replacements, rectifications or modifications to the equipment/system* as and when required by Employer in case the equipment/system* fails to demonstrate successful performance as per contract at site.

3. We, the Associate*/Collaborator*/Technology provider*/Licensor*/Holding company* do hereby undertake and confirm that this Letter of Technical Support shall be valid for a period of seven (7) years or up to the end of defect liability period of the contract, whichever is later.

Signature of the Authorised Representative:.....

For M/s

(Associate*/Collaborator*/Technology provider*/Licensor*/Holding company)

Signature of authorized signatory.....

Name

Designation ,

Date:.....

Common Seal of the Company

***: Strike off whichever is not applicable.**

Signature of authorized signatory.....

PROVENNESS OF COOLING TOWER

I. (A)



Details of Induced draught Cooling Towers (as per clause 4.3.1 of Sub-Section-IA, Part-A, Section-VI of Bidding Documents)

In support of Sub-Qualifying Requirements of Clause 4.3.1 of Sub-Section-IA, Part-A, Section-VI of Bidding Document, we confirm that We/our Sub-vendor have designed by itself, constructed and commissioned at least one (01) number Induced Draught Cooling Tower in RCC or Pultruded Fiberglass Reinforced Plastic(FRP) Construction of capacity not less than 13000m³/hr which has been in successful operation for atleast one year(1) prior to the date of Techno-commercial bid opening.

The reference Cooling Towers are of the same type i.e. counter flow or cross flow as is being offered and of the same construction type i.e. RCC construction or FRP construction as being offered by us.

The details of the reference cooling tower is furnished below:

Sl. Description/Details

Plant

No.

1. Description of Work and

Name of Client

2. Location/Address of the Plant/works

Signature of authorized signatory.....

3. Address of the Client (including
Contact Person Name, Telephone
No, e-mail etc.)

4. No. of Cooling Towers

5. Capacity of each Cooling
Tower (Cu.M/hr.)

6. Type of Fill (splash/modular/trickle type)

7. Type of Construction

8. Whether scope of works included

(a) Design of Cooling Towers by
Bidder/its Sub-vendor YES*/NO*

(b) Construction of
Cooling towers YES*/NO*

(c) Commissioning of
Cooling towers YES*/NO*

9. Date of Commissioning of the
Cooling tower

Signature of authorized signatory.....

10. Certificate from client to substantiate Bidder's QR data is enclosed at Annexure to this Attachment-3K YES*/NO*

11. Whether the reference cooling tower at sl. No. 1 is designed by the bidder/ sub vendor YES*/NO*

12. Whether the reference cooling tower at sl. No. 1 is got designed by bidder/ sub vendor YES*/NO*

13. Whether Documentary evidence/ certificate(s) from client enclosed for the above data Yes* / No*

● * Strike off whichever is not applicable.

Date : (Signature).....

Place : (Printed Name).....

Signature of authorized signatory.....

(Designation).....

(Common Seal).....

(Bidder / Sub vendor)

I. (B) Details of Induced draught Cooling Towers (as per clause 4.3.2 of Sub-Section-IA, Part-A, Section-VI of Bidding Documents

In support of Sub-Qualifying Requirements of Clause 4.3.2 of Sub-Section-IA, Part-A, Section-VI of Bidding Document, we confirm that We are a wholly or partially (with minimum 51% holding) held Indian subsidiary of a firm who fulfills the requirements in Clause 4.3.1 of Sub-Section-IA, Part-A, Section-VI of Bidding Documents. We , on our own/ alongwith our holding company have executed/ are executing atleast one contract involving design, construction and commissioning of atleast one(1) number Induced Draft Cooling Tower in RCC/ Pultruded Fiberglass Reinforced Plastic (FRP) Construction of capacity not less than 6500m³/hr.

We/our Holding Company furnish a letter of technical support from Holding company for successful performance of Cooling Towers, as per the format enclosed in the bidding document. This letter of technical support should be submitted to Employer prior to the placement of order on approved sub-vendor.

.

The details of the reference cooling tower is furnished below:

Sl. Description/Details

Plant

No.

Signature of authorized signatory.....

1. Description of Work and

Name of Client

2. Location/Address of the Plant/works

3. Address of the Client (including

Contact Person Name, Telephone

No, e-mail etc.)

4. No. of Cooling Towers

5. Capacity of each Cooling

Tower (Cu.M/hr.)

6. Type of Fill (Other than

splash/modular/trickle type)

Bidder to Specify the type of fill

7. Type of Construction

8. Whether scope of works included

(a) Design of Cooling Towers by

Bidder/its Sub-vendor associate/Collaborator

YES*/NO*

(Name of Designer)

(b) Construction of YES*/NO*

Signature of authorized signatory.....

Cooling towers

(c) Commissioning of

YES*/NO*

Cooling towers

9. Date of Commissioning of the

Cooling tower

10. Certificate from client to
substantiate Bidder's QR data is
enclosed at Annexure
to this Attachment-3K

YES*/NO*

11. Whether the reference cooling tower
at sl. No. 1 is designed by the bidder/ sub vendor

YES*/NO*

12. Whether the reference cooling tower
at sl. No. 1 is designed by
Sub-vendor's own engineers

YES*/NO*

13. Whether Documentary evidence/
certificate(s) from client enclosed
for the above data

Yes* / No*

● * Strike off whichever is not applicable.

Signature of authorized signatory.....

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common Seal).....

Date : (Signature).....

Place : (Printed Name).....

(Bidder / Sub vendor / Associate/ Collaborate/Holding Company)

Signature of authorized signatory.....

I. (C)

Signature of authorized signatory.....

**FORMAT FOR FILLING THE DETAILS OF PROVENNESS
LETTER OF SUPPORT FOR SATISFACTORY PERFORMANCE OF
(EQUIPMENT/SYSTEM NAME) FOR
SINGARENI TPP STAGE-I (1X800 MW)**

TO

[EMPLOYER' S NAME & ADDRESS]

Sub: Letter of Technical Support submitted From (name of the Associate*/Collaborator*/ Technology provider* / Licensor* / Holding Company*) undertaking the responsibility for satisfactory performance of (Name of the equipment/system*).

Dear Sirs,

1. In accordance with the Award of the Contract by (Name of the Contractor) to M/s. (Name of the sub-vendor), we, the aforesaid Associate*/Collaborator*/Technology provider*/Licensor*/Holding Company, (M/s) shall be fully responsible for the satisfactory performance of the (Name of the equipment/system*).
2. Further, the manner of achieving the objective set forth in point 1 above shall be as follows
For (Name of the equipment/system*):
 - (a) We shall be fully responsible for design, engineering & commissioning and extending all necessary support for putting in to satisfactory operation and carrying out the Guarantee Tests for (Name of the equipment/system*) to the satisfaction of the Employer.
 - (b) We shall depute technical experts to Bidder' s/sub-vendor' s works for supervision during manufacturing, assembly, inspection, as and when required by Employer. We shall participate in site erection, commissioning and final testing (as and when necessary) of the..... (Name of the equipment/system*).
 - (c) We shall participate in Technical Co-ordination meetings (TCMs) from time to time, as and when required by Employer.
 - (d) We shall promptly carry out all the corrective measures and shall promptly provide corrected design and shall undertake replacements, rectifications or modifications to the equipment/system* as and when required by Employer in case the equipment/system* fails to demonstrate successful performance as per contract at site.
3. We, the Associate*/Collaborator*/Technology provider*/Licensor*/Holding company* do hereby undertake and confirm that this Letter of Technical Support shall be valid for a period of seven (7) years or up to the end of defect liability period of the contract, whichever is later.

Signature of the Authorised Representative:.....

For M/s

(Associate*/Collaborator*/Technology provider*/Licensor*/Holding company)

Name

Designation

Date:.....

Common Seal of the Company

Signature of authorized signatory.....

***: Strike off whichever is not applicable.**

Signature of authorized signatory.....

**SINGARENI TPP STAGE-I (1X800 MW)), EPC PACKAGE
BIDDING DOCUMENT NO. CW-CM-11159-C-O-M-001
(Provenness Data)**

Sub : Details of Provenness for Chemical Treatment (System) Programme for ACW System

In terms of clause no. 4.11 of Sub-Section-IA, Part-A of Section-VI, we/our sub-vendor have executed contract for cooling water treatment programme of at least one (1) cooling water system having a flow rate not less than 10,000 Cu.M/hr operating in alkaline pH range and the treatment program should have been in successful operation for at least one (1) year. We/our sub-vendor confirm that this contract included supply of chemicals, operation and maintenance of the system. The Chemicals used in this programme have been organic polymers/organic phosphorous compounds/organic phosphates based chemicals. The reference plants in support of above is as per following details :

Sl.No.	Description	Data
1)	Name of the Supplier for Cooling Water Treatment Programme for this project	M/s.....
2)	Type and Name of the Chemicals proposed for this project	..... ..... .....
3)	Provenness Data of the Proposed Sub-vendor	Plant - 1
a)	Client's Name & Address	..... .....
b)	Scope of work (Strike out whichever is not applicable)	Design/Supply/ Commissioning/ Operation and Maintenance
c)	Capacity of cooling water system (Cu.m/hr.)	

Signature of authorized signatory.....

Sl.No.	Description	Data
Plant - 1		
d)	Whether the cooling water treatment programme is operating in alkaline pH range ?	Yes/No
e)	Type of chemicals used	Organic Polymers/ organicphos- phorous com- pounds/Organic Phosphates
f)	Name of the Chemicals used for the above CW Treatment system	.....
g)	Date of commissioning of the above CW treatment programme	
h)	Documentary evidence for the above are enclosed?	Yes/No

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

Note : Continuation sheets of like size and format may be used and annexed to this

Signature of authorized signatory.....

Sub : Sub-Qualifying Requirements for the Fire Detection and Protection System

To satisfy the requirements specified in Clause No. 4.4 of Sub-Section-IA, Part-A, Section-VI of Bidding Document, we furnish following details:

1.We/ sub-vendor declare that we have designed, supplied, erected and commissioned at least One (1) fire protection system of Contract value not less than Rs.35.0 million or equivalent in foreign currency (exchange rate applicable as on date of Techno-commercial Bid Opening), in industrial installation. The Fire Protection System comprise of

- a) fire hydrant system
- b) high velocity water (HVW) spray or medium velocity water (MVW) spray or sprinkler system.
- c) fire water pumping and pressurizing arrangement.

We further declare that the systems mentioned above have been designed to the recommendations of *Tariff Advisory Committee of India or Oil Industry Safety Directorate (OISD) or any other International reputed authority (like LPC-U.K. or NFPA - USA) and these systems is in successful operation for a period of not less than one (1) year. The details of Fire Protection system executed by us are furnished below: -

Details pertaining to Technical Qualification of the Sub-vendor.

Sl.No.	Description	Plant No. 1
A.	DATA OF FIRE PROTECTION SYSTEMS EXECUTED: (To be filled up for contracts having order value not less than Rs. 35.00 million or equivalent in foreign currency (exchange rate applicable as on date of techno-commercial bid opening)	
1.	Client name and address	.....
2.	Name and Address of the plant/ installation	.....
3.	Whether Fire protection system executed is for industrial installation ?	Yes*/No*
4.	Date of order	.....
5.	Date of commissioning	.....

Signature of authorized signatory.....

Sl.No.	Description	Plant No. 1
6.	Period of operation	.....
7.	Value of the order in Rs. Million	.....
8.	The Scope included :	
	a) Design	Yes*/No*
	b) Supply	Yes*/No*
	c) Erection	Yes*/No*
	d) Commissioning	Yes*/No*
9.	The fire protection system have been designed as per TAC/OISD/any other International reputed authority (like LPC-UK or NFPA, USA) (Please indicate the name of the authority)	Yes*/No*
10.	The above contract included :	
	a) Fire Hydrant system	Yes*/No*
	b) High velocity water spray (HVW) system	Yes*/No*
	c) Medium velocity water spray (MVW) System	Yes*/No*
	d) Sprinkler System	Yes*/No*
	e) Fire water pumping and pressurizing arrangement	Yes*/No*
11.	Documentary evidence/certificate from client in support of above is enclosed	Yes*/No*

Note : (1) Continuation sheets of like size and format may be used as per Sub-vendor requirement and be annexure to this attachment.

* **Please Strike off whichever is not applicable.**

Signature of authorized signatory.....

2. We/ Sub-Vendor furnish the following details of the firm from whom the analogue addressable type fire alarm system is proposed to be supplied for this package.

We / sub-vendor further declare that the analogue addressable type fire alarm system proposed to be supplied shall be sourced from a firm M/S _____ who has supplied at least One (1) similar system and these system has been approved or listed by UL-USA / FM-USA / LPC-UK / similar agency and are in successful operation for at least One (1) year. The details of the proposed firm are furnished below:

Sl.No.	Description	Plant No. 1
1.	Name of supplier	.....
2.	Address of supplier	.....
3.	Experience details of supplier	
a)	Name of the client	.....
b)	Address of the client	.....
c)	Address of the installation	.....
d)	Type of the installation (Industrial / commercial)	.....
e)	Whether the installed system has been approved by UL- USA/FM-USA/LPC-UK/Similar agency ? (please specify agency)	Yes*/No*
f)	Whether the installed system has been listed by UL-USA/ FM-USA/LPC-UK / Similar agency? (please specify agency)	Yes*/No*
g)	Date of order / award for analogue addressable type fire alarm system	.....
h)	Date of commissioning of the above system	.....
i)	Number of years for which the system is in operation	.....

Signature of authorized signatory.....

Sl.No.	Description	Plant No. 1
j)	Documentary evidence/certificate in support of above system to be enclosed	.....

*** Please strike off whichever is not applicable.**

Note : If a Sub-vendor proposed more than one firm for the supply of analogue addressable type fire alarm system, separate data shall be submitted in the above format for each of the proposed suppliers.

Signature of authorized signatory.....

3. We / our sub-vendor furnish the following details of the firm from whom the inert gas fire extinguishing system is proposed to be supplied for this package.

We / our sub-vendor further declare that the Inert gas fire extinguishing system to be supplied under the package shall be sourced from an agency M/S_____ who has designed and supplied at least One (1) Inert gas total flooding fire extinguishing system having a total risk Volume of atleast 1000 Cu.m. Further, we declare that this system have been designed to the recommendation of Tariff Advisory Committee of India or any other international reputed authority (like LPC-U.K. or NFPA, USA) and have been in operating condition for a period not less than One (1) year. The details of the proposed firm are furnished below :

Name of the Agency proposed for
this Package by the bidder :

Sl. No.	Description	Plant No. 1
1.	Name of supplier	.....
2.	Address of supplier	.....
3.	Experience details of supplier	
	a) Name of the client	.....
	b) Address of the client	.....
	c) Address of the installation	.....
	d) Type of the installation (Industrial / commercial), pl. specify	.....
	e) Whether the installed systems have been designed to the recommendation of TAC-India or any other international reputed authority (like LPC- UK or NFPA - USA) (please specify agency)	Yes*/No*

Signature of authorized signatory.....

Sl.No.	Description	Plant No. 1
f)	Risk area protected using the above system has a volume of	Cu.M
g)	The total flooding gaseous fire extinguishing system has been designed by bidder.	Yes*/No*
h)	Date of order / award for total flooding inert gas fire extinguishing system	.....
i)	Date of commissioning of the above system	.....
j)	Number of years for which the system is in operation	.....
k)	Documentary evidence/certificate in support of above to be enclosed	.....

Note: If a Sub-vendor proposed more than one firm for the supply of total flooding inert gas fire extinguishing system, separate data shall be submitted in the above format for each of the proposed suppliers/ agent.

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common Seal).....

*** Please strike off whichever is not applicable.**

Signature of authorized signatory.....

Sub : Sub-Qualifying Requirements for the Air Conditioning System

- (A) In line with the Sub-Qualifying Requirements stipulated in Clause No. 4.5 of Sub-Section-IA, Part-A of Section-VI, we/our sub-vendor hereby confirm that we/our sub-vendor have designed, supplied, erected and commissioned atleast One (1) number of Air Conditioning systems having a total installed capacity of 300TR or more including stand-by chiller unit (if any), which included atleast one chilling unit with a minimum capacity of 60 TR. The system have been in successful operation for atleast One (1) year. The details are given below:

Sl.No.	Item Description	Plant No. 1
1.	Name of the Client with full address, contact person(s), fax and tele no.	
2.	Name and address of the Plant	
3.	Purchase Order no. and date	
4.	Copy of purchase order enclosed	Yes/No
5.	Date of Commissioning	
6.	No. of years of successful operation	
7.	Whether clients certificate is enclosed to prove that "the Air Conditioning system is in successful operation for atleast one (01) year.	Yes/No
8.	Total installed capacity of air conditioning system (should be atleast 300 TR)	 TR
9.	Capacity of largest chilling unit in above air conditioning system (should be atleast 60 TR)	 TR
10.	Type of installation	Industrial/ Commercial Installation
11.	The scope of Contract included	
	(a) Design	Yes/No
	(b) Supply	Yes/No

Signature of authorized signatory.....

Sl.No.	Item Description	Plant No.1
	(c) Erection	Yes/No
	(d) Commissioning	Yes/No
12.	Documentary evidence in support of above enclosed	Yes/No

- (B) We further declare that the chillers to be supplied under the package shall be sourced from manufacturer M/s..... who has manufactured and supplied atleast One (1) no. of similar type of chiller unit having a capacity of not less than 150 TR and have been in successful operation for atleast One (1) year.

Chillers proposed to be supplied under this package would be sourced from following manufacturers. Experience details of the manufacturers are given below:

(a)	Type of vapor compression type chilling unit offered	Screw compressor
(b)	Name and Address of Manufacturer from whom the above equipment is sourced	
(c)	For the above type of chiller Experience details of the Manufacturer is as follows :	

Sl.No.	Item Description	Plant No.1
1.	Name of the Client with address, name of contact person(s), tel. no. & fax no.	
2.	Purchase Order no. and date	
3.	Date of Commissioning	
4.	No. of years of successful operation	
5.	Capacity of chiller unit	 TR

Signature of authorized signatory.....

Sl.No.	Item Description	Plant No.1
6.	Clients certificate to demonstrate successful operation of machine for at least one (01) year.	Yes/No
7.	Documentary evidence in support of above enclosed	Yes/No

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common Seal).....

Signature of authorized signatory.....

Sub : Sub-Qualifying Requirements for the Ventilation System

In line with the Sub-Qualifying Requirements stipulated in clause no. 4.6 of Sub-Section-IA, Part-A, Section-VI of Technical Specification of Bidding Documents, we/our Sub-vendor have designed, supplied, erected and commissioned atleast One (1) number ventilation system including air washer units having individual fan capacity of 80,000 Cum/hr. or more the system are in successful operation for atleast One (1) year.

Sl.No.	Item	Plant 1
1.	Name of the Project and its address	.....
2.	Name of the Client with address, name of Contact person(s) with tel.no. & fax no.	.....
3.	Order No. and date	
4.	Purchase order enclosed	Yes*/No*
5.	Date of commisisoning	.....
6.	Individual fan capacity of air washer unit in ventilation system, cu.m/hr.	.....
7.	The scope for the ventilation system contract included	
	(a) Design	Yes*/No*
	(b) Supply	Yes*/No*
	(c) Erection	Yes*/No*
	(d) Commissioning	Yes*/No*
8.	No. of years of successful.	.....
9.	The installation where the ventilation system has been provided can be treated as Industrial/commercial installation	Yes*/No*

Signature of authorized signatory.....

Sl.No.	Item Description	Plant No.1
10.	Documentary evidence in support of above is enclosed	Yes*/No*
11.	Clients certificate regarding successful operation of ventilation system enclosed	Yes*/No*

*** Strike off whichever is not applicable.**

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

Note : Continuation sheets of like size and format may be used as per Sub-vendor's requirement and shall be annexed to this Attachment-3K.

Signature of authorized signatory.....

Sub : Sub-Qualifying Requirements for the Compressed Air System stipulated in Clause No. 4.7 of Sub-Section-IA, Part-A, Section-VI of Technical Specification of Bidding Documents.

Sl.No.	Item	Plant 1

A) Air Compressor

In line with the Sub-qualifying requirements stipulated in Clause 4.7 of Sub-Section-IA, Part-A, Section-VI, we / our sub-vendor confirm that we/our sub-vendor have designed, manufactured, supplied, erected /supervised erection and commissioned/supervised commissioning of atleast one (1) no. non-lubricated oil free screw type air compressor of minimum capacity 20 NM3/min each or atleast one (1) no. centrifugal air compressors of minimum capacity 50 NM3/min each and at rated discharge pressure of 8 Kg./cm2(g) which have been in successfull operation for atleast one (1) year.

1. Name of the Project
and its address where the
system is installed
2. Name of the Client with
address, name of Contact
person(s) with tel.no.
&fax no.
3. Order No. and date
4. Purchase order enclosed Yes/No
5. Name of the Manufacturer & Address
6. Date of commissioning of the
compressors
7. No. of Compressors supplied
8. Whether the scope of work
executed for the aforesaid
compressors included the following
 - a) Designed Yes/No
 - b) Manufactured Yes/No

Signature of authorized signatory.....

Sl.No.	Item	Plant 1
	c) Supplied	Yes/No
	d) Erected/supervised erection	Yes/No
	e) Commissioned/supervised commissioning	Yes/No
9.	Brief Technical particulars of the Compressors (Bidder to fill)	
	a) whether the compressor supplied was non lubricated oil free screw/centrifugal type air compressor	
	b) Make & Model	
	c) Capacity	
	i) Flow (NM3/Min)	
	ii) Discharge pressure [Kg/cm2/(g)]	
10.	Whether atleastone (01) compressor have been in successful operation for a period of not less than one (01) year.	
11.	Whether documentary evidence in support of above enclosed?	Yes/No

Signature of authorized signatory.....

B) Air Drying plant

We/our sub-vendor further declare that the Air Drying Plant (ADP) to be supplied under the package shall be sourced from manufacturer(s) M/s..... who have manufactured and supplied atleast one (1) no. Air Drying Plant each of capacity 50 NM3/min or more and the type same as offered, which have been in successful operation. The experience details of manufacturer are as follows :

Sl.No.	Item	Plant 1
1.	Name of the Project and its address where the system is installed	.....
2.	Name of the Client with address, name of Contact person(s) with tel.no. & fax no.	.....
3.	Order No. and date	
4.	Purchase order enclosed	Yes/No
5.	Name of the Manufacturer & Address	
6.	Date of commissioning of the Air drying unit	
7.	No. of Air drying unit supplied	
8.	Whether the scope of work executed for the aforesaid Air drying unit included the following	
	a) Manufactured	Yes/No
	b) Supplied	Yes/No
9.	Brief Technical particulars of the Air Drying unit (Bidder to fill)	
	a) Type	
	b) Flow (NM3/Min)	

Signature of authorized signatory.....

Sl.	Item	Plant 1
10.	Whether atleastone (01) air drying plants have been in successful operation.	
11.	Whether documentary evidence in support of above enclosed?	Yes/No

Date :

(Signature).....

Place :

(Printed Name).....

(Designation).....

(Common seal).....

Signature of authorized signatory.....

Sub: Provenness details for Water Pre-treatment Plant &.

In terms of clause no. 4.8 of Sub-Section-IA, Part-A of Section-VI, We/our sub-vendor confirm that, we/our sub-vendor have designed, supplied, erected and commissioned at least one (1) number water/t, each with a capacity of not less than 1000 Cu.m/hr, comprising of clarifiers/tube settlers/ thickeners or a combination thereof including civil works. The plant have been in successful operation for at least one (1) year. The details of reference plant in support of above is as per following details :

Sl. No.	Description	Plant 1
1.	Name, Address & FAX / Phone No. of Client and Site / Plant	
2.	Contract number & date of award of Contract	
3.	Type of Treatment Plant	*Water / *Waste Water Treatment
4.	Total Capacity of the Treatment Plant in Cum/hr.	
5.	Number of Clarifiers / tube settlers/thickeners installed	
6.	Capacity of each Clarifiers/tube settler/thickeners installed (cu.m./hr.)	
7.	Total capacity of Clarifiers / tube settlers / thickness installed (cum/hr.)	
8.	Date of Commissioning of the plant	
9.	In the above contract, Bidder's scope included :	
(a)	Design	Yes* / No*
(b)	Supply	Yes* / No*
(c)	Erection	Yes* / No*
(d)	Commissioning	Yes* / No*
(e)	Civil Works	Yes* / No*

Signature of authorized signatory.....

Sl. No.	Description	Plant 1
10.	Whether Documentary evidence/ certificate in support of above data enclosed ?	Yes* / No*

*** Strike off whichever is not applicable.**

Date :

(Signature).....

Place :

(Printed Name).....

(Designation).....

(Common seal).....

Signature of authorized signatory.....

Sub: Provenness details of Ion Exchange Demineralisation Plant

In terms of clause no. 4.9 of Sub-Section-IA, Part-A of Section-VI, We/our sub-vendor confirm that, we have designed, supplied, erected and commissioned at least one (1) number of ion exchange based demineralizing plant, consisting of at least two (2) streams each of minimum 60 cum./hr capacity, capable of producing outlet water quality of silica and conductivity not more than 0.02 ppm as SiO₂ and 0.2 micromho/cm respectively, which have been in successful operation for at least one (1) year. The details of the reference plants in support of above is as per following details:

Sl.No.	Description	Data
1.	Client's Name & address	
2.	Order No. & Date	
3.	In the above contract, Bidder's scope included :	
	(a) Design	Yes* / No*
	(b) Supply	Yes* / No*
	(c) Erection	Yes* / No*
	(d) Commissioning	Yes* / No*
4.	Numer of Ion Exchange based DM Streams	
5.	Capacity of each DM Stream (Cu.m/hr)	
6.	Silica in effluent water (ppm) as SiO ₂	
7.	Conductivity of effluent water (micro mho/cm)	
8.	Date of commissioning of plant	

Signature of authorized signatory.....

Sl.No.	Description	Data
9.	Documentary evidence for the above data are enclosed?	Yes* / No*

*** Strike off whichever is not applicable.**

Date : (Signature).....
Place : (Printed Name).....
Designation).....
(Common seal).....

Note : Continuation sheets of like size and format, may be used and annexed to this Schedule if required.

Signature of authorized signatory.....

SUB: PROVENNESS DETAILS OF WASTE WATER REVERSE OSMOSIS PLANT

In terms of clause no. 4.10 of Sub-Section-I A, Part-A of Section-VI, We/our sub-vendor confirm that, we/our sub-vendor have designed, supplied, erected and commissioned / supervised commissioning of one (1) number Reverse Osmosis (RO) Plant of minimum capacity (permeate flow) of 120 Cum/hr OR two (2) numbers RO Plants in separate contracts each of minimum capacity (permeate flow) of 60 Cum/hr OR three (3) numbers RO Plants in separate contracts each of minimum capacity (permeate flow) of 40 Cum/hr. The above RO plant (s) is/are having inlet feed Water with TDS $\geq$ 500 ppm and capable of producing permeate water quality with TDS not more than 100 ppm OR having inlet feed as sea water and capable of producing permeate water quality with TDS not more than 500 ppm. The plant (s) have been in successful operation for at least one (1) year. The details of the reference plants in support of above is as per following details:

Sl. No.	Plant No. 1	Plant No. 2	Plant No. 3
1.	Name of work	.....	.....
2.	Name & Address of the Client (Including contact person name, telephone no., fax, e-mail etc)	.....	.....
3.	Order No. & Date award of Contract	.....	.....
4.	Name & Address of Installation where the RO Plants have been installed.....		
5.	Capacity (Permeate flow) of Plant in cum/ hr	.....	
6.	Whether the above plant had inlet feed as TDS $\geq$ 500 ppmYes* / No*Yes* / No*Yes* / No*		
7.	Whether the above plant is capable of producing permeate water quality with TDS not more than 100ppm with inlet feed as TDS $\geq$ 500ppmYes* / No*Yes* / No*Yes* / No*		

Signature of authorized signatory.....

Sl. No.	Plant No. 1	Plant No. 2	Plant No. 3

8. Whether the above plant
have inlet feed as sea water Yes/No Yes/No Yes/No

9. Whether the above Plant
is capable of producing
permeate water quality with
TDS not more than 500ppm
when Inlet is sea water. Yes* / No* Yes* / No* Yes* / No*

10. Whether scope of work in
the above contract includes:

(a) Design Yes* / No* Yes* / No* Yes* / No*

(b) Supply Yes* / No* Yes* / No* Yes* / No*

(c) Erection Yes* / No* Yes* / No* Yes* / No*

(d) Commissioning Yes* / No* Yes* / No* Yes* / No*

(e) Supervision of Yes* / No* Yes* / No* Yes* / No*
commissioning

11. Date of commissioning of the plant

12. Required documentary evidence
in support of
above is enclosed ? Yes* / No* Yes* / No* Yes* / No*

***Strike off whichever is not applicable.**

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

MILL REJECT HANDLING SYSTEM

We, hereby furnish the data on provenness criteria for manufacturer/supplier of Mill reject handling system and have previous experience of manufacturing/got manufactured and supplying metallic belt conveyor type or chain flight conveyor type handling systems of capacity

Signature of authorized signatory.....

1.5 MTPH or higher forash handling any industrial installations unit which are in successful operation in at least one (1) plant for a period not less than one (1) year as per clause no. 4.13 of Sub-section-I, Part-A of Section-VI.

The details of type and minimum equipment rating of such equipment are given below :

S.No.	Item Description	Station-I
(i)	Name of the station and its location	
(ii)	Client name and its address, Fax No. & Tel. No.	
	— e-mail id	
	— website address	
iii)	Name and Designation of the responsible person in client's organisation	
(iv)	Name of manufacturer & address	
(v)	Contract No. & Date	
(vi)	Capacity in MW of each Unit	
(vii)	Starting date of work	
(viii)	Scheduled date of completion	
(ix)	Actual date of completion	
(x)	Date of Commissioning of system/Package	
(xi)	Whether the Mill Reject Handling System has been in successful operation for a period not less than one (1) year.	*Yes/*No

Signature of authorized signatory.....

S.No.	Item Description	Station-I
(xii)	Brief Technical Particulars of the system/Package/equipment :	
-	Type of system:	Metallic belt conveyor/chain flight conveyor
-	Whether Mill reject:*Yes/*No handling system for coal	
-	Mill rejects conveying rate (MTPH)	.....

***Strike off whichever is not applicable.**

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

Signature of authorized signatory.....

(Applicable for Bidder/his sub vendors who is not a manufacturer of proven equipments as per clause no. 4.13.1 Sub-Section-I, Part-A of Section-VI and seeking qualification as per clause no. 4.13.2, Sub-Section-I, Part-A of Section-VI.)

We confirm that we/our Sub-vendor are a manufacturer of pneumatic conveying systems and have manufactured and supplied pressure type pneumatic conveying system of capacity 5 MTPH or higher for any material which are in successful operation in at least one (1) Plant for a period not less than one (1) year. We confirm that we* (or our proposed sub-vendor) have valid collaboration or licensing agreement for design, engineering, manufacture and supply of such equipment in India with M/s who meet the requirements of Clause. No. 4.13.1(a) Sub-Section-IA, Part-A of Section-VI. The details of type and minimum equipment rating of such equipment are given below :

S.No.	Item Description	Station-I

A PNEUMATIC CONVEYING SYSTEMS

- (i) Name of the plant and its location
- (ii) Client name and its address,
Fax No. & Tel. No.
 - e-mail id
 - website address
- iii) Name and Designation of the responsible person in client's organisation
- (iv) Contract No. & Date
- (v) Capacity in MW of each Unit, in case of power plant
- (vi) Starting date of work
- (viii) Scheduled date of completion
- (viii) Actual date of completion
- (ix) Date of Commissioning of system/Package

Signature of authorized signatory.....

S.No.	Item Description	Station-I
(xi)	Whether the pneumatic conveying System has been in successful operation for a period not less than one (1) year.	*Yes/*No
(xii)	Brief Technical Particulars of the system/Package/equipment :	
	- Type of system (Pneumatic)	*Yes/*No.
	- Material Handled and bulk density .	/..... kg/ Cubic.m
	- Conveying rate (MTPH)	.....
	- Write-up on system enclosed	*Yes/*No
(xiii)	Collaborators name and address	.....
(xiv)	Copy of collaboration/ valid licencing agreement for mill reject handling system meeting the requirement stipulated at 4.13.2, Sub section-IA, Part-A of Section-VI is enclosed as per Annexure-I to this Attachment	*Yes/*No

Date : (Signature).....

Place : (Printed Name).....

Designation).....

(Common seal).....

Signature of authorized signatory.....

B. COLLABORATOR'S EXPERIENCE FOR MILL REJECT HANDLING SYSTEM

S.No.	Item Description	Station-I
(i)	Name of the plant and its location	
(ii)	Client name and its address, Fax No. & Tel. No.	
	– e-mail id	
	– website address	
iii)	Name and Designation of the responsible person in client's organisation	
(iv)	Name of manufacturer & address	
(v)	Contract No. & Date	
(vi)	Capacity in MW of each Unit	
(vii)	Starting date of work	
(viii)	Scheduled date of completion	
(ix)	Actual date of completion	
(x)	Date of Commissioning of system/Package	
(xi)	Whether the Mill Reject Handling System has been in successful operation for a period not less than one (1) year.	*Yes/*No
(xii)	Brief Technical Particulars of the system/Package/equipment :	
	- Type of system (Pneumatic)	*Yes/*No

Signature of authorized signatory.....

S.No.	Item Description	Station-I
-	Whether Mill reject handling system for coal	*Yes/*No
-	Mill rejects conveying rate (MTPH)	.....

Date : (Signature).....

Place : (Printed Name).....

Designation).....

(Common seal).....

Signature of authorized signatory.....

Applicable for Bidder/his sub vendors seeking provenness criteria as per clause no. 4.13.3, Sub section-IA, Part-A of Section-VI.

We confirm that JV company*/subsidiary company* formed by one of our promoters of the Indian JV*/subsidiary company* formed for manufacturing of steam generator sets has collaboration/valid licencing agreement for design, engineering, manufacturing of mill reject handling system in India, with the JV promotor who meets the requirement stipulated at clause 4.13.1, Sub section-I, Part-A of Section-VI and details in respect of collaboration/ valid licencing agreement for the mill reject handling system is enclosed as per Annexure-I to this Attachment. The data in respect of provenness criteria for these equipment which are in successful operation in at least one (1) plant for a period not less than one(1) year are furnished below.

S.No.	Item Description	Station-I
(i)	Name of the plant and its location	
(ii)	Client name and its address, Fax No. & Tel. No.	
	– e-mail id	
	– website address	
iii)	Name and Designation of the responsible person in client's organisation	
(iv)	Name of manufacturer & address	
(v)	Contract No. & Date	
(vi)	Capacity in MW of each Unit	
(vii)	Starting date of work	
(viii)	Scheduled date of completion	
(ix)	Actual date of completion	
(x)	Date of Commissioning of system/Package	

Signature of authorized signatory.....

S.No.	Item Description	Station-I
(xi)	Whether the Mill Reject Handling System has been in successful operation for a period not less than one (1) year.	*Yes/*No
(xii)	Brief Technical Particulars of the system/Package/equipment :	
-	Type of system: Pneumatic/Metallic belt conveyor/Chain flight conveyor	
-	Whether Mill reject handling system for coal	*Yes/*No
-	Mill rejects conveying rate (MTPH)	.....

Date : (Signature).....

Place : (Printed Name).....

Designation).....

(Common seal).....

Signature of authorized signatory.....

**FORM OF LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR /
TECHNOLOGY PROVIDER TO BE PROVIDED
FOR MILL REJECT HANDLING SYSTEM AS PER CLAUSE 4.13 OF
TECHNICAL SPECIFICATIONS (SECTION -VI PART-A SUB-SECTION-IA)**

(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER TO BE EXECUTED BY BIDDER/SUB VENDOR OR INDIAN *JOINT VENTURE COMPANY/*SUBSIDIARY COMPANY FORMED BY ONE OF THE PROMOTERS OF THE INDIAN JV/ SUBSIDIARY COMPANY FORMED FOR MANUFACTURING STEAM GENERATOR SETS, ALONG WITH MANUFACTURER OF MILL REJECT HANDLING SYSTEM EQUIPMENTS MEETING THE REQUIREMENTS STIPULATED AT 4.13.1 OF SUB-SECTION-IA, PART-I, SECTION-VI IN ACCORDANCE WITH CLAUSE 4.13.2/4.13.3 AS APPLICABLE

The LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER executed this day of Two thousand by M/s (BIDDER/SUB VENDOR/INDIAN JV COMPANY/SUBSIDIARY COMPANY) a Company incorporated under having its Registered Office at (hereinafter called the BIDDER/SUB VENDOR/INDIAN JV COMPANY/SUBSIDIARY COMPANY, which expression shall include its successors, administrators, executors and permitted assigns) AND

*M/s a Manufacturer As in item 4.13 of TECHNICAL SPECIFICATIONS (SECTION-VI, PART-A, SUB-SECTION-IA) incorporated under having its Registered Office at(hereinafter called the "MANUFACTURER", which expression shall include its successors, administrators, executors and permitted assigns)

in favour of, having its Registered Office at SCCL, Kothagudem Collieries,Bhadrari Kothagudaem Dt, Telangana-507101 INDIA("Employer" which expression shall include its successors, administrators, executors and assigns).

WHEREAS, the Employer invited Bids for design, engineering, manufacture, supply, transportation to site, construction, installation, testing, commissioning and conductance of guarantee tests for the EPC Package for Singareni TPP-II(1x800MW) (hereinafter referred to as "Plant") vide its Bidding Document No. , which interalia include Mill Reject Handling System

WHEREAS M/S -----(Bidder) is submitted its proposal in response to the aforesaid invitation for Bid by the Employer for EPC package for Singareni TPP-II(1x800MW)against the employer's bidding documents no. interalia including design, engineering, manufacturing, supply, transportation to site, installation, testing and commissioning (including trial operation and performance and guarantee test) of mill reject handling system.

AND WHEREAS vide clause 4.13.2 /4.13.3 of TECHNICAL SPECIFICATIONS (SECTION-VI, PART-A, SUB-SECTION-IA), it has been specified that bidder/ sub-vendor who is a manufacturer of equipments of pneumatic conveying system and has manufactured and supplied pressure type pneumatic conveying system of capacity 5 MTPH or higher for any material which are in successful operation in at least one(1) plant for a period not less than one (1) year. JV company /Subsidiary company formed for manufacture of mill reject handling

Signature of authorized signatory.....

system for 660 MW super critical units can also manufacture, provided that it has a valid collaboration or licensing agreement for design, engineering, manufacturing and supply of such equipment in India with a qualified Manufacturer of pneumatic type coal mill reject handling system who meets the requirements stipulated at clause 4.13.1 of TECHNICAL SPECIFICATIONS (SECTION-VI, PART-A, SUB-SECTION-IA).

NOW THEREFORE, THIS DEED WITNESSETH AS UNDER:

1. We the Qualified Manufacturer of pneumatic type coal mill reject handling system and bidder/sub vendor/JV company/Subsidiary company, do hereby declare and undertake that we shall be jointly and severally responsible to the Employer for the successful performance of the Mill reject handling system.
2. In case of any breach of the Contract committed by the bidder/sub vendor/ JV company/Subsidiary company, we the Manufacturer do hereby undertake, declare and confirm that we shall be fully responsible for the successful performance of the Mill reject handling system and undertake to carryout all the obligations and responsibilities under this Letter of support from Collaborator(s) / Licensor / Technology Provider in order to discharge the bidder/sub vendor/JV company/Subsidiary company obligations stipulated under the Contract. Further, if the Employer sustains any loss or damage on account of any breach of the Contract for the Mill reject handling system, we the Manufacturer undertake to promptly indemnify and pay such loss/damages caused to the Employer on its written demand without any demur, reservation, Contest or protest in any manner whatsoever. This is without prejudice to any rights of the Employer against the bidder/sub vendor/ JV company/Subsidiary company under the Contract and/or guarantees. It shall not be necessary or obligatory for the Employer to first proceed against the bidder/sub vendor/ JV company/Subsidiary company before proceeding against the manufacturer nor any extension of time or any relaxation given by the Employer to the bidder/sub vendor/ JV company/Subsidiary company shall prejudice any rights of the Employer under this Letter of support from Collaborator(s) / Licensor / Technology Provider to proceed against the manufacturer. The liability of the contractor, his sub-vendor and the associate/collaborator shall be limited to and amount equal to 100% of the value of the contract** between the contractor and the sub supplier for the equipments/systems.
3. Without prejudice to the generality of the Undertaking in paragraph 1 above, the manner of achieving the objective set forth in paragraph 1 above shall be as follows:
 - (a) We the Manufacturer shall ensure that complete design, manufacturing, quality assurance and installation of the Mill reject handling system is carried out inline with our manufacturing & quality drawings and procedures and shall be fully responsible for its compliance so as to ensure satisfactory, reliable, safe and trouble free performance of Mill reject handling system .

Further, we the Manufacturer shall extend our quality surveillance / supervision / quality control to the bidder / sub vendor / JV company / Subsidiary company during manufacture, erection, commissioning and performance testing, both at bidder / sub vendor / JV company / Subsidiary company's works and/or at employer's project site.

Signature of authorized signatory.....

Further, the Manufacturer shall depute their technical experts from time to time to the bidder / sub vendor /* JV* / Subsidiary company works / Employer's project site as required by the Employer and agreed to by bidder / sub vendor / JV company / Subsidiary company to facilitate the successful performance of the Mill reject handling system as stipulated in the aforesaid Contract.

Further, the Manufacturer shall ensure proper design, manufacture installation, testing and successful performance of the Mill reject handling system under the said contract in accordance with stipulations of Bidding Documents and if necessary, the manufacturer shall advise the bidder/sub vendor/JV company/Subsidiary company suitable modifications of design and implement necessary corrective measures to discharge the obligations under the contract.

- (b) In the event the bidder/sub vendor/JV company/Subsidiary company fail to demonstrate that the Mill reject handling system meets the guaranteed parameters and demonstration parameters as specified in the contract, the manufacturer shall promptly carry out all the corrective measures related to engineering services at their own expense and shall promptly provide corrected design to the Employer.
 - (c) Implementation of the corrected design and all other necessary repairs, replacements, rectification or modifications to the Mill reject handling system and payment of financial liabilities and penalties and fulfillment of all other contractual obligations as provided under the contract shall be the joint and severally responsibility of the bidder/sub vendor/JV company/Subsidiary company and manufacturer.
- 4. We, the bidder/sub vendor/JV company/Subsidiary company and manufacturer do hereby undertake and confirm that this Undertaking shall be irrevocable and shall not be revoked till ninety (90) days after the end of the defect liability period of the last equipment covered under the Contract and further stipulate that the Undertaking herein contained shall terminate after ninety (90) days of satisfactory completion of such defect liability period. In case of delay in completion of defect liability period, the validity of this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be extended by such period of delay. We further agree that this Undertaking shall be without any prejudice to the various liabilities of the Contractor including Contract Performance Security as well as other obligations of the Contractor in terms of the Contract.
 - 5. The manufacturer and bidder/sub vendor/JV company/Subsidiary company will be fully responsible for the quality of all the equipment/main assemblies/components manufactured at their works or at their Vendors' works or constructed at site, and their repair or replacement, if necessary, for incorporation in the Plant and timely delivery thereof to meet the completion schedule under the Contract.
 - 6. In case of Award, in addition to the Contract Performance Security for the contract, the manufacturer shall furnish 'as security' an on demand Performance Bank Guarantee in favour of the Employer as per provisions of the bidding documents. The value of such Bank Guarantee shall be equal to **INR 1.6 Million (Indian Rupees One Million Six hundred thousand only)** and it shall be guarantee towards the faithful performance /compliance of this Letter of support from Collaborator(s) / Licensor / Technology Provider in accordance with the terms and conditions specified herein. The bank

Signature of authorized signatory.....

guarantee shall be unconditional, irrevocable and valid till ninety (90) days beyond the end of defect liability period of the last equipment covered under the Contract. In case of delay in completion of the defect liability period, the validity of this Bank Guarantee shall be extended by the period of such delay. The guarantee amount shall be promptly paid to the Employer on demand without any demur, reservation, protest or contest.

7. Any dispute that may arise in connection with this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be settled as per arbitration procedure/rules mentioned in the Contract Documents. This Letter of support from Collaborator(s) / Licensor / Technology Provider shall be construed and interpreted in accordance with the Laws of India and the Courts of Delhi shall have exclusive jurisdiction.
8. We, manufacturer and bidder/sub vendor/JV company/Subsidiary company agree that this Undertaking shall form an integral part of the Contracts from the date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider . We further agree that this Undertaking shall continue to be enforceable till its validity.
9. That this Letter of support from Collaborator(s) / Licensor / Technology Provider shall be operative from the effective date of signing of this Letter of support from Collaborator(s) / Licensor / Technology Provider .

IN WITNESS WHEREOF, Manufacturer and bidder / sub vendor / JV company / Subsidiary company vendor through their authorised representatives, have executed these presents and affixed common seal of their respective companies, on the day, month and year first mentioned above.

1.	WITNESS	For M/s
		(Manufacturer)
	 (Signature Name) Representative).....	(Signature of the Authorised
	 (Official Address)	Name.....
	Designation.....	
		Common Seal of the
	Company.....	
1.	WITNESS	ForM/s
		(*sub vendor)
	 (Signature Name) Representative).....	(Signature of the Authorised
	.....	Name.....
		Signature of authorized signatory.....

(Official Address)

Designation.....

Common Seal of the
Company.....

1. WITNESS

For M/s
(Bidder/Contractor)

.....
(Signature Name)
Representative).....

(Signature of the Authorised

.....
(Official Address)

Name.....

Designation.....

Common Seal of the
Company.....

1. WITNESS

For M/s
(JV company/Subsidiary company)

.....
(Signature Name)
Representative).....

(Signature of the Authorised

.....
(Official Address)

Name.....

Designation.....

Common Seal of the
Company.....

Note :

1) **Power of Attorney of the executants of this LETTER OF SUPPORT FROM COLLABORATOR(S) / LICENSOR / TECHNOLOGY PROVIDER is to be furnished.**

2) *** Strike out, whichever is not applicable.**

3) **** Copy of priced purchase order for the equipment shall be furnished by Bidder.**

Signature of authorized signatory.....

Sub :Provenness details for the Condensate Polishing Plant

- A.** In terms of clause no. 4.14 a) of Sub-Section-I A, Part-A of Section-VI, We/our sub-vendor confirm that we have designed, supplied, erected and commissioned at least one (1) Condensate Polishing Plant of mixed bed, deep bed type consisting of service vessel of minimum capacity of 500 M3/hr. The plant has external regeneration system, incorporating the same resin separation and regeneration process as proposed by us/our Sub-vendor for this package. The above plant have been in successful operation for a period of at least one (1) year as per following details:

Sl. No.	Description	Plant-I
1.	Name of Client	
2.	Location of the plant & address with name of contract person(s) with contract tel. & fax no.	
3.	Order No. and Date	
4.	Number and Capacity of Service Vessels (in Cu.m/hr.) in the above plant	
5.	Whether bidder's scope included	
	(i) Design	Yes* / No*
	(ii) Supply	Yes* / No*
	(iii) Erection	Yes* / No*
	(iv) Commissioning	Yes* / No*
6.	Whether the above Condensate Polishing Plant has external regeneration system	Yes* / No*
7.	Process of resin separation and regeneration adopted in the above Condensate Polishing Plant (Bidder to describe)	

Signature of authorized signatory.....

Sl. No.	Description	Plant-I
8.	Whether the process of resin separation and regeneration proposed for this package is same as that of the process adopted in the above Condensate Polishing Plant	Yes* / No*
9.	Date of Commissioning of the Condensate Polishing Plant	
10.	Whether Documentary evidence/ certificate(s) from client enclosed for the above data	Yes* / No*

***Strike off whichever is not applicable.**

Signature of authorized signatory.....

- B.** In terms of clause no. 4.14 (b) of Sub-Section-I A, Part-A of Section-VI, we/our sub-vendor confirm that, we/our sub-vendor is a Contractor in water treatment plant and has executed at least one (1) number ion exchange based demineralising plant of minimum capacity of 60 Cu.m/hr consisting of maximum two (2) streams and associates for this bid with an Associate who in turn fully meets the requirements stipulated at 4.14 (a) of Sub-Section-IA, Part-A, Section-VI above as per following details:

Sl. No.	Description	Plant-I
1.	Name of Client	
2.	Location of the plant & address with name of contact person(s) with contact tel. & fax. no.	
3.	Order No. and Date	
4.	Number of DM Stream(s) executed in the plant	
5.	Capacity of each stream (Cum/hr.)	
6.	Date of Commissioning of the DM Stream(s)	
7.	Whether Documentary evidence/ certificate(s) from client enclosed for the above data (for Sl. No.1 to 6)	Yes/No

Signature of authorized signatory.....

Details of Associate:

In support of qualifying requirements of Clause 4.14(b) of Sub-Section-IA, Part-A of Section-VI Technical Specification, we propose to associate with M/s. We confirm that our Associate have designed, supplied, erected and commissioned at least one (1) Condensate Polishing Plant of mixed bed, deep bed type consisting of service vessel of minimum capacity of 500 M3/hr. The plant has external regeneration system, incorporating the same resin separation and regeneration process as proposed by us for this package. The above plant have been in successful operation for a period of at least one (1) year as per following details.

Sl. No.	Description	Plant-I
1.	Name of Associate	
2.	Location of the plant & address with name of contact person(s) with contact tel. & fax. no.	
3.	Order No. and Date	
4.	Number and Capacity of Service Vessels (in Cum/hr) in the above Plant	
5.	Whether the scope of work included	
	a) Design	Yes*/No*
	b) Supply	Yes*/No*
	c) Erection	Yes*/No*
	d) Commissioning	Yes*/No*
6.	Whether the above Condensate Polishing Plant has external regeneration system	Yes*/No*
7.	Process of resin separation and regeneration adopted in the above Condensate Polishing Plant (Associate to describe)	Yes*/No*

Signature of authorized signatory.....

Sl. No.	Description	Plant-I
8.	Whether the process of resin separation and regeneration proposed for this package is same as that of the process adopted in the above Condensate Polishing Plant	Yes*/No*
9.	Date of Commissioning of the Condensate Polishing Plant	
10.	Whether Documentary evidence/ certificate(s) from client enclosed for the above data (for Sl. No. 3 to 9)	Yes*/No*

*** Strike off whichever is not applicable.**

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

Signature of authorized signatory.....

EPC PACKAGE FOR
SINGARENI TPP 1 X800 MW

BIDDING DOCUMENT NO. CW-CM-11159-C-O-M-001
(For Qualification as per Clause No. 4.19 of Sub-Section-IA, Part-A of Section-VI)

Bidder's Name and Address :

To
Corp Mater
SCCL.
KOTHAGU

1.0 We are qualified under clause no. 4.19.1 of Sub-Section-IA, Part-A, Section-VI of Bidding Documents.

2.0 We are a supplier of ash handling system(s) and have executed ash handling system(s) involving design, engineering, manufacturing/got manufactured, supply, erection /supervised erection and commissioning/ supervised commissioning for the following systems:

We also confirm that the activity of design and engineering for the systems described 2.1(a), 2.1(b) ,2.1(c) , 2.1(d) & 2.1 (e) of this Attachment-3K have been carried out by us

2.1 (a) Bottom Ash Handling System (Strike out whichever is not applicable)

(i) Wet Bottom Ash handling system comprising a jet pump system in conjunction with water impounded Bottom Ash Hopper designed for the conveying capacity of 50 tonnes/hour (dry ash basis) or more per jet pump for pulverised coal fired boilers.

Sl. No.	Name of Plant with location	No. of Units with MW Capacity in which system installed	Design conveying capacity per Jet pump (TPH) referred by client (Documentary evidence attached)	Offered Ash conveying capacity by bidder per Jet Pump (TPH)	Name of Manufacturer (Experience list enclosed)	Date of Commissioning and No. of years in successful operation	Remarks

Note : (a) The reference Bottom Ash Handling System is of the same type i.e. jet pump system as is being offered by us for the present plant
(b) Clients certificate enclosed in support of
(i) Details about above (Yes/No.)
(ii) Successful operation of above plant(s) for at least one (1) years. (Yes/No.)

Signature of authorized signatory.....

(iii) Design agency is engaged for design/vetting of design of bottom ash handling system comprising of Jet pump system in conjunction with Water impounded Bottom ash hopper

(Yes/No.)

(iv) Design of bottom ash handling system comprising of Jet pump system in conjunction with Water impounded Bottom ash hopper done by Bidder

(Yes/No.)

OR

2.1 (a) Wet Bottom Ash Handling system comprising a submerged scrapper chain conveyor system designed for the conveying capacity of 20 tonnes/hour (dry ash basis) or more per conveyor, for pulverised coal fired boilers:

Sl. No.	Name of Plant with location	No. of Units with MW Capacity in which system installed	Design conveying capacity per Scrapper conveyor (TPH) referred by client (Documentary evidence attached)	Offered Ash conveying capacity by bidder per Jet Pump (TPH)	Name of Manufacturer (Experience list enclosed)	Date of Commissioning and No. of years in successful operation	Remarks

Note : (a) The reference Bottom Ash Handling System is of the same type i.e. submerged scrapper chain conveyor system as is being offered by us for the present plant.
(b) Clients certificate enclosed in support of
(i) Details about above (Yes/No.)
(ii) Successful operation of above plant(s) for at least one (1) years. (Yes/No.)

2.1(b) Pneumatic Fly Ash Handling System (Strike out whichever is not applicable)

(i) Pneumatic Fly ash handling system for conveying fly ash from ESPs of a single pulverised coal fired boiler unit, by pressure conveying system designed for 30 TPH or more conveying capacity.

Sl. No.	Name of Plant with location and No. of years in successful operation	No. of Units with MW Capacity in which system installed	Design Remarks conveying capacity (TPH) specified by client	Offered Ash conveying capacity by bidder (TPH)	Name of manufacturer (Experience list enclosed)

Signature of authorized signatory.....

(Documentary
evidence attached)

Note : (a) The reference Pneumatic Fly Ash Handling Systems are of the same type i.e. pressure system as is being offered by us for the present plant.

(b) Clients certificate enclosed in support of

(i) Details about above Yes/No.

(ii) Successful operation of above plants for at least one (1) years. Yes/No.

OR

2.1(b)(ii) Pneumatic Fly ash handling system for conveying fly ash from ESPs of a single pulverised coal fired boiler unit, by vacuum conveying system designed for 30 TPH or more conveying capacity per vacuum extractor.

Sl. No.	Name of Plant with Date of Commissioning and No. of years in location	No. of Units with MW Capacity in successful operation which system installed	Design Remarks conveying capacity (TPH) specified by client (Documentary evidence attached)	Offered Ash conveying capacity by bidder (TPH)	Name of manufacturer (Experience list enclosed)

Signature of authorized signatory.....

Note : (a) The reference Pneumatic Fly Ash Handling Systems are of the same type i.e. vacuum system as is being offered by us for the present plant.

(b) Clients certificate enclosed in support of

(i) Details about above	(Yes/No.)

(ii) Successful operation of above plant(s) for at least one (1) years (Yes/No.)

And

2.1(c) Pneumatic Fly Ash Transportation System for transporting Fly Ash from a pulverized Coal and Boiler unit having capacity of not less than 20 TPH for a conveying distance of not less than 500 mtr.

Sl. No.	Name of Plant with Date of Commissioning and No. of years in location successful operation	No. of Units with MW Capacity in which system installed	Design Fly Ash transportation capacity (TPH) and conveying distance specified by client (Documentary evidence attached)	Offered Ash transportation capacity and conveying distance	Name of manufacturer (Experience list enclosed)	
			Capacity TPH	Conveying distance Mtr.	Capacity TPH	Conveying distance Mtr.

Note : Clients certificate enclosed in support of

(i) Details about above (Yes/No.)

(ii) Successful operation of above plant(s) for at least one (1) years. (Yes/No.)

Signature of authorized signatory.....

2.1 (d) Complete lean ash slurry disposal system for handling not less than 40 tonnes of ash per hour for pulverized coal/Lignite power stations which includes, among others, ash slurry pumps & piping system with associated controls.

S.No	Name of plant with location	No of units with MW capacity in which system installed	Total quantity of ash handled (TPH)	Scope of work alongwith scheme (enclosed with bid)	Name of manufacturer (Experience list enclosed)	Date of commissioning and No of years in successful operation	remarks

Note : Clients certificate enclosed in support of

(i) Details about above (Yes/No.)

(ii) Successful operation of above plant(s) for at least one (1) years. (Yes/No.)

2.1 (e) Complete high concentration ash slurry disposal system for handling not less than 40 tons of ash per hour for coal fired power stations which includes, among others, positive displacement ash slurry pumps & piping system with associated controls

S.No	Name of plant with location	No of units with MW capacity in which system installed	Total quantity of ash handled (TPH)	Scope of work alongwith scheme (enclosed with bid)	Name of manufacturer (Experience list enclosed)	Date of commissioning and No of years in successful operation	remarks

Note : Clients certificate enclosed in support of

Signature of authorized signatory.....

- (ii) Successful operation of above plant(s) for at least one (1) years. (Yes/No.)

3.0 We are qualified under clause 4.19.2 of Sub-Section-IA, Part-A, Section-VI of Bidding Documents.

- a. We have executed Ash Handling Plants for pulverised coal fired boiler units generating not less than 40 TPH of ash per Boiler which includes bottom ash handling system comprising either a jet pump system in conjunction with water impounded Bottom Ash Hopper or submerged scrapper chain conveyor system involving design and engineering either through bidder/its sub vendor or through design agency/agencies, manufacture/got manufactured, supply, erection/supervised erection and commissioning/ supervised commissioning for the following plants (Refer clause no. 4.19.2(a) of Sub-Section-IA, Part-A, Section-VI of bidding documents)

Sl. No.	Name of Plant with manufacturer location (Experience enclosed)	No. of Units Date of with MW Commissioning Capacity in and No. of which system years in succ-installed	Total Remarks Ash generation per boiler (T/Hr)	Total ash handling capacity (bottom+fly ash) (Tonnes/hour) per boiler	Type of Bottom Ash Handling System Supplied	Name design Engineering agency (Experience) list enclosed)

Note : Client's certificate enclosed in support of

- (i) Details about above (Yes/No.)
- (ii) Successful operation of above plant(s) for at least one (1) years. (Yes/No.)

We confirm that we* (or our proposed sub-vendor) have valid collaboration or licensing or Technology transfer agreement agreement for either the total requirement or the balance part under clause 4.19.1 (a), which we/ our sub vendor itself is not able to meet, with M/s The details of type and minimum equipment rating of such equipment are given below :

- 3.1 (a) Bottom Ash Handling System (Strike out whichever is not applicable)

Signature of authorized signatory.....

(i) Wet Bottom Ash handling system comprising a jet pump system in conjunction with water impounded Bottom Ash Hopper designed for the conveying capacity of 50 tonnes/hour (dry ash basis) or more per jet pump for pulverised coal fired boilers.

Sl. No.	Name of Plant with location	No. of Units with MW Capacity in which system installed	Design conveying capacity per Jet pump (TPH) referred by client (Documentary evidence attached)	Offered Ash conveying capacity by bidder per Jet Pump (TPH)	Name of Manufacturer (Experience list enclosed)	Date of Commissioning and No. of years in successful operation	Remarks

Note : (a) The reference Bottom Ash Handling System is of the same type i.e. jet pump system as is being offered by us for the present plant
 (b) Clients certificate enclosed in support of
 (i) Details about above (Yes/No.)
 (ii) Successful operation of above plant(s) for at least one (1) years. (Yes/No.)
 OR

3.1 (a) (ii) Wet Bottom Ash Handling system comprising a submerged scrapper chain conveyor system designed for the conveying capacity of 20 tonnes/hour (dry ash basis) or more per conveyor, for pulverised coal fired boilers:

Sl. No.	Name of Plant with location	No. of Units with MW Capacity in which system installed	Design conveying capacity per Scrapper conveyor (TPH) referred by client (Documentary evidence attached)	Offered Ash conveying capacity by bidder per Jet Pump (TPH)	Name of Manufacturer (Experience list enclosed)	Date of Commissioning and No. of years in successful operation	Remarks

Note : (a) The reference Bottom Ash Handling System is of the same type i.e. submerged scrapper chain conveyor system as is being offered by us for the present plant.
 (b) Clients certificate enclosed in support of
 (i) Details about above (Yes/No.)

Signature of authorized signatory.....

(ii) Successful operation of above plant(s) for at least one (1) years. (Yes/No)

And

Signature of authorized signatory.....

3.2 We are a supplier of ash handling systems and have executed ash handling plant for pulverised coal fired boiler unit, generating not less than 40 TPH of ash per Boiler which includes fly ash handling system for conveying fly ash from ESPs in dry form (involving pneumatic conveying systems of vacuum or pressure type) involving design and engineering either through bidder/it's sub vendor or through design agency/agencies, manufacture/got manufactured, supply, erection/supervised erection, and commissioning/ supervised commissioning for the following plants (Refer clause no. 4.19.2(b) of sub-section-IA, Part-A, Section-VI of bidding documents).

- (a) (i) Pneumatic Fly ash handling system for conveying fly ash from ESPs of a single pulverised coal fired boiler unit, by pressure conveying system designed for 30 TPH or more conveying capacity.

S.No	Name of plant with location	No of units with MW capacity in which system installed	Design conveying capacity (TPH) specified by client (Documentary evidence attached)	Offer ash conveying capacity by bidder (TPH)	Name of manufacture (experience list enclosed)	Date of commissioning and No. of years in successful operation	Name of design and engineering agency (experience list enclosed)	Remarks

Note : (a) The reference Pneumatic Fly Ash Handling Systems are of the same type i.e. pressure system as is being offered by us for the present plant.

- (b) Clients certificate enclosed in support of

- (i) Details about above Yes/No.
(ii) Successful operation of above plants for at least one (1) years. Yes/No.

We confirm that we* (or our proposed sub-vendor) have valid collaboration or licensing or Technology transfer agreement agreement for either the total requirement or the balance part under clause 4.19.1 (b), which we/ our sub vendor itself is not able to meet, with M/s The details of type and minimum equipment rating of such equipment are given below :

- (i) Pneumatic Fly ash handling system for conveying fly ash from ESPs of a single pulverised coal fired boiler unit, by pressure conveying system designed for 30 TPH or more conveying capacity.

Sl. No.	Name of Date of Commissioning Plant with and No. of years in	No. of Units with MW	Design Remarks conveying	Offered Ash conveying	Name of manufacturer

Signature of authorized signatory.....

location successful operation	Capacity in which system installed	capacity (TPH) specified by client (Documentary evidence attached)	capacity by bidder (TPH)	(Experience list enclosed)

Note : (a) The reference Pneumatic Fly Ash Handling Systems are of the same type i.e. pressure system as is being offered by us for the present plant.

(b) Clients certificate enclosed in support of

(i) Details about above Yes/No.

(ii) Successful operation of above plants for at least one (1) years. Yes/No.

OR

3.2 (a) (ii) Pneumatic Fly ash handling system for conveying fly ash from ESPs of a single pulverised coal fired boiler unit, by vacuum conveying system designed for 30 TPH or more conveying capacity per vacuum extractor.

S.No	Name of plant with location	No of units with MW capacity in which system installed	Design conveying capacity (TPH) specified by client (Documentary evidence attached)	Offer ash conveying capacity by bidder (TPH)	Name of manufacture (experience list enclosed)	Date of commissioning and No. of years in successful operation	Name of design and engineering agency (experience list enclosed)	remarks

Signature of authorized signatory.....

Note : (a) The reference Pneumatic Fly Ash Handling Systems are of the same type i.e. vacuum system as is being offered by us for the present plant.

(b) Clients certificate enclosed in support of

(i) Details about above (Yes/No.)

(ii) Successful operation of above plant(s) for at least one (1) years (Yes/No.)

We confirm that we* (or our proposed sub-vendor) have valid collaboration or licensing or Technology transfer agreement agreement for either the total requirement or the balance part under clause 4.19.1 (b), which we/ our sub vendor itself is not able to meet, with M/s The details of type and minimum equipment rating of such equipment are given below :

(a) (ii) Pneumatic Fly ash handling system for conveying fly ash from ESPs of a single pulverised coal fired boiler unit, by vacuum conveying system designed for 30 TPH or more conveying capacity per vacuum extractor.

Sl. No.	Name of Date of Commissioning Plant with and No. of years in location successful operation	No. of Units with MW Capacity in which system installed	Design Remarks conveying capacity (TPH) specified by client (Documentary evidence attached)	Offered Ash conveying capacity by bidder (TPH)	Name of manufacturer (Experience list enclosed)

Note : (a) The reference Pneumatic Fly Ash Handling Systems are of the same type i.e. vacuum system as is being offered by us for the present plant.

(b) Clients certificate enclosed in support of

(i) Details about above (Yes/No.)

(ii) Successful operation of above plant(s) for at least one (1) years (Yes/No.)

Signature of authorized signatory.....

And

We confirm that we* (or our proposed sub-vendor) have valid collaboration/association agreement for either the total requirement or the balance part under clause 4.19.1 (c), which we/ our sub vendor itself is not able to meet, with M/s The details of type and minimum equipment rating of such equipment are given below :

- b. (b) Pneumatic Fly Ash Transportation System for transporting Fly Ash from a pulverized Coal and Boiler unit having capacity of not less than 20 TPH for a conveying distance of not less than 500 mtr.

S.No	Name of plant with location	No of units with MW capacity in which system installed	Design transportation capacity (TPH) specified by client (Documentary evidence attached)	Offer ash transportation capacity by bidder (TPH)	Name of manufacture (experience list enclosed)	Date of commissioning and No. of years in successful operation	Name of design and engineering agency (experience list enclosed)	remarks

Note : Clients certificate enclosed in support of

(i) Details about above (Yes/No.)

(ii) Successful operation of above plant(s) for at least one (1) years. (Yes/No.)

And

3.3. We confirm that we* (or our proposed sub-vendor) have valid collaboration/association agreement for either the total requirement or the balance part under clause 4.19.1 (d), which we/ our sub vendor itself is not able to meet, with M/s The details of type and minimum equipment rating of such equipment are given below :

Signature of authorized signatory.....

Complete Ash slurry disposal system for handling not less than 40 tonnes of ash per hour for coal fired power stations which includes, among others, ash slurry pumps & piping system with associated controls.

S.No	Name of plant with location	No of units with MW capacity in which system installed	Total quantity of ash handled (TPH)	Scope of work along with scheme (enclosed with bid)	Name of manufacturer (Experience list enclosed)	Date of commissioning and No of years in successful operation	remarks

Note : Clients certificate enclosed in support of

(i) Details about above (Yes/No.)

(ii) Successful operation of above plant(s) for at least one (1) years. (Yes/No.)

3.4. We confirm that we* (or our proposed sub-vendor) have valid collaboration/association agreement for either the total requirement or the balance part under clause 4.19.1 (e), which we/ our sub vendor itself is not able to meet, with M/s The details of type and minimum equipment rating of such equipment are given below :

Complete high concentration ash slurry disposal system for handling not less than 40 tons of ash per hour for coal fired power stations which includes, among others, positive displacement ash slurry pumps & piping system with associated controls.

S.No	Name of plant with location	No of units with MW capacity in which system installed	Total quantity of ash handled (TPH)	Scope of work along with scheme (enclosed with bid)	Name of manufacturer (Experience list enclosed)	Date of commissioning and No of years in successful operation	remarks

Signature of authorized signatory.....

Note : Clients certificate enclosed in support of

(i) Details about above (Yes/No.)

(ii) Successful operation of above plant(s) for at least one (1) years. (Yes/No.)

4.0 We are qualified under clause 4.19.3 of Sub-Section-IA, Part-A, Section-VI of Bidding Documents. We confirm that we* /our proposed sub-vendor is an EPC organization in Collaboration with QAHPM (Qualified Ash Handling Plant Manufacturer):

a. The Bidder/Bidder's sub-vendor is an Engineering, Procurement and Construction (EPC) organization and have executed, in the last 10 years, industrial projects on EPC basis (with or without civil works) in the area of Power, Steel, Oil & Gas, Petro-chemical, Fertilizer, Flue Gas Desulphurisation and/or any other process industry with the total value of such projects being INR 4,000 million or more. At least one of such projects have a contract value of INR 1,600 million or more. These projects shall be in successful operation for a period of not less than one (1) year.

- i. Name of EPC Sub-Vendor:
- ii. Area of Project:
- iii. Total value of Project:
- iv. Total value of one such project:
- v. No of years of successful operation:

b. The Bidder/Bidder's sub-vendor have a valid ongoing collaboration and technology transfer/licensing agreement with a QAHPM meeting requirements of clause 4.19.1 on its own, valid minimum up to the end of the defect liability period of the contract. In such a case, Bidder/Bidder's sub-vendor shall either source the AHP System from such manufacturer or manufacture/get manufactured the AHP System as per the design and manufacturing drawings released by such QAHPM.

Name of QAHPM (Qualified Ash Handling Plant Manufacturer):

Details of QAHPM (Qualified Ash Handling Plant Manufacturer):

i. Bottom Ash Handling System (Strike out whichever is not applicable)

Signature of authorized signatory.....

Wet Bottom Ash handling system comprising a jet pump system in conjunction with water impounded Bottom Ash Hopper designed for the conveying capacity of 50 tonnes/hour (dry ash basis) or more per jet pump for pulverised coal fired boilers.

Sl. No.	Name of Plant with location	No. of Units with MW Capacity in which system installed	Design conveying capacity per Jet pump (TPH) referred by client (Documentary evidence attached)	Offered Ash conveying capacity by bidder per Jet Pump (TPH)	Name of Manufacturer (Experience list enclosed)	Date of Commissioning and No. of years in successful operation	Remarks

Note : (a) The reference Bottom Ash Handling System is of the same type i.e. jet pump system as is being offered by us for the present plant
 (b) Clients certificate enclosed in support of
 (i) Details about above (Yes/No.)
 (ii) Successful operation of above plant(s) for at least one (1) years. (Yes/No.)
 OR

Wet Bottom Ash Handling system comprising a submerged scrapper chain conveyor system designed for the conveying capacity of 20 tonnes/hour (dry ash basis) or more per conveyor, for pulverised coal fired boilers:

Sl. No.	Name of Plant with location	No. of Units with MW Capacity in which system installed	Design conveying capacity per Scrapper conveyor (TPH) referred by client (Documentary evidence attached)	Offered Ash conveying capacity by bidder per Jet Pump (TPH)	Name of Manufacturer (Experience list enclosed)	Date of Commissioning and No. of years in successful operation	Remarks

Note : (a) The reference Bottom Ash Handling System is of the same type i.e. submerged scrapper chain conveyor system as is being offered by us for the present plant.
 (b) Clients certificate enclosed in support of
 (i) Details about above (Yes/No.)

Signature of authorized signatory.....

Signature of authorized signatory.....

(ii) Successful operation of above plant(s) for at least one (1) years (Yes/No.)

And
Pneumatic Fly Ash Transportation System for transporting Fly Ash from a pulverized Coal and Boiler unit having capacity of not less than 20 TPH for a conveying distance of not less than 500 mtr. including fly ash storage silo.

Sl. No.	Name of Plant with Date of Commissioning and No. of years in location successful operation	No. of Units with MW Capacity in which system installed	Design Fly Ash Remarks transportation capacity (TPH) and conveying distance specified by client (Documentary evidence attached)	Offered Ash transportation capacity and conveying distance	Name of manufacturer (Experience list enclosed)	of
			Capacity TPH	Conveying distance Mtr.	Capacity TPH	Conveying distance Mtr.

Signature of authorized signatory.....

Note : Clients certificate enclosed in support of

(i) Details about above (Yes/No.)

(ii) Successful operation of above plant(s) for at least one (1) years. (Yes/No.)

AND

iii) Bottom Ash Slurry disposal System: Complete ash lean slurry disposal system for handling not less than 40 tonnes of ash per hour for coal fired power stations which includes, among others, ash slurry pumps & piping system with associated controls.

S.No	Name of plant with location	No of units with MW capacity in which system installed	Total quantity of ash handled (TPH)	Scope of work alongwith scheme (enclosed with bid)	Name of manufacturer (Experience list enclosed)	Date of commissioning and No of years in successful operation	remarks

Note : Clients certificate enclosed in support of

(i) Details about above (Yes/No.)

(ii) Successful operation of above plant(s) for at least one (1) years. (Yes/No.)

AND

iv) Fly Ash slurry disposal system: Complete high concentration ash slurry disposal system for handling not less than 40 tons of ash per hour for coal fired power stations which includes, among others, positive displacement ash slurry pumps & piping system with associated controls.

Signature of authorized signatory.....

S.No	Name of plant with location	No of units with MW capacity in which system installed	Total quantity of ash handled (TPH)	Scope of work alongwith scheme (enclosed with bid)	Name of manufacturer (Experience list enclosed)	Date of commissioning and No of years in successful operation	remarks

Note : Clients certificate enclosed in support of

(i) Details about above (Yes/No.)

(ii) Successful operation of above plant(s) for at least two (2) years. (Yes/No.)

Bidder confirms to furnish letter of support from Collaborator/ Licensor /Technology provider for successful performance of the AHP system valid up to the end of defect liability period of the contract as per the format enclosed in the bidding document, at the time of placement of order on the approved sub-vendor.

Bidder confirms that the Technology transfer/Licensing agreement between the Bidder, Bidder's sub-vendor & QAHPM shall cover transfer/licensing of technological knowhow for AHP system in the form of transfer/licensing of design dossier, design software's, drawings and documentation, quality system manuals and imparting relevant personnel training to the Bidder/Bidder's sub-vendor.

Annexure- LETTER OF SUPPORT_4.19.3

Letter of Support/Technology Transfer/Licensing agreement to be executed by the Bidder/Contractor, Bidder's Sub vendor and Collaborator & Technology Provider/Licensor (QAHPM) meeting the requirement of clause 4.19.3 of sub-section-I-A, Part A

1. We, the Collaborator & Technology Provider/Licensor, and the Contractor *and *his Sub-Vendor, do hereby declare and undertake that we shall be jointly and severally responsible to the Employer for the design, execution, and successful performance of the complete Ash handling System and all the contractual

Signature of authorized signatory.....

obligations including the technical guarantees for the complete Ash handling System, as specified under the said Contract(s) to the satisfaction of the Employer.

2. We the Collaborator & Technology Provider/Licenser do hereby undertake, declare, and confirm that we shall be fully responsible for the successful performance of the ash handling System and undertake to carry out all the obligations and responsibilities under this Technology transfer/Licensing agreement to discharge the Contractor's obligations stipulated under the Contract.
3. Further the manner of achieving the objectives set forth in paragraph 1 above shall be as follows:
 - (d) We, the Collaborator & Technology Provider/Licenser shall be fully responsible for complete design, engineering, preparation of all designs, design calculations, design documents/drawings, and manufacturing drawings including all its internals; preparation of all P&IDs & process flow diagrams; Selection of auxiliaries, and interfacing/ integrating with their auxiliaries so as to ensure satisfactory, reliable, safe and trouble free performance meeting all stipulated technical requirements as well as all guaranteed parameters specified in the Contract for Ash handling System.
 - (e) We, the Collaborator & Technology Licenser shall extend our quality surveillance/ supervision/ quality control to the Contractor during manufacture, erection, commissioning, and performance testing, both at Contractor's/Sub-vendor" works and/ or at Employer's project site and shall depute technical experts from time to time to the Contractor's/ Sub-vendor's works/ Employer's project site, as mutually agreed upon between the Employer and the Contractor.
 - (f) In the event the Collaborator & Technology Provider/Licenser and the Contractor and his Sub-Vendor fail to demonstrate that the ash handling System meets the guaranteed parameters and demonstration parameters as specified in the contract, the Collaborator & Technology Provider/Licenser and the Contractor and his Sub-Vendor shall promptly carry out all the corrective measures related to engineering services at their own expense and shall promptly provide corrected design to the Employer.
 - (g) We, the Collaborator & Technology Licenser shall participate in Technical Coordination Meetings (TCMs) from time to time, as and when required by the Employer.
4. We, the Contractor and his Sub-Vendor and the Collaborator & Technology Provider/Licenser do hereby undertake and confirm that this Technology transfer agreement/Licensing agreement **shall** be valid until the end of the defect liability period.
5. The Contractor will be fully responsible for the complete design, engineering, supply, erection, commissioning, quality of all the equipment/main assemblies/components manufactured at their works or at their Vendors' works or constructed at site, and their repair or replacement, if necessary, for incorporation in the Plant and timely delivery thereof to meet the completion schedule under the Contract.

Signatures of Contractor, Contractor's Sub-Vendor, Collaborator & Technology Provider/Licenser

1. For M/s

Signature of authorized signatory.....

(Contractor)

(Signature of the Authorised Representative, Official Address)

2. For M/s.....
(Contractor's Sub-Vendor)

(Signature of the Authorised Representative, Official Address)

3. For M/s
(Collaborator & Technology Provider/Licenser)

(Signature of the Authorised Representative, Official Address)

LETTER OF SUPPORT FOR SATISFACTORY PERFORMANCE OF (Name of Equipment) FOR
KORBA WEST STPP,STAGE-IV(2X660 MW), CSPGCL, KORBA WEST

TO:

[EMPLOYERS NAME & ADDRESS]

Sub: Letter of Support submitted From (name of the Associate /Collaborator*/Technology provider*/Licensor*/Qualified equipment manufacturer*) undertaking the responsibility for satisfactory performance of(name of the equipment).

Dear Sirs,

1. In accordance with the Award of the Contract by (Name of the Contractor) to M/s. (Name of the sub-vendor), we the aforesaid Associate /Collaborator*/Technology provider*/Licensor*/Qualified equipment manufacturer*, (M/s) shall be fully responsible for the satisfactory performance of the (Equipment name).

Signature of authorized signatory.....

2. Further, the manner of achieving the objective set forth in point 1 above shall be as follows:

For (Equipment name):

- (A) We shall provide and shall be fully responsible for design, engineering & commissioning, manufacturing and assembly drawings of..... (Equipment name).
..... (Equipment name) shall be manufactured and supplied as per above design provided by us and the drawings approved by Employer.
- (B) We shall depute technical experts to Bidder's/sub-vendor's works for supervision during manufacturing, assembly, erection, commissioning and final testing (as and when necessary) of the..... (Equipment name).
- (C) We shall promptly carry out all the corrective measures and shall promptly provide corrected design and shall undertake replacements, rectifications or modifications to the equipment as required in case the equipment fails to demonstrate successful performance as per contract at site.
- (D) We shall participate in Technical Co-ordination meetings (TCMs) from time to time, as and when required by Employer

3. We, the Associate /Collaborator*/Technology provider*/Licensor*/Qualified equipment manufacturer* do hereby undertake and confirm that this Letter of Support shall be valid for a period of seven (7) years or up to the end of defect liability period of the contract, whichever is later.

Signature of the Authorised Representative:.....

For M/s

(Associate*/Collaborator*/Technology provider*/Licensor/ Qualified equipment manufacturer*)

Name

Designation

Date:.....

Common Seal of the Company

*: Strike off whichever is not applicable.

Signature of authorized signatory.....

For Qualification as per Clause No. 4.19.4 of Sub-Section-IA, Part-A of Section-VI

In conformity with the requirements specified under clause 4.19.4(a) Sub section-IA, Section -VI, Part-A of Horizontal centrifugal pump module, we have offered Ash Slurry pumps manufactured by M/s who have in the past supplied and installed ash slurry pumps for similar duty application and have at least two (2) nos. pumps of the same models that are being offered having capacity not less than 1000 cubic meters per hour at each of two (2) different stations which are in successful operation for at least one (1) years prior to the date of Techno-Commercial bid opening. In support of the above, we furnish below the following details.

- i) Name of Ash Slurry pumps manufacturer :
- ii) The above pump manufacturer have supplied and Yes / No
installed at least two (2) nos. Ash slurry pumps of
parameters as specified in Clause 4.19.4(a), sub
section-IA, Section-VI, Part-A
- iii) Details of the Power Plants at which Ash Slurry Pumps
of the above make as specified in Clause 4.19.4(a),
sub section -IA, Section-VI, Part-A
 - a) Name of the Power Plant :
 - b) Pump Model :
 - c) Size of Pumps :
 - d) Number of pumps :
 - e) Capacity of the pump (m³ / hr.) :
 - f) Total dynamic Head of the pump (mwc) :
 - g) Concentration (by wt.) of the slurry and the
maximum particle size handled :
 - h) Date of commissioning of ash handling system :
 - i) Whether the pumps are in successful operation prior to Techno-Commercial bid ` opening(Attach certificate from Client) :

Signature of authorized signatory.....

AND

In conformity with the requirements specified under clause 4.19.4(b) Sub section-IA, Section -VI, Part-A of Positive Displacement Pumps of HCSD system module, we have offered Positive Displacement Pumps for High Concentration Slurry Disposal System manufactured by M/s who have in the past supplied and installed Positive Displacement Pumps of HCSD System for similar duty application and have at least two (2) nos. pumps of the same models that are being offered having capacity not less than 150 cubic meters per hour which are in successful operation for at least one (1) years prior to the date of Techno-Commercial bid opening. In support of the above, we furnish below the following details.

- i) Name of Positive Displacement Pumps of HCSD System manufacturer :
- ii) The above pump manufacturer have supplied and Yes / No
installed at least two (2) nos. Positive Displacement Pumps of HCSD System of
parameters as specified in Clause 4.19.4(b), sub
section-IA, Section-VI, Part-A
- iii) Details of the Power Plants at which **Positive Displacement Pumps for the HCSD System**
of the above make as specified in Clause 4.19.4(b),
sub section -IA, Section-VI, Part-A
 - a) Name of the Power Plant :
 - b) Pump Model :
 - c) Size of Pumps :
 - d) Number of pumps :
 - e) Capacity of the pump (m3 / hr.) :
 - f) Total dynamic Head of the pump (mwc) :
 - g) Concentration (by wt.) of the slurry and the
maximum particle size handled :
 - h) Date of commissioning of ash handling system :
 - i) Whether the pumps are in successful operation prior to Techno-Commercial bid ` opening(Attach certificate from Client) :

Signature of authorized signatory.....

LETTER OF SUPPORT FOR SATISFACTORY PERFORMANCE OF (Name of Equipment) FOR
KORBA WEST STPP,STAGE-IV(2X660 MW), CSPGCL, KORBA WEST
EPC PACKAGE

TO:

[EMPLOYERS NAME & ADDRESS]

Sub: Letter of Support submitted From (name of the Associate /Collaborator*/Technology provider*/Licensor*/Qualified equipment manufacturer*) undertaking the responsibility for satisfactory performance of(name of the equipment).

Dear Sirs,

4. In accordance with the Award of the Contract by (Name of the Contractor) to M/s. (Name of the sub-vendor), we the aforesaid Associate /Collaborator*/Technology provider*/Licensor*/Qualified equipment manufacturer*, (M/s) shall be fully responsible for the satisfactory performance of the (Equipment name).
5. Further, the manner of achieving the objective set forth in point 1 above shall be as follows:
For (Equipment name):
 - (E) We shall provide and shall be fully responsible for design,engineering & commissioning, manufacturing and assembly drawings of..... (Equipment name). (Equipment name) shall be manufactured and supplied as per above design provided by us and the drawings approved by Employer.
 - (F) We shall depute technical experts to Bidder's/sub-vendor's works for supervision during manufacturing, assembly, erection, commissioning and final testing (as and when necessary) of the..... (Equipment name).
 - (G) We shall promptly carry out all the corrective measures and shall promptly provide corrected design and shall undertake replacements, rectifications or modifications to the equipment as required in case the equipment fails to demonstrate successful performance as per contract at site.

Signature of authorized signatory.....

- (H) We shall participate in Technical Co-ordination meetings (TCMs) from time to time, as and when required by Employer
6. We, the Associate /Collaborator*/Technology provider*/Licensor*/Qualified equipment manufacturer* do hereby undertake and confirm that this Letter of Support shall be valid for a period of seven (7) years or up to the end of defect liability period of the contract, whichever is later.

Signature of the Authorised Representative:.....
For M/s

(Associate*/*Collaborator/*Technology provider/*Licensor/ Qualified equipment manufacturer*)

Name
Designation
Date:.....

Common Seal of the Company

*: Strike off whichever is not applicable.

COLLABORATOR'S/LICENSOR/ASSOCIATED EXPERIENCE FOR ASH HANDLING SYSTEM

	1	2	3	4
Name and address of the collaborator/licensor/associate				
System for which collaboration/licensing/association made				

Signature of authorized signatory.....

M/s(Our collaborator/licensor/associate) are a supplier of ash handling systems having executed ash handling systems involving design, engineering, manufacture, supply, erection and commissioning for the following systems. We also confirm that the activity of design and engineering for the systems described in this Attachment- 3K have been carried out by the collaborator/licensor/associate of the relevant system, himself and through external design agency/agencies.

Signature of authorized signatory.....

EPC PACKAGE FOR
SINGARENI STPP STAGE-II (1X800 MW)
BIDDING DOCUMENT NO CW-CM-11159-C-O-M-001
(Experience List of Bidder)

Bidder's Name and Address :

To
SCCL, Kothagudem,

Dear Sirs,

Sub : Sub-Qualifying Requirements for the Coal Handling Plant Package.

1. To satisfy the requirements of Item no. 4.20 of Sub-Section-IA, Part-A, Section-VI of Bidding Documents, we furnish the following details:

* We M/s.....(Bidder/Sub-vendor) have filled in the requisite Qualifying Requirement (QR) details in line with requirements of Clause No. 4.20.1 of Sub-Section-IA, Part-A, Section-VI of Bidding Documents in Attachment-3K which establishes our meeting the QR.

--
* **Sub-vendor to strike out whichever is not applicable.**

I. Applicable to Sub-vendor meeting Sub-QR as per Clause No. 4.20.1 of Sub-Section-IA, Part-A, Section-VI.

To satisfy the requirement of Clause No. **4.20.1 of Sub-Section-IA, Part-A, Section-VI**. We give below the details:

A. Qualifying Requirement details as per Clause 4.20.1 of Sub-Section-IA, Part-A, Section-VI.

In accordance with Clause No. **4.20.1 of Sub-Section-IA, Part-A, Section-VI**, we confirm that we have designed,engineered/got engineered manufactured/got manufactured, erected/supervised erection and commissioned/supervised commissioning at least one (1) number integrated bulk material handling plant (essentially comprising of conveying and crushing) including all associated structural steel works and electrical works of 1000 Metric tonnes per hour rated capacity or above for coal or other minerals of equivalent volumetric capacity, which is in successful operation for at least one (1) year. The details of the qualifying plant are as under:

1. Name of the client :.....
2. Complete address of Client :.....
with name of contact person(s),

Signature of authorized signatory.....

e-mail, Fax and Tel No.

3. Name & Location of the Plant :
4. Contract / Order No. & Date :
5. Date of commissioning :
6. Conveying and crushing capacity (in Metric tonnes/hour) :
7. Materials handled alongwith its bulk density :
8. Whether the System is in operation Yes*/No*
9. No. of years of successful operation
10. Whether bidder's/ its Sub Vendor scope included
 - (a) Design Yes*/No*
 - (b) Engineered Yes*/No*
 - (c) Got engineered Yes*/No*
 - (d) Manufactured Yes*/No*
 - (e) Got manufactured Yes*/No*
 - (f) Erected Yes*/No*
 - (g) Supervised Erection Yes*/No*
 - & Commissioned Yes*/No*
 - (i) Supervised Commissioning Yes*/No*
11. Whether the scope of work included all associated civil & structural steel and Electrical Works Yes*/No*
12. Client's certificate enclosed at Annexure..... to this Attachment-3K in support of :
 - (i) Details sought at item Nos. 3 thru 11 above. Yes*/No*
 - (ii) Successful operation of above Plant for at least one (1) Year. Yes*/No*

Signature of authorized signatory.....

*** Please strike out whichever is not applicable.**

Signature of authorized signatory.....

- (B) In accordance with clause no. 4.20.2 of Sub-Section-IA, Part-A, Section-VI, we have designed, manufactured, supplied, erected and commissioned including all associated structural steel works and electrical works of atleast one (1) number cantilever boom type, slewable and luffable, bucket wheel type travelling stacker-cum-reclaimer suitable for stacking and reclaiming at a rated capacity of 1000/1000 Metric Tonnes per hour (or above) for coal or other mineral of equivalent volumetric capacity, which is in successful operation for atleast one (1) year. The details of the qualifying plant are as follows:

1. Name of client with full address, contact person(s), Fax no. and Tel no.
2. Name & Location of the plant
3. Order no. and Date of order
4. Date of commissioning
5. Details of stacker/reclaimer
 - (a) Rated Capacity
 - (i) Stacking (MTPH)
 - (ii) Reclaiming (MTPH) (average)
 - (b) Cantilever boom type, Slewable & luffable *Yes/No
 - (c) Bucket wheel type: * Yes/No
 - (d) Travelling type * Yes/No
 - (e) Boom Length (mtr.):
6. Material handled alongwith its bulk density
7. Whether work executed as prime contractor or sub-contractor
8. Whether system is in operation Yes*/No*
9. No. of years of successful operation
10. Scope of work

Signature of authorized signatory.....

(i)	Whether bidder's scope included	:	*Yes/No
	(a) Design	:	Yes/No
	(b) Manufacturing	:	Yes/No
	(c) Supply	:	Yes/No
	(d) Erection	:	Yes/No
	(e) Commissioning	:	Yes/No
(ii)	Whether scope of work included all associated structural steel and Electrical works	:	*Yes/No
11. Clients certificate enclosed at Annexure..... to this Attachment-3K in support of
- | | | | |
|------|--|---|-----------|
| (i) | Details sought out item nos. 3 through 11 above | : | *Yes / No |
| (ii) | Successful operation of above for at least one (1) year. | : | *Yes / No |

* **Strike out whichever is not applicable.**

Date :	Signature).....
Place :	(Printed Name).....
	(Designation).....
	(Common seal).....

Signature of authorized signatory.....

(C) **SCHEDULE OF QUALIFICATION REGARDING WAGON TIPPLER.**

In conformity with the requirements specified under clause 4.20.3 Sub section-IA, Section -VI, Part-A of Wagon Tippler module, we have offered Wagon Tippler manufactured / supplied by M/s who has supplied minimum one (1) no. side discharge wagon tippler suitable for tipping Indian Railway Wagons used for transportation of coal or other minerals which are in successful operation for at least one (1) year. In support of the above, we furnish below the following details :

PLANT – 1

(1) Name of Manufacturer

(2) Experience and Details

(i) Clients Name and Address

(ii) Type

(iii) Years of Commissioning

(iv) Number supplied

(v) Rated Tipping rate

(M) **CERTIFICATE FROM CLIENT ENCLOSED** YES NO

Signature of authorized signatory.....

SUB : SUB-QUALIFYING REQUIREMENTS FOR THE FUEL OIL SYSTEM

In order to satisfy the requirement of bidder/subvendor's experience, as indicated in Technical Specification clause no. 4.21.0, Sub-Section-IA, Section-VI, Part-A, we declare that we, M/s..... have engineered/ got engineered, supplied, erected, tested and commissioned atleast one (1) no. of Fuel Oil Handling and storage installations, which is in successful operation for minimum one(1) year consisting of :

- i) Fuel Oil decanting facilities for road tankers/railway wagons.
- ii) Fuel oil Storage tanks of capacity not less than 500 cubic meters each.

The details are given below :

Sl. No.	Description	Station-I	Station-II
1.	Name and address of manufacturer		
2.	Client's Name & its address		
3.	Name & Location of the Plant		
4.	Contract / Order No. & Date		
5.	Date of commissioning		
6.	Capacity of storage tank	Cu.M	Cu.M
7.	No. of above said storage tank		
8.	Scope of the work for the aforesaid contract including		
	(i) Engineering		
	(ii) Got Engineered		Yes*/No*
			Yes*/No*
	(iii) Supply	Yes*/No*	Yes*/No*
	(iii) Erection		
	(iv) Testing	Yes*/No*	Yes*/No*
	(v) Commissioning	Yes*/No*	Yes*/No*

Signature of authorized signatory.....

Sl. No.	Description	Station-I	Station-II
9	Date of commencement of successful operation		
10.	No. of years in successful operation		
11.	Client's certificate(s) enclosed as Annexure..... to this Attachment-3K		

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

*** Strike out whichever is not applicable.**

Signature of authorized signatory.....

SINGARENI TPP STAGE-I (1X800 MW))
BIDDING DOCUMENT NO. CW-CM-11159-C-O-M-001
[Qualifying Requirement Data/ Provenness Data (as applicable)]

Bidder's Name and Address :

To
SCCL
Kothagudem 507101

**DETAILS OF PROVENNESS OF THE
OFFERED GENERATOR AS PER
CLAUSE NO. 5.1.0 Sub-Section-IA,
PART-A, SECTION-VI OF BIDDING DOCUMENTS**

	Reference Generator	Offered Generator
(a)	Name of the Station and its Location	
(b)	Client Name and its Address, Fax and Tel. No.	
(c)	Name and Designation of the responsible person in Client's Organisation	
(d)	Contract No. & Date	
(e)	Date of commissioning	
(f)	Date of commencement of successful operation	
(g)	Generator Make	
(h)	Model No.	
(i)	MVA Rating	
(j)	MW Rating	
(k)	Rated Voltage	
(l)	Cooling Medium (e.g. Water, hydrogenetc)	
	(i) Stator Core	
	(ii) Stator Winding	
	(iii) Rotor	

Signature of authorized signatory.....

		Reference Generator	Offered Generator
(m)	Number of shaft mounted fans		
(n)	Thermal Class of Insulation		
	(i) Stator		
	(ii) Rotor		
(o)	Type of Excitation System		
(p)	Details of Core & Core support system (e.g. Spring type/ Rigid type etc.)		
(q)	Factory /Works where the Generator rating equal to 500 MW or more was Manufactured, assembled &tested		
(r)	Factory/works where the offered Generator is proposed to be Manufactured, assembled and tested		
(s)	Latest/recent certificate from client that the generator with above technical parameters is in successful operation for a minimum period of one (1) year prior to the date of Techno- Commercial Bid opening (actual time period to be mentioned) and caused no serious problem in past, is enclosed at Annexure.... to this Attachment-3K no serious problem in past, is enclosed at Annexure.... to this Attachment-3K		

Signature of authorized signatory.....

	Reference Generator	Offered Generator
(t)	List of above Generators (with date of supply) already manufactured, assembled & tested in the factory/works mentioned at S.No.(R1) above is enclosed at Annexure.... to this Attachment-3K	

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

Signature of authorized signatory.....

**EPC PACKAGE FOR
SINGARENI TPP STAGE-I (1X800 MW)
BIDDING DOCUMENT NO. CW-CM-11159-C-O-M-001**

Bidder's Name and Address :

To
SCCL
Kothagudem 507101

SUB : Sub-Qualifying Requirements for the Isolated Phase Busduct

(A) We/ subvendor..... have designed, manufactured, supplied, *erected / *supervised erection and *commissioned/ *supervised commissioning of Isolated phase busduct for a Turbo-Generator of at least 500 MW, which is in successful operation for a period of at least two (2) years as on the date of consideration for approval but not later than six months after award date of the package as per stipulated requirements mentioned at Clause No. 5.2.0 of Sub-Section A-1, Part-A, Section-VI of Bidding documents. The details of the same are given below :

- a) Name of the Plant and its Location
- b) Client's name, his address with Fax No.
- c) Rating of Turbo Generator (MW)
- d) Number of Units
- e) Busduct rating (in KV & KA)
- f) Brief Scope of work
- g) Date of Award of Contract
- h) Value of Order
- i) Date of commissioning
- j) No. of years in successful operation as on date of consideration for approval but not later than six months after award date of the package :
- k) Certificate from client in support of above i.e. from (a) to (j) including capacity of Turbo Generator, Bus duct Rating, year and month of Commissioning, period of successful operation and that the above Isolated Phase bus duct installed by us have caused no serious problem in the

Signature of authorized signatory.....

past, is furnished this proposal
at Annexure.....

Date : (Signature).....

Place : (Printed Name).....

(Designation)

(Company Seal).....

Note :

1. Continuation sheet of like size & format may be used, if required.
2. * Please strikeoff whichever is not applicable.

Signature of authorized signatory.....

18.00.00

Sub QR Data to be filled in to meet the provenness requirements (Refer Clause No. 5.6.0 of Sub-Section-I intent of specification, Part-A, Section-VI. for LT SWITCHGEAR

S.No. Item Description

1.1 No. of Air circuit breaker panels and/or draw out motor control centre panels manufactured and supplied, under a single order, with fault rating of at least 45kA for one (1) second and 105kA peak which are in successful operation for at least two (2) years.
(under Route 1)

1.01.00 Name & address of Manufacturer

1.02.00 Name of the plant and its location

1.03.00 Client(s) name and its address, Fax and Tel. No.

1.04.00 Name and designation of the responsible person in client's organisation

1.05.00 Contract No. & Date

Whether manufactured and supplied the referred Air Circuit breaker panels

1.06.00 /MCC panels

(YES/NO)

1.07.00 Fault rating

KA (rms)

Time (Sec.)

KA (Peak)

1.08.00 No. of draw out type MCC panels supplied

1.09.00 No. of draw out type Air Circuit breaker panels supplied

1.10.00 Date of commissioning

1.11.00 No. of years in Successful operation

1.12.00 Certificate in support of above stated experience including capacity of Plant, Year & Month of Commissioning of Plant & descriptive scheme of plant for which the data has been indicated and that the above system installed above have caused no serious problem in the past is enclosed at Annexure

1.2 No. of Air circuit breakers having fault rating of at least 45kA rms BREAKING,

Signature of authorized signatory.....

105kA peak MAKING and 45kA withstand for one (1) second, and their associated draw out type Air circuit breaker panels having fault rating of at least 45kA for one (1) second and 105kA peak, manufactured and supplied which are in successful operation for at least two (2) years.
(under Route 1)

- 1.01.00 Name & address of Manufacturer
- 1.02.00 Name of the stations and its location
- 1.03.00 Client(s) name and its address, Fax and Tel. No.
- 1.04.00 Name and designation of the responsible person in client's organisation
- 1.05.00 Contract No. & Date
- 1.06.00 Whether manufactured and supplied the referred Air Circuit Breakers and their associated draw out type Air Circuit Breaker panels (YES/NO)
- 1.07.00 Air Circuit Breakers having fault rating:
(i) Rated current (A)
(ii) Breaking Capacity (KA rms)
(iii) Making Capacity (KA peak)
- 1.08.00 Draw out type Air Circuit Breaker panels having fault rating:
(i) KA (rms)
(ii) Time (Sec)
(iii) KA (peak)
- 1.09.00 Date of commissioning
- 1.10.00 No. of years in Successful operation
- 1.11.00 Certificate in support of above stated experience including capacity of Plant, Year & Month of Commissioning of Plant & descriptive scheme of plant for which the data has been indicated and that the above system installed above have caused no serious problem in the past is enclosed at Annexure

Signature of authorized signatory.....

- 1.3 No. of Air circuit breaker panels and/or draw out motor control centre panels manufactured and supplied, under a single order, with fault rating of at least 45kA for one (1) second and 105kA peak which are in successful operation for at least two (2) years.
(under Route 2)
- 1.01.00 Name & address of Manufacturer
- 1.02.00 Name of the plant and its location
- 1.03.00 Client(s) name and its address, Fax and Tel. No.
- 1.04.00 Name and designation of the responsible person in client's organisation
- 1.05.00 Contract No. & Date
- 1.06.00 Whether manufactured and supplied the referred Air Circuit breaker panels /MCC panels (YES/NO)
- 1.07.00 Fault rating
KA (rms)
Time (Sec.)
KA (Peak)
- 1.08.00 No. of draw out type MCC panels supplied
- 1.09.00 No. of draw out type Air Circuit breaker panels supplied
- 1.10.00 Date of commissioning
- 1.11.00 No. of years in Successful operation
- 1.12.00 Certificate in support of above stated experience including capacity of Plant, Year & Month of Commissioning of Plant & descriptive scheme of plant for which the data has been indicated and that the above system installed above have caused no serious problem in the past is enclosed at Annexure

Signature of authorized signatory.....

S.No.	Item Description
1.4	No. of draw out type Air circuit breaker panels manufactured and supplied with fault rating of at least 45kA for one (1) second and 105kA peak which are in successful operation for at least two (2) years. (under Route 2)
1.01.00	Name & address of Manufacturer
1.02.00	Name of the stations and its location
1.03.00	Client(s) name and its address, Fax and Tel. No.
1.04.00	Name and designation of the responsible person in client's organisation
1.05.00	Contract No. & Date
1.06.00	Whether manufactured and supplied the referred Air Circuit Breaker panels (YES/NO)
1.07.00	Draw out type Air Circuit Breaker panels having fault rating: (iv) KA (rms) (v) Time (Sec) (vi) KA (peak)
1.08.00	Date of commissioning
1.09.00	No. of years in Successful operation
1.10.00	Certificate in support of above stated experience including capacity of Plant, Year & Month of Commissioning of Plant & descriptive scheme of plant for which the data has been indicated and that the above system installed above have caused no serious problem in the past is enclosed at Annexure
1.5	Bidder's / Sub Vendor's Associate or Collaborator or Technology Provider or Licensor data to meet qualifying requirement stipulated in Route 1. (under Route-2)
1.5.1	No. of Air circuit breaker panels and/or draw out motor control centre panels manufactured and supplied, under a single order, with fault rating of at least 45kA for one

Signature of authorized signatory.....

(1) second and 105kA peak which
are in successful operation for at least two (2) years.
(under Route 2)

- Name & address of Manufacturer (Associate or Collaborator or Technology
Provider or Licensor)
- 1.01.00
- 1.02.00 Name of the plant and its location
- 1.03.00 Client(s) name and its address, Fax and Tel. No.
- 1.04.00 Name and designation of the responsible person in client's organisation
- 1.05.00 Contract No. & Date
- 1.06.00 Whether manufactured and supplied the referred Air Circuit breaker panels /MCC panels (YES/NO)
- 1.07.00 Fault rating
KA (rms)
Time (Sec.)
KA (Peak)
- 1.08.00 No. of draw out type MCC panels supplied
- 1.09.00 No. of draw out type Air Circuit breaker panels supplied
- 1.10.00 Date of commissioning
- 1.11.00 No. of years in Successful operation
- 1.12.00 Certificate in support of above stated experience
including capacity of Plant, Year & Month of
Commissioning of Plant & descriptive scheme of
plant for which the data has been indicated and that the
above system installed above have caused no
serious problem in the past is enclosed at
Annexure
- 1.5.2 No. of Air circuit breakers having fault
rating of at least 45kA rms BREAKING,
105kA peak MAKING and 45kA withstand
for one (1) second, and their associated
draw out type Air circuit breaker panels
having fault rating of at least 45kA for one (1)
second and 105kA peak, manufactured
and supplied which are in successful
operation for at least two (2) years.
(under Route 2)
- Name & address of Manufacturer
(Associate or Collaborator or Technology
Provider or Licensor)
- 1.01.00
- 1.02.00 Name of the stations and its location

Signature of authorized signatory.....

- 1.03.00 Client(s) name and its address, Fax and Tel. No.
- 1.04.00 Name and designation of the responsible person in client's organisation
- 1.05.00 Contract No. & Date
- 1.06.00 Whether manufactured and supplied the referred Air Circuit Breakers and their associated draw out type Air Circuit Breaker panels (YES/NO)
- 1.07.00 Air Circuit Breakers having fault rating:
(iv) Rated current (A)
(v) Breaking Capacity (KA rms)
(vi) Making Capacity (KA peak)
- 1.08.00 Draw out type Air Circuit Breaker panels having fault rating:
(vii) KA (rms)
(viii) Time (Sec)
(ix) KA (peak)
- 1.09.00 Date of commissioning
- 1.10.00 No. of years in Successful operation
- 1.11.00 Certificate in support of above stated experience including capacity of Plant, Year & Month of Commissioning of Plant & descriptive scheme of plant for which the data has been indicated and that the above system installed above have caused no serious problem in the past is enclosed at Annexure
- 1.12 The letter of technical support by Associate/ Collaborator /Technology Provider / Licensor provided **(under Route-2)**. (Yes/No)

-
- Note :** 1) Certificates from the client for the successful operation for each of the above shall be Submitted.
- 2) Supporting documents/ reference data as applicable shall be submitted.

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

Signature of authorized signatory.....

19.00.00

Sub QR Data to be filled in to meet the provenness requirements (Refer Clause No. 5.7.0 of Sub-Section-I intent of specification, Part-A, Section-VI) **for 11kV / 6.6kV / 3.3 KV SWITCHGEARS**

S.No.	Item Description

1.1 No. of 6.6 kV or above Switchgear panels manufactured and supplied with fault rating of at least 40kA for one (1) second and 100kA peak, which are in successful operation for at least two (2) years .

1.01.00 Name & address of Manufacturer

1.02.00 Name of the Station and its location

1.03.00 Client(s) name and its address, Fax & Tel No.

1.04.00 Name and designation of the responsible person in client's organisation

1.05.00 Contract No. & Date

1.06.00 Voltage rating of the Switchgear panels manufactured & supplied

1.07.00 Fault rating

KA (rms)

Time (Sec)

KA (Peak)

Signature of authorized signatory.....

- 1.08.00 Date of commissioning
- 1.09.00 No. of years in Successful operation
- 1.10.00 Certificates from client(s) in support of above stated experience including capacity of Plant, Year & Month of Commissioning of Plant & descriptive scheme of the plant for which the data has been indicated and that the above system installed above have caused no serious problem in the past is enclosed at Annexure
- 1.2 No. of Vacuum Circuit breakers manufactured and supplied for 6.6 kV or above panels with a rating of 40 kA rms BREAKING, 100kA peak MAKING and 40kA withstand for one (1) second, which are in successful operation in 6.6kV or higher voltage application for a period of at least two (2) years.
- 1.01.00 Name & address of Manufacturer
- 1.02.00 Name of the station and its location
- 1.03.00 Client(s) name and its address, Fax No. & Tel no.
- 1.04.00 Name and designation of the responsible person in Client's organisation
- 1.05.00 Contract Number and date
- 1.06.00 Rated Current (A)
- 1.07.00 RMS Breaking Capacity (kA)
- 1.08.00 Peak Making Capacity (KA)

Signature of authorized signatory.....

1.09.00 Fault rating

KA (rms)

Time (Sec)

1.10.00 Voltage class

1.11.00 Date of Commissioning

1.12.00 No. of years in successful operation

1.13.00 Certificate from Client(s) in support of the above stated experience including capacity of Plant, year & month of commissioning of plant & descriptive scheme of the plant for which the data has been indicated and the above system installed have caused no serious problem in the past is enclosed at Annexure.....

-
- Note :**
- 1) Certificates from the client for the successful operation for each of the above shall be Submitted.
 - 2) Supporting documents/ reference data as applicable shall be submitted.

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

Signature of authorized signatory.....

20.00.00

Sub QR Data to be filled in to meet the provenness requirements (Refer Clause No. 5.8.0 of Sub-Section-I intent of specification, Part-A, Section-VI. **for Numerical Relays & Networking**

S.No.	Item Description

1.1 No. of Numerical relays with
IEC 61850 used for application
in Feeder protections/Transformer
protections / Motor protections
manufactured, supplied and successfully
configured by manufacturer which are in
successful operation for at least two (2) years

1.01.00 Name & address of Manufacturer

1.02.00 Name of the plant and its location

1.03.00 Client(s) name and its address, Fax and Tel.
No.

1.04.00 Name and designation of the responsible
person in client's organisation

1.05.00 Contract No. & Date

1.06.00 Date of commissioning

1.07.00 No. of years in successful operation
for above relays

1.08.00 Certificate from client(s) in support of
the above stated experience has been
enclosed at Annexure.....

2.1 No. of communicable Numerical
Relays in the network on IEC
61850 manufactured/integrated and successfully
done Site Acceptance Test (SAT) by the manufacturer /
integrator

2.01.00 Name & address of Manufacturer /
Integrator

2.02.00 Name of the plant and its location

2.03.00 Client(s) name and its address, Fax and Tel.
No.

Signature of authorized signatory.....

2.04.00 Name and designation of the responsible person in client's organisation

2.05.00 Contract No. & Date

2.06.00 Date of commissioning/SAT

2.07.00 Certificate from client in support of above stated experience/data has been enclosed at Annexure.....

- Note :**
- 1) Certificates from the client for the successful operation as applicable shall be Submitted.
 - 2) Supporting documents/ reference data as applicable shall be submitted.

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

Signature of authorized signatory.....

21.00.00

Sub QR Data to be filled in to meet the provenness requirements (Refer Clause No. 5.9.0
of Sub-Section-I intent of specification, Part-A, Section-VI) **for Battery**

S.No.	Item Description

1.1 Numbers, Rating and type of the
Battery manufactured and supplied
and installed at two (2) different
industrial installations and which
are in successful operation for
at least two (2) years

1.01.00 Name & address of Manufacturer

1.02.00 Name of the plant(s) and its location(s)

1.03.00 Client(s) name and its address, Fax and Tel.
No.

1.04.00 Name and designation of the responsible
person in client's organisation

1.05.00 Contract No. & Date

1.06.00 Date of commissioning

1.07.00 No. of years in successful operation
for above batteries

1.08.00 Certificate from client(s) in support of
the above stated experience has been
enclosed at Annexure.....

Note : 1) Certificates from the client for the successful operation for each of the above
shall be Submitted.

2) Supporting documents/ reference data as applicable shall be submitted.

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

Signature of authorized signatory.....

22.00.00

Sub QR Data to be filled in to meet the provenness requirements (Refer Clause No. 5.4.0
of Sub-Section-I intent of specification, Part-A, Section-VI) **for Battery Charger**

S.No.	Item Description
1.1	Numbers and Rating of static auto- matic voltage regulator type battery chargers manufactured and supplied and installed at two (2) different industrial installations and which are in successful operation for at least two (2) years.
1.01.00	Name & address of Manufacturer
1.02.00	Name of the plant(s) and its location(s)
1.03.00	Client(s) name and its address, Fax and Tel. No.
1.04.00	Name and designation of the responsible person in client's organisation
1.05.00	Contract No. & Date
1.06.00	Date of commissioning
1.07.00	No. of years in successful operation for above Battery chargers
1.08.00	Certificate from client(s) in support of the above stated experience has been enclosed at Annexure.....

- Note :**
- 1) Certificates from the client for the successful operation for each of the above shall be Submitted.
 - 2) Supporting documents/ reference data as applicable shall be submitted.

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

Signature of authorized signatory.....

Sub : Sub-Qualifying Requirements for the BFP Motor (Refer Clause No. 5.3.0 of Sub-Section-IA, Part-A, Section-VI.

S.No.	Item Description	Station-I
BFP MOTOR		
1.00.00	Name of the manufacturer and its address	
1.00.01	Name of the Station and its Location	
1.01.00	Client Name and its Address, Fax No. & Tel. Nos.	
1.01.01	Name and Designation of the responsible person in Client's Organisation	
1.01.02	Contract No. & Date	
1.01.03	Rating of Motor in MW	
1.01.04	Date of Commissioning	
1.01.05	Date of Commencement of Operation	
1.01.06	Whether the Motors are in Successful Operation for atleast two (2) years as on the date of consideration for approval but not later than six months after award date of the package	Yes/No
1.01.07	Technical Particulars	
	(a) Make	
	(b) KW Rating at 50 deg.C. ambient (10MW or more)	
	(c) Rated Voltage (KV)	
	(d) Motor Type (Squirrel Cage)	Yes/No
	(e) Frame Size & Type Designation	

Signature of authorized signatory.....

(f) Type & Class of Insulation

(g) Type of Cooling

(h) Reference Standard

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

Signature of authorized signatory.....

Sub : Sub-Qualifying Requirement of ID Fan Motor (Refer Clause No. 5.3.0 of Sub-Section-IA, Part-A, Section-VI).

S.No.	Item Description

ID FAN MOTOR

- (i) Name of the manufacturer and its address
- (ia) Name of the station and its location
- (ii) Client name and its address,
 - Fax No. & Tel. No.
 - e-mail id
 - website address
- (iii) Name and Designation of the responsible person in client's organisation
- (iv) Name of the manufacturers & address
- (v) Contract No. & Date
- (vi) Rating of motor in MW
- (vii) Date of commissioning
- (viii) Date of commencement of operation
- (ix) Whether the motors are in successful operation for a period not less than one (1) year
(.....)

#Yes/#No

Signature of authorized signatory.....

S.No.	Item Description	
(x)	Technical Particulars	
(a)	Make	
(b)	KW rating at 50°C ambient, (4MW or above)	
(c)	Rated voltage (KV)	
(d)	Motor type *(squirrel cage)	Yes/No
(e)	Frame size & type designation	
(f)	Type & class of insulation	
(g)	Type of cooling	
(h)	Reference standard	

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

Signature of authorized signatory.....

Sub-Qualifying Requirements for the CW Motor (Refer Clause No. 5.3.0 of Sub-Section-IA, Part-A, Section-VI.

S.No.	ItemDescription	Station-I	Station-2
CW MOTOR			
1.0.0	Name of themanufacturer and its address		
1.0.1	Name of the Station and itsLocation		
1.1.0	Client Name and itsAddress, Fax No. & Tel. Nos.		
1.1.1	Name and Designation ofthe responsible person in Client's Organisation		
1.1.2	Contract No. &Date		
1.1.3	Quantity & Rating of Motor in KW		
1.1.4	Date ofCommissioning		
1.1.5	Date ofCommencement of Operation		
1.1.6	Whether the Motors arein Successful Operation for a period of not less than two (2) Years prior to the dateof techno-commercialbidopening		Yes/No
1.1.7	TechnicalParticulars (a) Make		

Signature of authorized signatory.....

S.No.	ItemDescription	Station-I	Station-2

(b)	KW Rating at 50 deg.C ambient		
(c)	Rated Voltage (KV)		
(d)	Motor Type (Squirrel Cage)	Yes/No	
(e)	DOL started	Yes/No	
(f)	Frame Size & Type Designation		
(g)	Type & Class of Insulation		
(h)	Type of Cooling		
(i)	Vertical	Yes/No	
(j)	Motor speed not exceeding 500rpm synchronous	Yes/No	
(k)	Reference Standard		

Date : (Signature).....

Place : (PrintedName).....

(Designation).....

(Common seal).....

Signature of authorized signatory.....

Sub : Sub-Qualifying Requirement of HT Cables

In support of supplier experience as indicated in Technical specification, clause no. 5.10 of Sub-Section-IA, Part-A, Section-VI, we declare that the supplier/sub-vendor have manufactured and supplied the following cables.

- (i) Atleast 50 Kms of XLPE insulated power cables of 6.35/11 KV or higher voltage grade, executed in one or more orders.
- (ii) Atleast one (1) Km of flame retardant low smoke cables of any voltage level.
- (A) The details of above cables at (i) are given as under* :

Sl.No.	Particulars	
1.	Client name and its address, fax no. & telephone no.	
2.	Name & Designation of the responsible person in client's organisation	
3.	Name, Address, telephone no. & fax no. of the user of the cables	
4.	Name & designation of the responsible person in user's organisation	
5.	Contract No. and date	
6.	Details of XLPE insulated power cables of 6.35/11 KV or higher voltage grade	
(i)	Manufactured	Yes/No
(ii)	Supplied	Yes/No
(iii)	Rated voltage of cable	 KV
(iv)	Type and size of Cable	

Signature of authorized signatory.....

Sl.No.	Particulars
(v)	Total Quantity supplied Km

7. User's Certificate of Cable enclosed

(B) The details of above cables at (ii) are given as under :

Sl.No.	Particulars
1.	Client name and its address, fax no. & telephone no.
2.	Name & Designation of the responsible person in client's organisation
3.	Name, Address, telephone no. & fax no. of the user of the cables
4.	Name & designation of the responsible person in user's organisation
5.	Contract No. and date
6.	Details of Flame Retardant Low Smoke cables of any voltage level
(i)	Manufactured Yes/No
(ii)	Supplied Yes/No
(iii)	Rated Voltage of Cable KV
(iv)	Type and size of Cable
(v)	Total Quantity supplied Km
7.	User's Certificate of Cable enclosed

Signature of authorized signatory.....

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

Note :

1. Continuation sheets of like size and format may be used as per the Sub-vendor's requirement and shall be annexed to this Schedule.
2. Sub-vendor is required to attach necessary documents like copies of work order, completion certificates, agreements, drawings etc. in support of

* If the quantity ordered is less than 50 Km in one order than please furnish the details for other orders in same format.

Signature of authorized signatory.....

Sub : Sub-Qualifying Requirements for the DG Sets

- A) In support of Supplier Experience as indicated in Technical Specification clause 5.11 of Sub-Section-IA, Part-A, Section-VI, we furnish details of DG Sets as below :-

Sl. No.	Item Description	Installation No.1	Installation No.2

(i) Details of DG sets

- (a) Name of Bidder/Sub-vendor
- (b) Name of the client
- (c) Complete Address of client, phone no. & fax no.
- (d) Name of responsible person in client's organisation
- (e) Location of Plant/installation where DG sets supplied
- (f) No. of DG sets supplied
- (g) Rating of DG sets (not less than 1500 KVA)
- (h) Make of Alternator in the supplied DG set
- (i) Make of Engine in the supplied DG set
- (j) Date of commissioning
- (k) No. of years of successful operation

Signature of authorized signatory.....

Sl. No.	Item Description	Installation No.1	Installation No.2
(I)	Documentary evidence/ Certificate in support of above is enclosed	Yes*/*No	Yes*/*No

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common Seal).....

*** Strike off whichever is not applicable.**

Signature of authorized signatory.....

**EPC PACKAGE FOR
Singareni THERMAL POWER PROJECT STAGE II
BIDDING DOCUMENT NO.:**

Bidder's Name and Address:

To

**Corp Material
Procurement Dept
SCCL, Kothagudem.**

Dear Sirs,

1. Details Pertaining to Technical Qualification of the Bidder as per Item No. 5.5.1A of the Technical Specification

(A) Qualification on its own experience (applicable for bidders/sub-vendor seeking Qualification under clause 5.5.1A.1 of Technical Specification)

We confirm that we have designed, manufactured and supplied at least two (2) nos. (one each at two different installations) of 400 KV or above class Generator transformers of at least 200 MVA capacity (either three phase transformer as a single unit or single phase transformer), which have been in successful operation for at least two (2) years. The details of the same are given below.

Sl. No.	Item Description	Installation 1	Installation 2
1.	Name of the Plant and its location		
2.	Client Name and its Address, Fax and Tel.No.		
3.	Name and Designation of the Responsible Person in Client's Organisation		

Signature of authorized signatory.....

4.	Contract No. & Date		
5.	Voltage rating of Transformer (KV)		
6.	MVA rating of Transformer		
7.	Whether Single phase or Three phase		
8.	Voltage class of Transformer		
9.	Date of Commissioning of Transformer		
10.	Date of commencement of Successful operation.		
11.	Number of years of Successful Operation prior to the date of Techno-Commercial bid opening.		
12.	Scope of work executed for aforesaid Transformers included the following : (i) Design (ii) Manufacture (iii) Installation (iv) Supervision of Installation (v) Commissioning (vi) Supervision of Commissioning	YES* / NO* YES* / NO* YES* / NO* YES* / NO* YES* / NO* YES* / NO*	YES* / NO* YES* / NO* YES* / NO* YES* / NO* YES* / NO* YES* / NO*
13.	Documentary evidence in support of above enclosed		
14.	Certificate(s) from the Client(s) & copy of LOA/P.O. are enclosed along with the bid at Annexure- to this Attachement-3K		

(B) (i) Qualification along with Associate/Collaborator/ Technology provider/ Licensor applicable for Bidders seeking Qualification under clause 5.5.1A.2 of Technical Specification)

Signature of authorized signatory.....

We have designed, manufactured and supplied at least two (2) numbers of 220 KV or above class transformers which have been in successful operation for two years (2) and have established manufacturing facilities for 400KV Class transformers in India based on the technological support from our Associate / Collaborator/Technology provider/ Licensor, who meets the stipulated requirement in respect of Clause 5.5.1A.1 of Technical Specification. The details of our qualification are given below:

Sl. No.	Item Description	Installation 1	Installation 2
1.	Name of the Plant and its location		
2.	Client Name and its Address, Fax and Tel. No.		
3.	Name and Designation of the Responsible Person in Clients Organisation		
4.	Contract No. & Date		
5.	Voltage rating of Transformer (KV)		
6.	MVA rating of Transformer		
7.	Whether Single phase or Three phase		
8.	Voltage class of Transformer		
9.	Date of Commissioning of Transformer		
10.	Date of commencement of Successful operation.		
11.	Number of years of Successful Operation prior to the date of Techno-Commercial bid opening.		
12.	Scope of work executed for aforesaid Transformers included the following :		
	(i) Design	YES* / NO*	YES* / NO*
	(ii) Manufacture	YES* / NO*	YES* / NO*
	(iii) Installation	YES* / NO*	YES* / NO*
	(iv) Supervision of Installation	YES* / NO*	YES* / NO*
	(v) Commissioning	YES* / NO*	YES* / NO*
	(vi) Supervision of Commissioning	YES* / NO*	YES* / NO*
13.	Whether manufacturing facility for 400KV Class transformers available based on technological support of Associate/Collaborator/Technology provider/ Licensor	YES* / NO*	YES* / NO*

Signature of authorized signatory.....

14.	Documentary evidence in support of Sl. No. 13 above enclosed	YES* / NO*	YES* / NO*
15.	Certificate(s) from the Client(s) & copy of LOA/P.O. are enclosed along with the bid at Annexure- to this Attachment-3A-1	YES* / NO*	YES* / NO*
16.	Whether undertaking jointly executed by Bidder and his Associate/Collaborator/Technology provider/ Licensor, as per format enclosed in bidding documents, for the successful performance of the Equipment, submitted along with the bid.	YES* / NO*	YES* / NO*

(B) (ii) Bidder's Associate/Collaborator/ Technology provider/ Licensor Qualification Data as per clause 5.5.1A.1 of Technical Specification)

We confirm that We have associated/collaborated with M/s who have designed, manufactured and supplied at least two (2) numbers (one each at two different installations) of 400 KV or above class Generator transformers of at least 200 MVA capacity (either three phase transformer as a single unit or single phase transformer), which have been in successful operation for at least two years (2). The details of the same are given below.

Sl. No.	Item Description	Installation 1	Installation 2
1.	Name of the Associate / Collaborator		
2.	Address of Associate / Collaborator including Tel. No. and Fax no.		
3.	Name of the Plant and its Location		
4.	Client Name and its Address, including Tel. No. and Fax no.		
5.	Name and designation of the responsible person in Clients Organisation.		
6.	Contract No. & Date		
7.	Voltage class of Transformer		
8.	MVA rating of Transformer		

Signature of authorized signatory.....

9.	Whether single phase or Three phase		
10.	Date of Commissioning of Transformer		
11.	Date of commencement of Successful operation		
12.	Number of years of Successful Operation prior to the date of Techno-Commercial bid opening.		
13.	Scope of work executed for aforesaid Transformers included the following :		
	(i) Design	YES* / NO*	YES* / NO*
	(ii) Manufacture	YES* / NO*	YES* / NO*
	(iii) Installation	YES* / NO*	YES* / NO*
	(iv) Supervision of Installation	YES* / NO*	YES* / NO*
	(v) Commissioning	YES* / NO*	YES* / NO*
	(vi) Supervision of Commissioning	YES* / NO*	YES* / NO*
14.	Documentary evidence in support of above enclosed	YES* / NO*	YES* / NO*
15.	Certificate(s) from the Client(s) & copy of LOA/P.O. are enclosed along with the bid at Annexure- to this Attachement- 3A-1	YES* / NO*	YES* / NO*

Note:

*** Please Strike off whichever is not applicable**

Date: (Signature).....

Place: (Printed Name).....

(Designation).....

(Company Seal).....

Signature of authorized signatory.....

Dear Sirs,

2. Details Pertaining to Technical Qualification of the Bidder as per Item No. 5.5.2A of the Technical Specification

(A) Qualification on its own experience (applicable for bidders/sub-vendor seeking Qualification under clause 5.5.2A.1 of Technical Specification)

We confirm that we have designed, manufactured and supplied 400 KV or above class shunt reactors of at least 50 MVAR capacity (either three phase as a single unit or bank of three single phase reactors of at least 16.67 MVAR each) which have been in successful operation at two (2) different installations for at least two (2) years. The details of the same are given below.

Sl. No.	Item Description	Installation 1	Installation 2
1.	Name of the Plant and its location		
2.	Client Name and its Address, Fax and Tel.No.		
3.	Name and Designation of the Responsible Person in Client's Organisation		
4.	Contract No. & Date		
5.	Voltage rating of Reactor (KV)		
6.	MVAR rating of Reactor		
7.	Whether Single phase or Three phase		
8.	Voltage class of Reactor		
9.	Date of Commissioning of Reactor		
10.	Date of commencement of Successful operation.		
11.	Number of years of Successful Operation prior to the date of Techno-Commercial bid opening.		

Signature of authorized signatory.....

12.	Scope of work executed for aforesaid Reactor included the following: (i) Design (ii) Manufacture (iii) Installation (iv) Supervision of Installation (v) Commissioning (vi) Supervision of Commissioning	YES* / NO* YES* / NO* YES* / NO* YES* / NO* YES* / NO* YES* / NO*	YES* / NO* YES* / NO* YES* / NO* YES* / NO* YES* / NO* YES* / NO*
13.	Documentary evidence in support of above enclosed		
14.	Certificate(s) from the Client(s) & copy of LOA/P.O. are enclosed along with the bid at Annexure- to this Attachment- 3K		

Signature of authorized signatory.....

- (B) (i) Qualification along with Associate/Collaborator/ Technology provider/ Licensor applicable for Bidders seeking Qualification under clause 5.5.2A.2 of Technical Specification)

We have designed, manufactured and supplied at least two (2) no. 400 KV or above class transformer / 220 KV or above class reactor which have been in successful operation for two (2) years and have established manufacturing facilities for 400 KV class shunt reactors in India based on technological support of its Associate or Collaborator or Technology provider or Licensor, who meets the stipulated requirement in respect of Clause 5.5.2A.1 of Technical Specification. The details of our qualification are given below:

Sl. No.	Item Description	Installation 1	Installation 2
1.	Name of the Plant and its location		
2.	Client Name and its Address, Fax and Tel. No.		
3.	Name and Designation of the Responsible Person in Clients Organisation		
4.	Contract No. & Date		
5.	Voltage rating of Reactor (KV)		
6.	MVA rating of Reactor		
7.	Whether Single phase or Three phase		
8.	Voltage class of Reactor		
9.	Date of Commissioning of Reactor		
10.	Date of commencement of Successful operation.		
11.	Number of years of Successful Operation prior to the date of		

Signature of authorized signatory.....

	Techno-Commercial bid opening.		
12.	Scope of work executed for aforesaid Reactor included the following : (i) Design (ii) Manufacture (iii) Installation (iv) Supervision of Installation (v) Commissioning (vi) Supervision of Commissioning	YES* / NO* YES* / NO* YES* / NO* YES* / NO* YES* / NO* YES* / NO*	YES* / NO* YES* / NO* YES* / NO* YES* / NO* YES* / NO* YES* / NO*
13.	Whether manufacturing facility for 400KV Class transformers available based on technological support of Associate/Collaborator/Technology provider/ Licensor	YES* / NO*	YES* / NO*
14.	Documentary evidence in support of Sl. No. 13 above enclosed	YES* / NO*	YES* / NO*
15.	Certificate(s) from the Client(s) & copy of LOA/P.O. are enclosed along with the bid at Annexure- to this Attachment-3A-1	YES* / NO*	YES* / NO*
16.	Whether undertaking jointly executed by Bidder and his Associate/Collaborator/Technology provider/ Licensor, as per format enclosed in bidding documents, for the successful performance of the Equipment, submitted along with the bid.	YES* / NO*	YES* / NO*

Signature of authorized signatory.....

(B) (ii) Bidder's Associate/Collaborator/ Technology provider/ Licensor Qualification Data as per clause 6.5.2A.1 of Technical Specification)

We confirm that we have designed, manufactured and supplied 400 KV or above class shunt reactors of at least 50 MVAR capacity (either three phase as a single unit or bank of three single phase reactors of at least 16.67 MVAR each) which have been in successful operation at two (2) different installations for at least two (2) years. The details of the same are given below.

Sl. No.	Item Description	Installation 1	Installation 2
1.	Name of the Associate / Collaborator		
2.	Address of Associate / Collaborator including Tel. No. and Fax no.		
3.	Name of the Plant and its location		
4.	Client Name and its Address, including Tel. No. and Fax no.		
5.	Name and designation of the responsible person in Client's organisation.		
6.	Contract No. & Date		
7.	Voltage class of Reactor		
8.	MVA rating of Reactor		
9.	Whether single phase or Three phase		
	Date of Commissioning of Reactor		
10.	Date of commencement of Successful operation.		
11.	Number of years of Successful Operation prior to the date of Techno-Commercial bid opening.		
12.	Scope of work executed for aforesaid Transformers included the following :		
	(i) Design	YES* / NO*	YES* / NO*

Signature of authorized signatory.....

	(ii) Manufacture	YES* / NO*	YES* / NO*
	(iii) Installation	YES* / NO*	YES* / NO*
	(iv) Supervision of Installation	YES* / NO*	YES* / NO*
	(v) Commissioning	YES* / NO*	YES* / NO*
	(vi) Supervision of Commissioning	YES* / NO*	YES* / NO*
14.	Documentary evidence in support of above enclosed	YES* / NO*	YES* / NO*
15.	Certificate(s) from the Client(s) & copy of LOA/P.O. are enclosed along with the bid at Annexure-..... to this Attachment-3A-1	YES* / NO*	YES* / NO*

*** Please Strike off whichever is not applicable**

Date: (Signature).....

Place: (Printed Name).....

(Designation).....

(Company Seal).....

Signature of authorized signatory.....

3. Details Pertaining to Technical Qualification of the Bidder as per Item No. 5.5.3A (a) of the Technical Specification:

We hereby confirm that we have designed, manufactured & supplied, at least two (2) numbers (one each at two different installations) of 132 kV or above class transformers of at least 110MVA capacity, which have been in successful operation for at least two (2). The details of the same are given below.

Sl. No.	Item Description	Installation 1	Installation 2
1.	Name of the Plant and its location		
2.	Client Name and its Address, Fax and Tel. No.		
3.	Name and Designation of the Responsible Person in Clients Organisation		
4.	Contract No. & Date		
5.	Voltage ratio		
6.	MVA rating of Transformer		
7.	Voltage class of Transformer		
8.	Date of Commissioning of Transformer		
9.	Date of commencement of Successful operation.		
10.	Scope of work executed for aforesaid Transformers included the following		
	(i) Design	YES* / NO*	YES* / NO*
	(ii) Manufacture	YES* / NO*	YES* / NO*
	(iii) Supply	YES* / NO*	YES* / NO*
11.	Certificate(s) from the Client(s) & copy of LOA/P.O. are enclosed along with the bid at Annexure-..... to this Attachment-3A-1	YES* / NO*	YES* / NO*

Signature of authorized signatory.....

B. Details Pertaining to Technical Qualification of the Bidder as per Item No. 5.5.3A (b) of the Technical Specification:

In accordance with Clause 5.5.3A (b) of Technical specification, We hereby confirm that we have our own facilities for conducting all routine and type tests on Transformers as per IS :

2026 (except short circuit test). The details of the same are given below:

Sl. No.	Name of Test	YES* / NO*

Note:

1. Bidder's to use their own format for giving details of all routine and type test facilities available with them.
2. Certificates from client(s) must also be attached as Annexure to this Attachment-3K.

Signature of authorized signatory.....

C. Details Pertaining to Technical Qualification of the Bidder as per Item No. 5.5.3A (c) of the Technical Specification:

In accordance with clause 5.5.3A (c) , we hereby confirm that we have manufactured 90 MVA, 132 kV or higher rating oil filled transformer, which have been successfully short circuit tested. The details of the same are given below:

Sl. No.	Item Description	Installation
1.	Name of the station and its location	
2.	Client Name and its Address, including Tel. No. and Fax no.	
3.	Name and designation of the responsible person in Clients organisation.	
4.	Contract No. & Date	
5.	Voltage ratio	
6.	MVA rating of Transformer	
7.	Voltage class of Transformer	
	Short Circuit test carrying agency (Test Lab)- Name and Address	
8.	Date of Short Circuit test	
9.	Short circuit test conducted successfully	YES* / NO*
10.	Certificate(s) from the Client(s) & copy of LOA/P.O. are enclosed along with the bid at Annexure to this Attachment-3K	YES* / NO*

Signature of authorized signatory.....

Sub QR Data to be filled in to meet the proveness requirements (Refer Clause No. 5.12.1 of Sub-Section-IA proveness, Part-A, Section-VI. **for AUXILIARY OIL FILLED TRANSFORMERS AND HT TRANSFORMERS**

- (I) We hereby confirm that We/Subvendor M/s have manufactured & supplied atleast two (2) numbers (One each at two different installations) of 16MVA, 11 KV or higher rating oil filled transformers which have been in successful operation for a period of atleast two (2) years as per stipulated requirements mentioned at Clause No.5.12.1.1 of Sub-Section- IA proveness, Part-A of Section-VI. The details of the same are given below:

Sl. No.	Item Description	Installation No. 1	Installation No. 2
1.00.00	Name of the Installation and its location		
1.01.00	Client name and its address, Fax and Tel. No., email id		
1.02.00	Name and designation of the responsible person in client's organization		
1.03.00	Contract No. & Date		
1.04.00	Voltage Ratio		
1.05.00	MVA Ratings		
1.06.00	Voltage Class of Transformers		

Signature of authorized signatory.....

Sl. No.	Item Description	Installation No. 1	Installation No. 2
1.07.00	Date of Commissioning of transformers		
1.08.00	Date of commencement of successful operations		
1.09.00	Scope of work executed for aforesaid transformers included the following :		
	(i) Manufactured	Yes/No	Yes/No
	(ii) Supplied	Yes/No	Yes/No
1.10.00	No. of years in successful operation		

Signature of authorized signatory.....

Sl.	Item Description	Installation	Installation
No.		No. 1	No. 2

2.00.00 Certificate(s) from the
client(s) are enclosed
along with the bid at
Annexure-.....to
this Attachment-3K.

II. We hereby further confirm that we/sub-vendor M/s have our/his own facilities for conducting all routine and type tests on transformers as per IS:2026 (except short circuit test) as per Clause No. 5.12.1.2 of Sub-Section- IA provennessPart-A of Section-VI. The details of the same are given below:

Sl. No.	Name of Test	Yes/No

Note :

- 1) Sub-vendor to use their own performa for giving details of all routine and type test facilities available with them.
- 2) Certificates from client(s) must also be attached as Annexure..... to this Attachment-3K.

Signature of authorized signatory.....

III. We/sub-vendor hereby confirm that 16MVA, 11KV Class or higher rated oil filled transformer manufactured by We/sub-vendor have been successfully short circuit tested as per requirement of Clause No. 5.12.1.3 of Sub-Section- IA provenness, Part-A of Section-VI. The details of the same are given below:

Sl. No.	Item Description	Details
1.00.00	Name of the station and its location	
1.01.00	Client name and its address, Fax and Tel. No. ., email id	
1.02.00	Name and designation of the responsible person in client's organisation	
1.03.00	Contract No. & Date	
1.04.00	Voltage Ratio	
1.05.00	MVA Ratings	

Signature of authorized signatory.....

Sl. No.	Item Description	Details
1.06.00	Voltage Class of transformers	
1.07.00	Short Circuit Test Carrying Agency (Test Lab) Name and Address	
1.08.00	Date of Short Circuit Test	
1.09.00	Short circuit test conducted successfully	Yes/No
2.00.00	Certificate(s) from the client(s) / Lab are enclosed along with the bid at Annexure-..... to this Attachement-3K.	

Note :

- 1) Sub-vendor may provide any additional information regarding short circuit test on transformers and enclose along with the proposal at Annexure..... to this Attachment-3K.
- 2) If needed Sub-vendor may use own performa for giving necessary details regarding short circuit test conducted on transformers and enclose with the proposal at Annexure..... to this Attachment-3K.

Date :

(Signature).....

Place :

(Printed Name).....

(Designation).....

(Common seal).....

Signature of authorized signatory.....

**LETTER OF TECHNICAL SUPPORT FOR SATISFACTORY PERFORMANCE OF
(TRANSFORMER*/ REACTOR*) FOR (PROJECT NAME).....**

TO:

[EMPLOYERS NAME & ADDRESS]

Sub: Letter of Technical Support submitted by Associate*/Collaborator*/Technology provider*/Licensor* undertaking the complete responsibility of the scope as detailed here.

Dear Sirs,

In consideration of SCCL (hereinafter referred to as "Employer") having awarded to M/s..... with its Registered Office at (hereinafter referred to as "Contractor") a contract for ".....(package name)..... for its(project name)..... Vide Contract no. dated..... (hereinafter referred as "Contract").

AND WHEREAS, the Contractors scope of supply and services in the contract also includes..... (Name and quantity of equipment).....

AND WHEREAS, the Contractors have established manufacturing facilities for 400kV class Transformer/Shunt Reactor based on the technological support from their Associate/ Collaborator/Technology provider/ Licensor ie. M/s.....

AND WHEREAS in term of clause no....., Part-A, Sub-Section – II, Section-VI of bidding documents, the Bidder/Sub-vendor can be considered for manufacturing and supply of(equipment name).... Provided the qualified Associate/ Collaborator/Technology provider/ Licensor provides a Letter of Technical Support for satisfactory performance of the(equipment name)..... under this contract.

NOW THEREFORE, THIS DEED WITNESSETH AS UNDER:

1. That in accordance of the Award of the Contract by the Contractor to M/s., we the aforesaid Associate*/ Collaborator*/Technology provider*/Licensor*, will be fully responsible in accordance with the contract to the Employer for the satisfactory performance of the(equipment name).....
2. Without prejudice to the generality of the Undertaking in paragraph 1 above, the manner of achieving the objective set forth in paragraph 1 above shall be as follows
For Transformers and reactors (as applicable):
 - (a) We shall provide design, manufacturing and assembly drawings of Transformer/Reactor. Transformer/Reactor shall be manufactured and supplied as per above design provided by us and the drawings approved by Employer.

Signature of authorized signatory.....

- (b) We shall depute technical experts to Bidder's/sub-vendor's works for supervision during core-coil assembly and final testing of the transformer/reactor.
 - (c) We shall promptly carry out all the corrective measures and shall promptly provide corrected design and shall undertake replacements, rectifications or modifications to the equipment as required in case of the equipment fails to demonstrate successful performance as per contract at site.
3. We, the Associate/ Collaborator/Technology provider/Licensors do hereby undertake and confirm that this Letter of Technical Support shall be irrevocable and shall not be revoked till ninety (90) days after the end of the defect liability period of the plant under the contract and further stipulate that the Letter of Technical Support herein contained shall terminate after ninety (90) days of satisfactory completion of such defect liability period. In case of delay in completion of defect liability period, the validity of this Letter of Technical Support shall be extended by such period of delay. We further agree that this LETTER OF TECHNICAL SUPPORT shall be without any prejudice to the various liabilities of the Contractor including Contract Performance Security as well as other obligations of the Contractor in terms of the Contract.
4. Any dispute that may arise in connection with this LETTER OF TECHNICAL SUPPORT shall be settled as per arbitration procedure/rules mentioned in the Contract Documents. This LETTER OF TECHNICAL SUPPORT shall be construed and interpreted in accordance with the Laws of India and the Courts of Delhi shall have exclusive jurisdiction.
5. We, the Associate/Collaborator/Technology provider/Licensors and the Contractor agree that this Letter of Technical Support shall be irrevocable and shall form an integral part of the Contract awarded to the Contractor and shall be operative from the date of its execution.

IN WITNESS WHEREOF, the Associate*/Collaborator*/Technology provider*/Licensors* through their authorised representatives, have executed these presents and affixed common seal of their companies, on the day, month and year first mentioned above.

For M/s

(Associate/Collaborator/Technology provider/Licensors)

Signature of authorized signatory.....

WITNESS:

1. Signature of the Authorised Representative (Sub-Vendor):.....

Name

Designation

Date:.....

Common Seal of the Company

Signature of the Authorised Representative (Main Bidder):.....

Name

Designation

Date:.....

Common Seal of the Company

**Note: Power of Attorney of the persons signing on behalf of Associate/
Collaborator/Technology provider/Licensors is to be furnished by the bidder and to be
attached with the signed Letter of Technical Support.**

***: Strike off whichever is not applicable.**

Signature of authorized signatory.....

ATTACHMENT 3K- DOCUMENT(SWITCHYARD) :

Sub: Sub-Qualifying Requirements for the 400 KV Instrument Transformers (Capacitor Voltage Transformer)

In order to satisfy the requirement of as indicated in Technical Specification, Clause No. 5.14, of Sub-Section-IA, Part-A, Section-VI, We/Subvendor hereby confirm that M/s..... is a manufacturer who have manufactured and supplied minimum fifteen (15) nos. of single phase (CVT) of 400 KV or above Voltage Class suitable for Air Insulated Substation/Switchyard which are in successful operation for minimum two (2) years. The details are given below.

S.No.	Description	Installation
1	Name and Address of Manufacturer and Name of contact person with email ID, Telephone & Fax Nos.	
2	Client's Name & its Address along with Name of contact person with email ID, Telephone & Fax Nos.	
3	Name & Location of the Substation/ Switchyard	
4	Name of Contract	
5	Contract Reference No. & Date	
6.	Scope of the work for the aforesaid Contract includes	
	(i) Manufacture	Yes*/No*
	(ii) Type Test	Yes*/No*
	(iii) Supply	Yes*/No*
7.	(i) No. of Single phase Capacitor Voltage Transformers Supplied	
	(ii) Voltage Level (in KV)	
	(iii) Whether suitable for Air insulated Substation/Switchyard	Yes*/No*
8.	Date of Commissioning	
9.	Date of commencement of successful operation	

Signature of authorized signatory.....

S.No.	Description	Installation

10. No. of years in Successful operation
11. Client(s) certificate(s) enclosed in support of stated experience at Sr. No. 6 to 10 at Annexure..... to this Attachment-3K

(Use separate sheet for each experience/Contract)

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common Seal).....

Signature of authorized signatory.....

Sub: Sub-Qualifying Requirements for the 400 KV Surge Arrestors

In order to satisfy the requirement as indicated in Technical Specifications, Clause No. 5.14, of Sub-Section-IA, Part-A, Section-VI, We hereby confirm that M/s is a manufacturer who have manufactured and supplied atleast fifteen (15) nos. of single phase Surge Arrestors of 400 KV or above Voltage Class suitable for Air Insulated Substation/Switchyard which are in successful operation for minimum two (2) years. The details are given below:

S.No.	Description	
1	Name and Address of Manufacturer and Name of contact person with email ID, Telephone & Fax Nos.	
2	Client's Name & its Address alongwith Name of contact person with email ID, Telephone & Fax Nos.	
3	Name & Location of the Substation / Switchyard	
4	Name of Contract	
5	Contract Reference No. & Date	
6.	Scope of the work for the aforesaid Contract includes	
	(i) Manufacture	Yes*/No*
	(ii) Type Test	Yes*/No*
	(iii) Supply	Yes*/No*
7.	(i) No. of Single phase Surge Arrestors supplied	
	(ii) Voltage Level (in KV)	
	(iii) Whether suitable for Air insulated Substation/Switchyard	Yes*/No*
8.	Date of Commissioning	
9.	Date of commencement of successful operation	

Signature of authorized signatory.....

S.No.	Description
10.	No. of years in Successful operation
11.	Client(s) certificate(s) enclosed in support of stated experience at Sr. No. 6 to 10 at Annexure to this Attachment-3K

(Use separate sheet for each experience/Contract)

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

Signature of authorized signatory.....

Sub : Sub-Qualifying Requirements for the Sub-Station Automation System & Protective Relays

- (i) In order to satisfy the requirement of Supplier experience as indicated in Technical Specifications, Clause No. 5.15 of Sub-Section-IA, Part-A, Section-VI, We hereby confirm that M/s, have offered the Substation Automation System with distributed architecture and is in successful operation in atleast one (1) Substation/Switchyard of not less than 220 KV class for minimum one (1) year. The details are given below :

S.No.	Description	Installation
1	Name and Address of Supplier and Name of contact person with email ID, Telephone & Fax Nos.	
2	Client's Name & its Address alongwith Name of contact person with email ID, Telephone & Fax Nos.	
3	Name & Location of the Substation/ Switchyard	
4	Name of Contract	
5	Contract Reference No. & Date	
6.	Scope of the work for the aforesaid Contract includes	
	(i) Manufacture	Yes*/No*
	(ii) Type Test	Yes*/No*
	(iii) Supply	Yes*/No*
7.	Details of the reference system	
	(i) Manufacturers of bay equipment controllers	
	(ii) Type designation of BayControllers	
	(iii) HMI software provided	
8.	(i) Whether the above Substation Automation System with distributed Architecture	*Yes/*No

Signature of authorized signatory.....

S.No.	Description	Installation
	(ii) Voltage level of Substation/ Switchyard (in KV)	
9.	Date of Commissioning	
10.	Date of commencement of successful operation	
11.	No. of years in Successful operation	
12.	Client(s) certificate(s) enclosed in support of stated experience at Sr. No. 6 to 11 at Annexure..... to this Attachment-3K	

(Use separate sheet for each experience/Contract)

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

Note : Continuation sheets of like size and format may be used as per Sub-vendor's requirement and shall be annexed to this Attachment.

* Please Strike off whichever is not applicable.

Signature of authorized signatory.....

- (ii) **For GENERATOR PROTECTION RELAYS, THE BAY PROTECTION UNITS INCLUDING THE BUS BAR PROTECTION :** In order to satisfy the requirement of Supplier experience as indicated in Technical Specifications, Clause No. 5.15 of Sub-Section-IA, Part-A, Section-VI, We hereby confirm that M/s is a manufacturer who have manufactured and supplied the offered type of devices for respective equipment, which are in successful operation in a 100 MW or above unit / 220 KV class or above Substation/Switchyard for minimum one (1) year. The details are given below:

S.No.	Description	Installation
1	Name and Address of Manufacturer and Name of contact person with email ID, Telephone & Fax Nos.	
2	Client's Name & its Address alongwith Name of contact person with email ID, Telephone & Fax Nos.	
3	Name & Location of the Unit/Substation/Switchyard	
4	Name of Contract	
5	Contract Reference No. & Date	
6.	Scope of the work for the aforesaid Contract includes	
	(i) Manufacture	Yes*/No*
	(ii) Type Test	Yes*/No*
	(iii) Supply	Yes*/No*
7.	(i) No. of Generator Protection Relays supplied	
	(ii) Capacity of generators (in MW)	
	(iii) No. of Bay Protection Units	
	(iv) No. of Bus bar protection system	
	(v) Voltage Level of Substation/Switchyard (in KV)	

Signature of authorized signatory.....

S.No.	Description	Installation
8.	Date of Commissioning	
	(i) Generator Protection Relays	
	(ii) Bay protection unit	
	(iii) Busbar protection system	
9.	Date of commencement of successful operation	
10.	No. of years in Successful operation	
	(i) Generator Protection Relay	
	(ii) Bay protection unit	
	(iii) Busbar protection system	
11.	Client(s) certificate(s)s enclosed in support of stated experience at Sr. No. 6 to 10 is enclosed at Annexure..... to this Attachment-3K	
	(Use separate sheet for each experience/Contract)	

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

Signature of authorized signatory.....

- iii) **ENERGY METERING AND ABT SYSTEM** : In order to satisfy the requirement of Supplier experience as indicated in Technical Specifications, Clause No. 5.15 of Sub-Section-IA, Part-A, Section-VI, We hereby confirm that M/s is a manufacturer who have manufactured and supplied the offered type of devices for respective equipment, which are in successful operation in a 100 MW or above unit / 220 KV class or above Substation/Switchyard for minimum one (1) year. The details are given below:

S.No.	Description	Installation
1	Name and Address of Manufacturer and Name of contact person with email ID, Telephone & Fax Nos.	
2	Client's Name & its Address alongwith Name of contact person with email ID, Telephone & Fax Nos.	
3	Name & Location of the Unit/Substation/Switchyard	
4	Name of Contract	
5	Contract Reference No. & Date	
6.	Scope of the work for the aforesaid Contract includes	
	(i) Manufacture	Yes*/No*
	(ii) Type Test	Yes*/No*
	(iii) Supply	Yes*/No*
7.	(i) No. of Energy meters	
	(ii) ABT Software detail	
	(ii) Voltage Level of Substation/Switchyard (in KV)	

Signature of authorized signatory.....

S.No.	Description	Installation
8.	Date of Commissioning	
	(i) Energy Metering System	
9.	Date of commencement of successful operation	
10.	No. of years in Successful operation	
	(i) Energy Metering System	
11.	Client(s) certificate(s)s enclosed in support of stated experience at Sr. No. 6 to 10 is enclosed at Annexure..... to this Attachment-3K	
	(Use separate sheet for each experience/Contract)	

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

Signature of authorized signatory.....

SINGARENI EPC PACKAGE (1X800 MW)

BIDDING DOCUMENT NO. CW-CM-11159-C-O-M-001
Experience details of Sub-vendor seeking qualification as per
Clause 6.0 of Sub-Section-IA, Proveness, Part-A,
Section-VI of Bidding Document)

For the purpose of qualification of Bidders/ Sub-vendor(s), experience shall be reckoned as on the date of consideration for approval but not later than six months after award date of **EPC Package** unless otherwise specified in respective clauses.

Bidder's Name and Address:

To
Corp Material Procurement Dept,
SCCL.
KOTHAGUDEM 507101

1.00.0 C&I Equipment/Systems (BOP C&I DDCMIS)

1.01.0 We/our sub-vendor(M/s.....) confirm that we meet the proveness requirements specified in Cl. No.6.1 of proveness requirements in the Sub-Section-IA, Part-A, Section-VI of Bidding Documents. In this regard we declare that we/our sub-vendor(M/s.....) is an Indian company registered in India as per Companies Act and have engineered, supplied and commissioned/got commissioned# BOP C&I part of Distributed Digital Control, Monitoring & Information System (DDCMIS) in at least one (1) unit of rating 200 MW or above in a power station, the details of which are given below:

Sl.No.	Item Description	Plant No.1
1.	Name of Power Station (Location and Address)	
2.	Name of the Owner of Power Station with full Address Fax. No. Telephone No. e-mail address	
3.	Name of Package/Contract along with Order/LOA No. & Date	
4.	Name & Address of the Contractor on whom the order for executing the reference plant system was placed by the Owner of the reference plant	
5.	In case the Bidder/sub-vendor is not the Contractor at Sl. No. 4, Name & Address of the Organisation which placed order for reference plant system on the Bidder/sub-vendor	

Signature of authorized signatory.....

Sl.No.	Item Description	Plant No.1
6.	Unit Rating (MW)	
7.	Whether coal fired station	*Yes/No
8.	Control & Instrumentation Systems Distributed Digital, Control Monitoring & Information System (DDCMIS) / Distributed Control System (DCS)	
8a.	Scope of work included in the bidder's order	
(a)	Engineering	*Yes/No
(b)	Supply	*Yes/No
(c)	Commissioning	*Yes/No
8b.	Whether the control system includes	
(a)	Modulating control for Steam Generator (SG)	*Yes/No
(b)	Modulating control for feed water/ condensate cycle	*Yes/No
(c)	Binary control of the auxiliaries for Steam Generator (SG)	*Yes/No
(d)	Binary control of the auxiliaries for Turbine Generator (TG)	*Yes/No
	#In case the system was got commissioned through some other agency, please furnish details of agency and scope of commissioning work	
8c.	Actual date of commissioning	
9.	Following documents are enclosed in support of meeting the stipulated Provenness Requirements	
(a)	Relevant portion of Letter of Award / Contract Agreement / Order enclosed	*Yes/No
(b)	BOP DDCMIS supplier's registration details in India as per Company's Act	.....

Signature of authorized signatory.....

1.02.0 We/our sub-vendor(M/s) confirm that we meet the provenness requirements specified in **Cl. No.6.3 & 6.4** of provenness requirements in the Sub-Section-IA, Part-A, Section-VI of Bidding Documents. In this regard we declare that the offered BOP C&I DDCMIS is the same or of the same series which is operating successfully for BOP C&I application or SG C&I application or TG C&I application in at least one (1) unit of rating 200 MW or above for a period of not less than one (1) year and the offered BOP C&I DDCMIS have been commissioned in at least one (1) unit of rating 200 MW or above in a power station for BOP C&I application, the details of which are given below :

SINo	Item Description	Plant No.1
1.	Name of Power Station (Location and Address), where the offered control system is operating successfully for a period of one (1) year for the following (a) Name of the Owner of Power Station with full Address Fax No. & Telephone No. (b) Unit Rating (MW) (c) Whether coal fired station (d) The above power station includes the following controls of BOP C&I, SG C&I and TG C&I as follows : (i) Whether the control system for BOP C&I includes the following: - Modulating control for Steam Generator (SG) - Modulating control for feed water/condensate cycle - Binary control of the auxiliaries for Steam Generator (SG) - Binary control of the auxiliaries for Turbine Generator (TG)	*Yes/No

Signature of authorized signatory.....

SINo	Item Description	Plant No.1
	(ii) SG C&I includes the following :	*Yes/No
	• Burner management system of coal fired units. • Boiler protection of coal fired units.	
	(iii) TG C&I includes the following	*Yes/No
	• Steam Turbine Electro Hydraulic Control • Turbine Protection System	
	(e) Actual date of commissioning	
	(f) Number of years of successful operation	
2.	Name of Power Station (Location and Address), where the offered control system has been commissioned	
	(a) Name of client with full Address Fax No. & Telephone No.	
	(b) Unit Rating (MW)	
	(c) Whether coal fired station	*Yes/No
	(d) Whether the control system includes the following :-	
	• Modulating control for Steam Generator (SG)	*Yes/No
	• Modulating control for feed water/condensate cycle	*Yes/No
	• Binary control of the auxiliaries for Steam Generator (SG)	*Yes/No
	• Binary control of the auxiliaries for Turbine Generator (TG)	*Yes/No

Signature of authorized signatory.....

SINo	Item Description	Plant No.1
	(e) Actual Date of Commissioning	
3.	(a) Name of the Control System offered for BOP C&I DDCMIS	.....
	(b) Name of the Control system provided in above Reference Plant	
	(i) For reference at Sl. No.1 above	.....
	(ii) For reference at Sl. No. 2 above	.....
	(c) Name of the Control System of reference at Sl. No. 1 and Sl. No. 2 above is same as being offered for BOP C&I DDCMIS	*Yes/No
	(d) Whether the Control System of reference at Sl. No. 1 and Sl. No. 2 above is of the same series as being offered for BOP C&I DDCMIS	*Yes/No
4.	Following documents are enclosed in support of meeting the stipulated provenness requirements for the reference plant	
	(a) Relevant portion of Letter of Award/Contract agreement/Order	*Yes/No
	(b) End user Certificate	*Yes/No
	(c) Sample of configuration diagram, Functional Grouping Diagram, Bill of Material	*Yes/No

Signature of authorized signatory.....

2.00.00 C&I Equipment/Systems (SG C&I DDCMIS)

2.01.01 Route 1(For DDCMIS supplier)

We/our sub-vendor(M/s) confirm that we meet the provenness requirements specified at **Cl. No.6.1** of provenness requirements in the Sub-Section-IA, Part-A, Section-VI of Bidding Documents. In this regard we declare that we/our sub-vendor(M/s.....) is an Indian company registered in India as per Companies Act and have engineered, supplied and commissioned/got commissioned SG C&I part of Distributed Digital Control, Monitoring & Information System (DDCMIS) in at least one (1) unit of rating 200 MW or above in a power station, the details of which are given below :

Sl.No.	Item Description	Plant No.1
1.	Name of Power Station (Location and Address)	
2.	Name of the Owner of Power Station with full Address Fax No. Telephone No. e-mail address	
3.	Name of Package/Contract along with Order/LOA No. & Date	
4.	Name & Address of the Contractor on whom the order for executing the reference plant system was placed by the Owner of the reference plant	
5.	In case the Bidder/our sub-vendor is not the Contractor at Sl.No.4, Name & Address of the Organisation which placed order for reference plant system on the Bidder/sub-vendor	
6.	Unit Rating (MW)	
7.	Whether coal fired station	*Yes/No

Signature of authorized signatory.....

Sl.No.	Item Description	Plant No.1
8.	Control & Instrumentation Systems Distributed Digital, Control Monitoring & Information System (DDCMIS) / Distributed Control System (DCS)	
8a.	Scope of work included in the bidder's order	
(a)	Engineering	*Yes/No
(b)	Supply	*Yes/No
(c)	Commissioning	*Yes/No
8b.	Whether the control system includes	
(a)	Burner management System of coal fired units	*Yes/No
(b)	Boiler protection of coal fired units	*Yes/No
	#In case the system was got commissioned through some other agency, please furnish details of agency and scope of commissioning work	
8c.	Actual date of commissioning	
9.	Following documents are enclosed in support of meeting the stipulated Provenness Requirements	
(a)	Relevant portion of Letter of Award / Contract Agreement / Order enclosed	*Yes/No
(b)	SG C&I DDCMIS supplier's registration details in India as per Company's Act	.....

Signature of authorized signatory.....

2.01.02Route 2 (For DDCMIS supplier with Collaborator/Associate)

We/our sub-vendor(M/s.....) confirm that we meet the provenness requirements specified in **Cl. No.6.2** of provenness requirements in the Sub-Section-IA, Part-A, Section-VI of Bidding Documents. In this regard we declare that we/our sub-vendor(M/s.....) is an Indian company registered in India as per Companies Act and have engineered, supplied and commissioned BOP C&I part of Distributed Digital Control, Monitoring & Information System (DDCMIS) in at least one (1) unit of a power station having unit rating of 200 MW or above and we have collaborated / associated with M/s..... (Name of Associate/Collaborator) whose address is and who has engineered, supplied and commissioned/got commissioned SG C&I Distributed Digital Control, Monitoring & Information System (DDCMIS) in at least one (1) unit of rating 200 MW or above in a power station. ,the details of which are given below :

(a) **Details of BOP C&I DDCMIS supplied by Bidder/Sub-Vendor(M/s.....)**

Sl.No.	Item Description	Plant No.1
1.	Name of Power Station (Location and Address)	
2.	Name of the Owner of Power Station with full Address Fax. No. Telephone No. e-mail address	
3.	Name of Package/Contract along with Order/LOA No. & Date	
4.	Name & Address of the Contractor on whom the order for executing the reference plant system was placed by the Owner of the reference plant	
5.	In case the Bidder/sub-vendor is not the Contractor at Sl. No. 4, Name & Address of the Organisation which placed order for reference plant system on the Bidder/sub-vendor	

Signature of authorized signatory.....

Sl.No.	Item Description	Plant No.1
6.	Unit Rating (MW)	
7.	Whether coal fired station	*Yes/No
8.	Control & Instrumentation Systems Distributed Digital, Control Monitoring & Information System (DDCMIS) / Distributed Control System (DCS)	
8a.	Scope of work included in the bidder's order	
	(a) Engineering	*Yes/No
	(b) Supply	*Yes/No
	(c) Commissioning	*Yes/No
8b.	Whether the control system includes	
	(a) Modulating control for Steam Generator (SG)	*Yes/No
	(b) Modulating control for feed water/ condensate cycle	*Yes/No
	(c) Binary control of the auxiliaries for Steam Generator (SG)	*Yes/No
	(d) Binary control of the auxiliaries for Turbine Generator (TG)	*Yes/No
	#In case the system was got commissioned through some other agency, please furnish details of agency and scope of commissioning work	
8c.	Actual date of commissioning	
9.	Following documents are enclosed in support of meeting the stipulated Provenness Requirements	
	(a) Relevant portion of Letter of Award / Contract Agreement / Order enclosed	*Yes/No
(b)	BOP DDCMIS supplier's registration details in India as per Company's Act	

Signature of authorized signatory.....

b) **Details of SG C&I DDCMIS supplied by Associate / Collaborator**

Sl.No	Item Description	Plant No.1
1.	Name of Power Station (Location and Address)	
2.	Name of the Owner of Power Station with full Address Fax No. Telephone No. e-mail address	
3.	Name of Package/Contract along with Order/LOA No. & Date	
4.	Name & Address of the Contractor on whom the order for executing the reference plant system was placed by the Owner of the reference plant	
5.	In case the Bidder/Sub-vendor is not the Contractor at Sl.No.4, Name & Address of the Organisation which placed order for reference plant system on the Bidder/Sub-vendor	
6.	Unit Rating (MW)	

Signature of authorized signatory.....

Sl.No.	Item Description	Plant No.1
7.	Whether coal fired station	*Yes/No
8.	Control & Instrumentation Systems Distributed Digital, Control Monitoring & Information System (DDCMIS) / Distributed Control System (DCS)	
8a.	Scope of work included in the bidder's order	
(a)	Engineering	*Yes/No
(b)	Supply	*Yes/No
(c)	Commissioning	*Yes/No
8b.	Whether the control system includes	
(a)	Burner Management System of coal fired units	*Yes/No
(b)	Boiler Protection of coal fired units	*Yes/No
	#In case the system was got commissioned through some other agency, please furnish details of agency and scope of commissioning work	
8c.	Actual date of commissioning	
9.	Following documents are enclosed in support of meeting the stipulated Provenness Requirements	
(a)	Relevant portion of Letter of Award/Contract Agreement/ Order enclosed	*Yes/No

Signature of authorized signatory.....

2.02.00 We/our sub-vendor (M/s.....) confirm that we meet the qualifying requirements specified in **Cl. No.6.3 & 6.4** of provenness requirements in the Sub-Section-IA, Part-A, Section-VI of Bidding Documents. In this regard we declare that the offered SG C&I DDCMIS is the same or of the same series which is operating successfully for BOP C&I application or SG C&I application or TG C&I application in in at least one (1) unit of rating 200 MW or above for a period of not less than one (1) year and the offered SG C&I DDCMIS has been commissioned in at least one (1) unit of rating 200 MW or above for SG C&I application in a power station. the details of which are given below :

SI.No.	Item Description	Plant No.1
1.	Name of Power Station (Location and Address), where the offered control system is operating successfully for a period of one (1) year for the following	
	(a) Name of the Owner of Power Station with full Address	
	Fax No. & Telephone No.	
	(b) Unit Rating (MW)	
	(c) Whether coal fired station	*Yes/No
	(d) The above power station includes the following controls of BOP C&I, SG C&I and TG C&I as follows :	
	(i) Whether the control system for BOP C&I includes the following:	*Yes/No
	• Modulating control for Steam Generator (SG)	
	• Modulating control for feed water/condensate cycle	
	• Binary control of the auxiliaries for Steam Generator (SG)	
	• Binary control of the auxiliaries for Turbine Generator (TG)	

Signature of authorized signatory.....

Sl.No.	Item Description	Plant No.1
	(ii) SG C&I includes the following :	*Yes/No
	- Burner management system of coal fired units - Boiler protection of coal fired units	
	(iii) TG C&I includes the following	*Yes/No
	- Steam Turbine Electro Hydraulic Control - Turbine Protection System	
	(e) Actual date of commissioning	
	(f) Number of years of successful operation	
2.	Name of Power Station (Location and Address), where the offered control system has been commissioned.	
	(a) Name of client with full Address Fax No. & Telephone No.	
	(b) Unit Rating (MW)	
	(c) Whether coal fired station	*Yes/No
	(d) Whether the control system includes the following :-	
	- Burner Management System of coal fired units - Boiler protection of coal fired units	*Yes/No *Yes/No
3.	(a) Name of the Control System offered for SG C&I DDCMIS	.....

Signature of authorized signatory.....

Sl.No.	Item Description	Plant No.1
(b)	Name of the Control system provided in above Reference Plant	
(i)	For reference at Sl. No.1 above	.....
(ii)	For reference at Sl. No.2 above	.....
(c)	Name of the Control System of reference at Sl. No. 1 and Sl. No.2 above is same as being offered for SG C&I DDCMIS	*Yes/No
(d)	Whether the Control System of reference at Sl. No. 1 and Sl. No. 2 above is of the same series as being offered for SG C&I DDCMIS	*Yes/No
(e)	Actual Date of Commissioning	
4.	Following documents are enclosed in support of meeting the stipulated provenness requirements for the reference plant	
(a)	Relevant portion of Letter of Award/Contract agreement/Order	*Yes/No
(b)	End user Certificate	*Yes/No
(c)	Sample of configuration diagram, Functional Grouping Diagram, Bill of Material etc.	*Yes/No

Signature of authorized signatory.....

3.00.00 C&I Equipment/Systems (TG C&I DDCMIS)

3.01.01 Route1(For DDCMIS supplier)

We/our sub-vendor (M/s.....) confirm that we meet the provenness requirements specified in **CI. No. 6.1** of provenness requirements in the Sub-Section-IA, Part-A, Section-VI of the Bidding Documents. In this regard we declare that we/our sub-vendor(M/s.....) is an Indian company registered in India as per Companies Act and have engineered, supplied and commissioned/got commissioned TG C&I part of Distributed Digital Control, Monitoring & Information system (DDCMIS) in at least one (1) unit of rating 200 MW or above in a power station, the details of which are given below:

Sl.No.	Item Description	Plant No.1
1.	Name of Power Station (Location and Address)	
2.	Name of the Owner of Power Station with full Address	
	Fax No.	
	Telephone No.	
	e-mail address	
3.	Name of Package/Contract along with Order/LOA No. & Date	
4.	Name & Address of the Contractor on whom the order for executing the reference plant system was placed by the Owner of the reference plant	
5.	In case the Bidder/sub-vendor is not the Contractor at Sl.No.4, Name & Address of the Organi- sation which placed order for reference plant system on the Bidder/Sub-vendor	
6.	Unit Rating (MW)	
7.	Control & Instrumentation Systems Distributed Digital, Control Monitoring & Information System (DDCMIS) / Distributed Control System (DCS)	

Signature of authorized signatory.....

Sl.No.	Item Description	Plant No.1
7a.	Scope of work included in the bidder's order	
(a)	Engineering	*Yes/No
(b)	Supply	*Yes/No
(c)	Commissioning	*Yes/No
7b.	Whether the control system includes	
(a)	Steam Turbine Electro Hydraulic Control	*Yes/No
(b)	Turbine Protection System	*Yes/No
	#In case the system was got commissioned through some other agency, please furnish details of agency and scope of commissioning work	
7c.	Actual date of commissioning	
8.	Following documents are enclosed in support of meeting the stipulated Provenness Requirements	
(a)	Relevant portion of Letter of Award/Contract Agreement/ Order enclosed	*Yes/No
(b)	TG C&I DDCMIS supplier's registration details in India as per Company's Act	.....

Signature of authorized signatory.....

3.01.02 Route 2 (For DDCMIS supplier with Collaborator/Associate)

We/our sub-vendor (M/s.....) confirm that we meet the provenness requirements specified in **Cl. No.6.2** of provenness requirements in the Sub-Section-IA, Part-A, Section-VI of the Bidding Documents. In this regard we declare that we/our sub-vendor(M/s.....) is an Indian company registered in India as per Companies Act and have engineered, supplied and commissioned/got commissioned BOP C&I part of Distributed Digital Control, Monitoring & Information System (DDCMIS) in at least one (1) unit of rating 200 MW or above in a power station and we have associated/collaborated with M/s (Name of Associate/Collaborator) whose address is and who has engineered, supplied and commissioned TG C&I Distributed Digital Control, Monitoring & Information System (DDCMIS) in at least one (1) unit of rating 200 MW or above in a power station the details of which are given below :

(a) Details of BOP C&I DDCMIS supplied by Bidder/Sub-vendor (M/s.....)

Sl.No.	Item Description	Plant No.1
1.	Name of Power Station (Location and Address)	
2.	Name of the Owner of Power Station with full Address Fax. No. Telephone No. e-mail address	
3.	Name of Package/Contract along with Order/LOA No. & Date	
4.	Name & Address of the Contractor on whom the order for executing the reference plant system was placed by the Owner of the reference plant	
5.	In case the Bidder/sub-vendor is not the Contractor at Sl. No. 4, Name & Address of the Organisation which placed order for reference plant system on the Bidder/sub-vendor	

Signature of authorized signatory.....

Sl.No.	Item Description	Plant No.1
6.	Unit Rating (MW)	
7.	Whether coal fired station	*Yes/No
8.	Control & Instrumentation Systems Distributed Digital, Control Monitoring & Information System (DDCMIS) / Distributed Control System (DCS)	
8a.	Scope of work included in the bidder's order	
	(a) Engineering	*Yes/No
	(b) Supply	*Yes/No
	(c) Commissioning	*Yes/No
8b.	Whether the control system includes	
	(a) Modulating control for Steam Generator (SG)	*Yes/No
	(b) Modulating control for feed water/ condensate cycle	*Yes/No
	(c) Binary control of the auxiliaries for Steam Generator (SG)	*Yes/No
	(d) Binary control of the auxiliaries for Turbine Generator (TG)	*Yes/No
	#In case the system was got commissioned through some other agency, please furnish details of agency and scope of commissioning work	
8c.	Actual date of commissioning	
9.	Following documents are enclosed in support of meeting the stipulated Provenness Requirements	
	(a) Relevant portion of Letter of Award / Contract Agreement / Order enclosed	*Yes/No
(b)	BOP DDCMIS supplier's registration details in India as per Company's Act	

Signature of authorized signatory.....

b) Details of TG C&I DDCMIS supplied by Associate / Collaborator

Sl.No.	Item Description	Plant No.1
1.	Name of Power Station (Location and Address)	
2.	Name of the Owner of Power Station with full Address	
	Fax No.	
	Telephone No.	
	e-mail address	
3.	Name of Package/Contract along with Order/LOA No. & Date	
4.	Name & Address of the Contractor on whom the order for executing the reference plant system was placed by the Owner of the reference plant	
5.	In case the Bidder/Sub-vendor is not the Contractor at Sl.No.4, Name & Address of the Organisation which placed order for reference plant system on the Bidder/Sub-vendor	
6.	Unit Rating (MW)	

Signature of authorized signatory.....

SI.No.	Item Description	Plant No.1
7.	Control & Instrumentation Systems Distributed Digital, Control Monitoring & Information System (DDCMIS) / Distributed Control System (DCS)	
7a.	Scope of work included in the bidder's order	
(a)	Engineering	*Yes/No
(b)	Supply	*Yes/No
(c)	Commissioning	*Yes/No
7b.	Whether the control system includes	
(a)	Steam Turbine Electro Hydraulic Control	*Yes/No
(b)	Turbine Protection System	*Yes/No
7c.	Actual date of commissioning	
8.	Following documents are enclosed in support of meeting the stipulated Provenness Requirements	
(a)	Relevant portion of Letter of Award/Contract Agreement/ Order enclosed	*Yes/No
(b)	Details of his Associate for TG C&I DDCMIS	

Signature of authorized signatory.....

3.02.00 We/our sub-vendor (M/s.....) confirm that we meet the qualifying requirements specified in **Cl. No.6.3 & 6.4** of provenness requirements in the Sub-Section-IA, Part-A, Section-VI of Bidding Documents. In this regard we declare that the offered TG C&I DDCMIS is the same or of the same series which is operating successfully for BOP C&I application or SG C&I application or TG C&I application in in at least one (1) unit of rating 200 MW or above for a period of not less than one (1) year and the offered TG C&I DDCMIS has been commissioned in at least one (1) unit of rating 200 MW or above for TG C&I application in a power station. the details of which are given below :

Sl.No.	Item Description	Plant No.1
1.	Name of Power Station (Location and Address), where the offered control system is operating successfully for a period of one (1) year for the following	
	(a) Name of the Owner of Power Station with full Address	
	Fax No. & Telephone No.	
	(b) Unit Rating (MW)	
	(c) Whether coal fired station	*Yes/No
	(d) The above power station includes the following controls of BOP C&I, SG C&I and TG C&I as follows :	
	(i) Whether the control system for BOP C&I includes the following:	*Yes/No
	• Modulating control for Steam Generator (SG)	
	• Modulating control for feed water/condensate cycle	
	• Binary control of the auxiliaries for Steam Generator (SG)	
	• Binary control of the auxiliaries for Turbine Generator (TG)	

Signature of authorized signatory.....

Sl.No.	Item Description	Plant No.1
	(ii) SG C&I includes the following :	*Yes/No
	- Burner management system of coal fired units - Boiler protection of coal fired units	
	(iii) TG C&I includes the following	*Yes/No
	- Steam Turbine Electro Hydraulic Control - Turbine Protection System	
	(e) Actual date of commissioning	
	(f) Number of years of successful operation	
2.	Name of Power Station (Location and Address), where the offered control system has been commissioned	
	(a) Name of client with full Address Fax No. & Telephone No.	
	(b) Unit Rating (MW)	
	(c) Whether coal fired station	*Yes/No
	(d) Whether the control system includes the following :-	
	- Steam Turbine Electro Hydraulic Control - Turbine Protection System	*Yes/No
3.	(a) Name of the Control System offered for TG C&I DDCMIS	.....

Signature of authorized signatory.....

Sl.No.	Item Description	Plant No.1
(b)	Name of the Control system provided in above Reference Plant	
(i)	For reference at S.No.1 above.....	
(ii)	For reference at Sl.No.2 above.....	
(c)	Name of the Control System of reference at S.No. 1 and Sl.No.2 above is same as being offered for TG C&I DDCMIS	*Yes/No
(d)	Whether the Control System of reference at Sl.No. 1 and Sl.No.2 above is of the same series as being offered for TG C&I DDCMIS	*Yes/No
(e)	Actual Date of Commissioning	
4.	Following documents are enclosed in support of meeting the stipulated provemmess requirements for the reference plant	
(a)	Relevant portion of Letter of Award/Contract agreement/Order	*Yes/No
(b)	End user Certificate	*Yes/No
(c)	Sample of configuration diagram, Functional Grouping Diagram, Bill of Material etc.	*Yes/No

Signature of authorized signatory.....

4.00.00SWAS

4.01.00 We/our sub-vendor (**M/s**.....) confirm that we meet the provenness requirements specified in **Cl. No.6.6(a)** of provenness requirements in the Sub-Section-IA, Part-A, Section-VI of Bidding Documents. In this regard we declare that the Isolation valves, Blow down Valves, Coolers & Automatic Pressure reducer valves in Primary Rack, Thermal shut-off valves and Analysers of SWAS system offered for this package shall be same or of same series which should have been in successful operation for a period of not less than one (1) year in at least one (1) supercritical unit of rating 660MW or above in a power station, the details of which are given below

Note: ----- The information for SWAS items as above shall be filled in format as below for each item separately.

Sl.No.	Item Description	Plant No.1
(i)	Name of SWAS item	.....
(ii)	Make / Model of SWAS item in reference unit of powerStation	.....
(ii)	Name of Power Station (Location &Address)	.....
(iii)	Unit Size (MW) of reference unit	.....
(iv)	Commissioning date of above SWAS item	
(v)	Whether above SWAS item hasbeen in successful operation for a period of not less than one(1) year	*Yes/No
(vi)	End user certificate Attached	*Yes/No
(vii)	Make /Model of above SWAS item offered for this package	
(viii)	Whether offered SWAS item is same as that in reference at (i) above	*Yes/No
(ix)	Whether offered SWAS item is of same series as that in reference at (i) above	*Yes/No

Signature of authorized signatory.....

5.00.00CEMS

5.01.00 We/our sub-vendor (**M/s**.....) confirm that we meet the provenness requirements specified in **Cl. No.6.6(b)** of provenness requirements in the Sub-Section-IA, Part-A, Section-VI of Bidding Documents. In this regard we declare that the CEMS offered for this package is the same or of the same series which is operating successfully for a period of not less than one (1) year in at least one (1) unit of rating 200 MW or above in a power station, the details of which are given below

Sl.No.	Item Description	Plant No.1
(i)	Make / Model in reference unit of power Station	
(ii)	Name of Power Station (Location & Address)	
(iii)	Unit Size (MW) of reference unit	
(iv)	Commissioning date	
(v)	Whether above CEMS has been in successful operation for a period of not less than one(1) year	*Yes/No
(vi)	End user certificate Attached	*Yes/No
(vii)	Make /Model offered for this package	
(viii)	Whether offered CEMS is same as that in reference at (i) above	*Yes/No
(ix)	Whether offered CEMS is of same series as that in reference at (i) above	*Yes/No

Signature of authorized signatory.....

6.00.00 Vibration Monitoring System

6.01.00 We/our sub-vendor (**M/s**.....) confirm that we meet the provenness requirements specified in **Cl. No.6.6(b)** of provenness requirements in the Sub-Section-IA, Part-A, Section-VI of Bidding Documents. In this regard we declare that the Vibration Monitoring System offered for this package is the same or of the same series which is operating successfully for a period of not less than one (1) year in at least one (1) unit of rating 200 MW or above in a power station, the details of which are given below

Sl.No.	Item Description	Plant No.1
(i)	Make / Model in reference unit of power Station	
(ii)	Name of Power Station (Location & Address)	
(iii)	Unit Size (MW) of reference unit	
(iv)	Commissioning date	
(v)	Whether above VMS has been in successful operation for a period of not less than one(1) year	*Yes/No
(vi)	End User certificate Attached	*Yes/No
(vii)	Make /Model offered for this package	
(viii)	Whether offered VMS is same as that in reference at (i) above	*Yes/No
(ix)	Whether offered VMS is of same series as that in reference at (i) above	*Yes/No

Signature of authorized signatory.....

7.00.00 UPS system

7.01.00 We/our sub-vendor(M/s.....) confirm that we meet the provenness requirements specified in **Cl. No.6.6(d)** of provenness requirements in the Sub-Section-IA, Part-A, Section-VI of Bidding Documents. In this regard we declare that the UPS system offered for this package is same or of same series and type as that of 105 KVA or above capacity UPS which is operating successfully for a period of not less than one (1) year in a power station., the details of which are given below.

SI.No.	Item Description	Plant No.1
(i)	Make/Model in reference power station	
(ii)	Name of Power Station (Location & Address)	
(iii)	Rating of UPS (phase, kVA) in reference	
(iv)	Commission Date	
(v)	Whether above UPS system hasbeen in successful operation for a period of not less than one(1) year	*Yes/No
(vi)	End user certificate Attached	*Yes/No
(viii)	Whether offered UPS system is same as that in reference at (i) above	*Yes/No
(ix)	Whether offered UPS system is of same series and type as that in reference at (i) above	*Yes/No

Signature of authorized signatory.....

8.00.0024 V DC Modular Charger

8.01.00 We/our sub-vendor(M/s.....) confirm that we meet the provenness requirements specified in **Cl. No.6.6(e)** of provenness requirements in the Sub-Section-IA, Part-A, Section-VI of Bidding Documents. In this regard we declare that the 24 V DC modular charger offered for this package is same or of same series and type as that of 500A or above capacity 24 V DC modular charger which is operating successfully for a period of not less than one (1) year in any industry or telecommunication application, the details of which are given below :

Sl.No.	Item Description	Plant No.1
(i)	Make/Model in reference	
(ii)	Client Name & Address	
(iii)	Name of Industry (Power Gen Station/Telecommunication/Others)	
(iv)	Rating in Amps	
(v)	Commission Date	
(vi)	Whether above system has been in successful operation for a period of not less than one(1) year	*Yes/No
(vii)	End user certificate Attached	*Yes/No
vii)	Make /Model offered for this package	.....
(viii)	Whether offered 24 DC Modular Charger is same as that in reference at (i) above	*Yes/No
(ix)	Whether offered 24 DC Modular Charger is of same series and type as that in reference at(i) above	*Yes/No

Signature of authorized signatory.....

9.00.00 **CCTV SYSTEM**

9.01.00 We/our sub-vendor(M/s.....) confirm that we meet the provenness requirements specified in **Cl. No.6.6(f)** of provenness requirements in the Sub-Section-IA, Part-A, Section-VI of Bidding Documents. In this regard we declare that the combination of offered make of IP based camera and offered make of video management software, for CCTV system, has been in successful operation for a period of not less than one (1) year in a large industrial setup viz power plant, cement plant, petroleum refinery, steel plants or coal mine, having installation of minimum forty (40) nos. cameras, the details of which are given below.

Sl.No. Item Description

Plant No.1

- (i) Make/Model/Version of IP based camera & video management software
- (ii) Client Name & Address
- (iii) Name of Industry (Power plant, cement plant, petroleum refinery, steel plant, coal mine)
- (iv) Number of cameras in above reference installation
- (v) Whether above offered combination *Yes/No of IP based camera & video management software for CCTV has been in successful operation for a period of not less than one(1) year in a large industrial set up viz power plant, cement plant, petroleum refinery steel plant or coal mine having installation of minimum forty (40) nos. cameras
- (vi) End user certificate Attached *Yes/No

Signature of authorized signatory.....

**EPC PACKAGE FOR
SINGARENI TPP 1 X800 MW
BIDDING DOCUMENT NO. CW-CM-11159-C-O-M-001
(Details pertaining to technical qualification of the Sub-Vendor)**

Bidder's Name and Address :

To
Corp Material Procurement Dept,
SCCL.

Sub :Provenness Criteria for Civil Works

- (I) We declare that we/our Sub-vendor's/ Agency(ies) meet the Provenness Criteria stipulated at Clause No. 7.0 of Part-A, Sub-Section-IA of Section-VI of our own*/jointly with our Sub-Vendors as indicated below:

Ref. of QR	Clause 7.1	Clause 7.2
Whether Bidder meets the requirement	* Yes/No	* Yes/No
** Whether Sub-vendor/Civil Construction Agency M/s..... meets part of the requirement	* Yes/No	* Yes/No
** Whether Sub-vendor/Civil Construction Agency M/s..... meets part of the requirement	* Yes/No	* Yes/No
** Whether Sub-vendor/Civil Construction Agency M/s..... meets part of the requirement	* Yes/No	* Yes/No

* **Strike off whichever is not applicable.**

** **Add more agencies if proposed.**

Signature of authorized signatory.....

Sub :Provenness Requirements for the Civil Works Design and Detail Engineering

(II) We declare that we/our Sub-vendor's/ Agency(ies) meet the Criteria stipulated at Clause No. 7.7 of Part-A, Sub-Section-IA of Section-VI of our own*/jointly with our Sub-Vendors as indicated below:

S.No.	Ref. of QR	Clause 7.7
1	Whether Bidder meets the requirement	* Yes/No
2	** Whether Consulting agency M/s..... meets part of the requirement	* Yes/No
3	** Whether Consulting agency M/s..... meets part of the requirement	* Yes/No
4	** Whether Consulting agency M/s..... meets part of the requirement	* Yes/No
5	** Whether Consulting agency M/s..... meets part of the requirement	* Yes/No

* Strike off whichever is not applicable.

** Add more agencies if proposed.

Signature of authorized signatory.....

(II) In order to satisfy the Qualifying Requirements stipulated at Clause No. 7.1 of Sub-Section-IA, Part-A of section-VI, we declare that *We/our Sub-Vendors *M/s. have executed **Earth Work in filling** coal based /lignite based including cutting in hard rock for a thermal power plant of 500MW or higher capacity, as per details given below:

Sl. No.	Name of contracts	Name & Address of Client	Ref. No. and date of Award of Contract	Date of completion of works		Actually executed earth work quantity** for the reference contract ----- Cu.m/year	Asking rate of earth work for this contract ----- Cu.m/year	Remarks
				As per Contract	Actual			
1	2	3	4	5	6	7	8	9

Note : i) Certificate from client(s) i.e. M/s regarding the quantum of Earth work in filling work executed during the one year period in the above contracts is enclosed at Annexure

ii) One Year means any continuous 12 months period within entire contract period.

***Strike out whichever is not applicable.**

Signature of authorized signatory.....

(III) In order to satisfy the Qualifying Requirements stipulated at Clause No. 7.1 of Sub-Section-IA, Part-A of section-VI, we declare that *We/our Sub-Vendors *M/s. have executed **Piling** works for a thermal power plant of 500MW or higher capacity, as per details given below:

Sl. No.	Name of contracts	Name & Address of Client	Ref. No. and date of Award of Contract	Date of completion of works		Actually executed piling quantity ** for the reference contract		Asking rate of piling for this contract		Remarks
				As per Contract	Actual	Dia (mm)	(RM / year)	Dia (mm)	(RM / year)	
1	2	3	4	5	6	7	8	9	10	11

Note : i) Certificate from client(s) i.e. M/s regarding the quantum of piling work executed during the one year period in the above contracts is enclosed at Annexure
ii) One Year means any continuous 12 months period within entire contract period.

***Strike out whichever is not applicable.**

** Installation of pile using rotary hydraulic rigs

Signature of authorized signatory.....

(IV) In order to satisfy the Qualifying Requirements stipulated at Clause No. 7.1 of Sub-Section-IA, Part-A of section-VI, we declare that *We/our Sub-Vendors *M/s. have executed structural steel fabrication & erection works related to **Main Power House Building** for a thermal power plant of 500MW or higher capacity, as per details given below:

Sl. No.	Name of contracts	Name & Address of Client	Ref. No. and date of Award of Contract	Date of completion of works		Actually executed fabrication** for the reference contract (MT/year)	Asking rate of fabrication for this contract (MT/year)	Remarks
				As per Contract	Actual			
1	2	3	4	5	6	7	8	9

Note : i) Certificate from client(s) i.e. M/s regarding the quantum of structural steel fabrication & erection work executed during the one year period in the above contracts is enclosed at Annexure

ii) One Year means any continuous 12 months period within entire contract period.

iii) Main Power House Building consist of Main Power House and Mill & Bunker Building.

*Strike out whichever is not applicable.

** Fabrication can be at shop / factory or site.

Signature of authorized signatory.....

- (V) In order to satisfy the Qualifying Requirements stipulated at Clause No. 7.1 of Sub-Section-IA, Part-A of section-VI, we declare that *We/our Sub-Vendors *M/s. have executed RCC works related to **Main Power House Building** for a thermal power plant of 500MW or higher capacity, as per details given below:

Sl. No.	Name of contracts	Name & Address of Client	Ref. No. and date of Award of Contract	Date of completion of works				Actually executed RCC for the reference contract (Cu.m / year)	Asking rate of RCC for this contract (Cum/year)	Remarks
				As per Contract		Actual				
				-----		-----				
				start	Finish	Start	Finish			
1	2	3	4	5	6	7	8	9	10	11

- Note :
- i) Certificate from client(s) i.e. M/s regarding the quantum of RCC work related to Main Power House Buildings executed during the one year period in the above contracts is enclosed at Annexure
 - ii) One Year means any continuous 12 months period within entire contract period.
 - iii) Main Power House Buildings consist of Main Power House and Mill & Bunker Building.

***Strike out whichever is not applicable**

Signature of authorized signatory.....

(VI) In order to satisfy the Qualifying Requirements stipulated at Clause No. 7.1 of Sub-Section-IA, Part-A of section-VI, we declare that *We/our Sub-Vendors *M/s. have executed RCC works related to **Turbo Generator Foundation** for a thermal power plant of 500MW or higher capacity, as per details given below:

Sl. No.	Name of contracts	Name & Address of Client	Ref. No. and date of Award of Contract	Date of completion of works				Actually executed RCC for the reference contract (Cu.m / year)	Asking rate of RCC for this contract (Cum/year)	Remarks
				As per Contract		Actual				
				-----		-----				
				start	Finish	Start	Finish			
1	2	3	4	5	6	7	8	9	10	11

Note : i) Certificate from client(s) i.e. M/s regarding the quantum of RCC work executed for TG foundation during the one year period in the above contracts is enclosed at Annexure

ii) One Year means any continuous 12 months period within entire contract period.

iii) Turbo Generator Foundation can be with Vibration Isolation System (VIS) or without VIS.

*Strike out whichever is not applicable.

Signature of authorized signatory.....

(VII) In order to satisfy the Qualifying Requirements stipulated at Clause No. 7.3 of Sub-Section-IA, Part-A of section-VI, we declare that *We/our Sub-Vendors *M/s. have executed civil and structural works related to **Coal Handling Plant** for a thermal power plant of 500MW or higher capacity, as per details given below:

Sl. No.	Name of contracts	Name & Address of Client	Ref. No. and date of Award of Contract	Date of completion of works		Actually executed work for the reference contract			Asking rate of work for this contract			Remarks
				As per Contract	Actual	RCC (cu.m/ Yr.)	Fab. (MT/ Yr.)	Erec- tion (MT/ Yr.)	RCC (cu.m/ Yr.)	Fab. (MT/ Yr.)	Erec- tion (MT/ Yr.)	
1	2	3	4	5	6	7	8	9	10	11	12	13

Note : i) Certificate from client(s) i.e. M/s regarding the quantum of civil& structural steel work related to Coal Handling plant executed during the one year period in the above contracts is enclosed at Annexure
ii) One Year means any continuous 12 months period within entire contract period.

***Strike out whichever is not applicable.**

Signature of authorized signatory.....

(VIII) In order to satisfy the Qualifying Requirements stipulated at Clause No. 7.3 of Sub-Section-IA, Part-A of section-VI, we declare that *We/our Sub-Vendors *M/s. have executed civil and structural works related to **Ash Handling Plant**, for a thermal power plant of 500MW or higher capacity, as per details given below:

Sl. No.	Name of contracts	Name & Address of Client	Ref. No. and date of Award of Contract	Date of completion of works		Actually executed work for the reference contract			Asking rate of work for this contract			Remarks
				As per contract	Actual	RCC (Cu. m/Yr)	Fab. (MT/ Year)	Erec- tion (MT/ Yr.)	RCC (Cu.m/ Yr)	Fab. (MT/ Year)	Erec- tion (MT/ Yr.)	
1	2	3	4	5	6	7	8	9	10	11	12	13

Note : i) Certificate from client(s) i.e. M/s regarding the quantum of civil& structural steel work related to Ash Handling Plant executed during the one year period in the above contracts is enclosed at Annexure

ii) One Year means any continuous 12 months period within entire contract period

***Strike out whichever is not applicable.**

Signature of authorized signatory.....

(IX) In order to satisfy the Qualifying Requirements stipulated at Clause No. 7.3 of Sub-Section-IA, Part-A of section-VI, we declare that *We/our Sub-Vendors *M/s. have executed civil and structural works related to **DM/PT plant** for a thermal power plant of 500MW or higher capacity, as per details given below:

Sl. No.	Name of contracts	Name & Address of Client	Ref. No. and date of Award of Contract	Date of completion of works		Actually executed RCC for the reference contract (Cu.m./Year)	Asking rate this contract (Cu.m./year)	Remarks
				As per Contract	Actual			
1	2	3	4	5	6	7	8	9

Note : i) Certificate from client(s) i.e. M/s regarding the quantum of civil work related to DM/PT Plant executed during the one year period in the above contracts is enclosed at Annexure

ii) One Year means any continuous 12 months period within entire contract period the above single contracts is enclosed at Annexure

***Strike out whichever is not applicable.**

Signature of authorized signatory.....

(X) In order to satisfy the Qualifying Requirements stipulated at Clause No. 7.4 of Sub-Section-IA, Part-A of section-VI, we declare that *We/our Sub-Vendors *M/s. have executed civil and structural works related to RCC **Chimney shell using slipform shuttering** for a thermal power plant of 500MW or higher capacity, as per details given below:

Sl. No.	Name of contracts	Name & Address of Client	Ref. No. and date of Award of Contract	Date of completion of works (Shell / Flue Liner)				Height of RCC Shell (m)	Whether own Slip from equipment	Remarks
				As per Contract		Actual				
				-----		-----				
				start	Finish	Start	Finish			
1	2	3	4	5	6	7	8	9	10	11

Note : i) Certificate from client(s) i.e. M/s regarding civil / structural steel work related to RCC Chimney executed in the above contracts is enclosed at Annexure

***Strike out whichever is not applicable.**

Signature of authorized signatory.....

(XI) In order to satisfy the Qualifying Requirements stipulated at Clause No. 7.7 of Sub-Section-IA, Part-A of section-VI, we declare that *We/our Sub-Vendors *M/s. have carried out the design and detail engineering of **Main Plant Building, Turbo Generator Foundation** (with or without VIS as offered by bidder), **Condenser, Coal Handling Plant, Ash Handling Plant**, for a coal based/lignite based power plant of 500MW or higher capacity, reinforce concrete **Chimney with steel flues** (minimum 100m height), as per details given below :

Sl. No.	Name of contracts	Name & Address of Client	Ref. No. and date of Award of Contract	Date of completion of Design/Engg	Scope of	works	Remarks
				As per Contract	Actual		
1	2	3	4	5	6	7	8

Note :

- i) Certificate from client(s) i.e. M/s regarding the Completion of design & detailed engineering of civil & structural works of a coal based/lignite based power plant of 500MW or higher capacity is enclosed at Annexure
- ii) Certificate from client(s) i.e. M/s regarding the Completion of design & detailed engineering of reinforced concrete chimney with steel flues (minimum 100m height) is enclosed at Annexure
- iii) Certified from clients(s) ie. M/s regarding the Completion of design & detailed engineering of Civil Works for Condensor is enclosed at Annexure.....
- iv) Certified from client(s) i.e M/s regarding the Completion of design & detailed engineering of Turbo Generator Foundation is enclosed at Annexure.....

* **Strike out whichever is not applicable.**

Signature of authorized signatory.....

(On Company' s Letter Head)

LETTER OF SUPPORT FOR SATISFACTORY PERFORMANCE
of..... (Name of Equipment / System*)

for SINGARENI TPP STAGE-I (1x800 MW) SINGARENI TPP STAGE-I (1x800 MW) Power
Project Package

TO,

[EMPLOYER' S NAME & ADDRESS]

Sub: Letter of Technical Support submitted From (name of the Associate*/ Collaborator*/ Technology provider*
/ Licenser*) undertaking the responsibility for successful performance of (name of equipment/system*).

Dear Sirs,

1. In accordance with the Award of the Contract by (Name of the Contractor) to M/s. (Name of the sub-vendor), we, the aforesaid Associate*/Collaborator*/Technology provider*/Licensor*, (M/s) shall be fully responsible for the successful performance of the (name of equipment/system*).
2. Further, the manner of achieving the objective set forth in point 1 above shall be as follows for (name of equipment/system*):
 - (a) We shall provide design, manufacturing and assembly drawings of..... (name of equipment/system*). (name of equipment/system*) which shall be manufactured and supplied as per above design provided by us and the drawings approved by the Employer.
 - (b) We shall depute technical experts to Bidder' s/sub-vendor' s works for supervision during manufacturing, assembly, erection, commissioning and final testing (as and when necessary) of the..... (name of equipment/system*).
 - (c) We shall promptly carry out all the corrective measures and shall promptly provide corrected design and shall undertake replacements, rectifications or modifications to the equipment/system* as and when required by Employer in case the equipment/system* fails to demonstrate successful performance as per contract at site.

Signature of authorized signatory.....

- (d) We shall participate in Technical Co-ordination meetings (TCMs) from time to time, as and when required by the Employer.
- 3. We, the Associate*/Collaborator*/Technology provider*/Licensor* do hereby undertake and confirm that this Letter of Technical Support shall be valid until the end of defect liability period of the contract.

Signature of authorized signatory.....

Signature of the Authorised Representative...
For M/s
(Associate*/Collaborator*/Technology provider*/Licensor*)
Address
Name
Designation
Date:.....
Common Seal of the Company

***: Strike off whichever is not applicable.**

Note : The above format to be referred for auxiliary related to Steam Generator, Electrostatic Precipitator (ESP), Flue Gas Desulphurization (FGD) sub systems as applicable as per the proveness criteria given at sub-section-IA, Part-A of provenness of Technical Specification (Sub-section-VI).

Signature of authorized signatory.....



SUB-SECTION-I-B

PROJECT INFORMATION

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

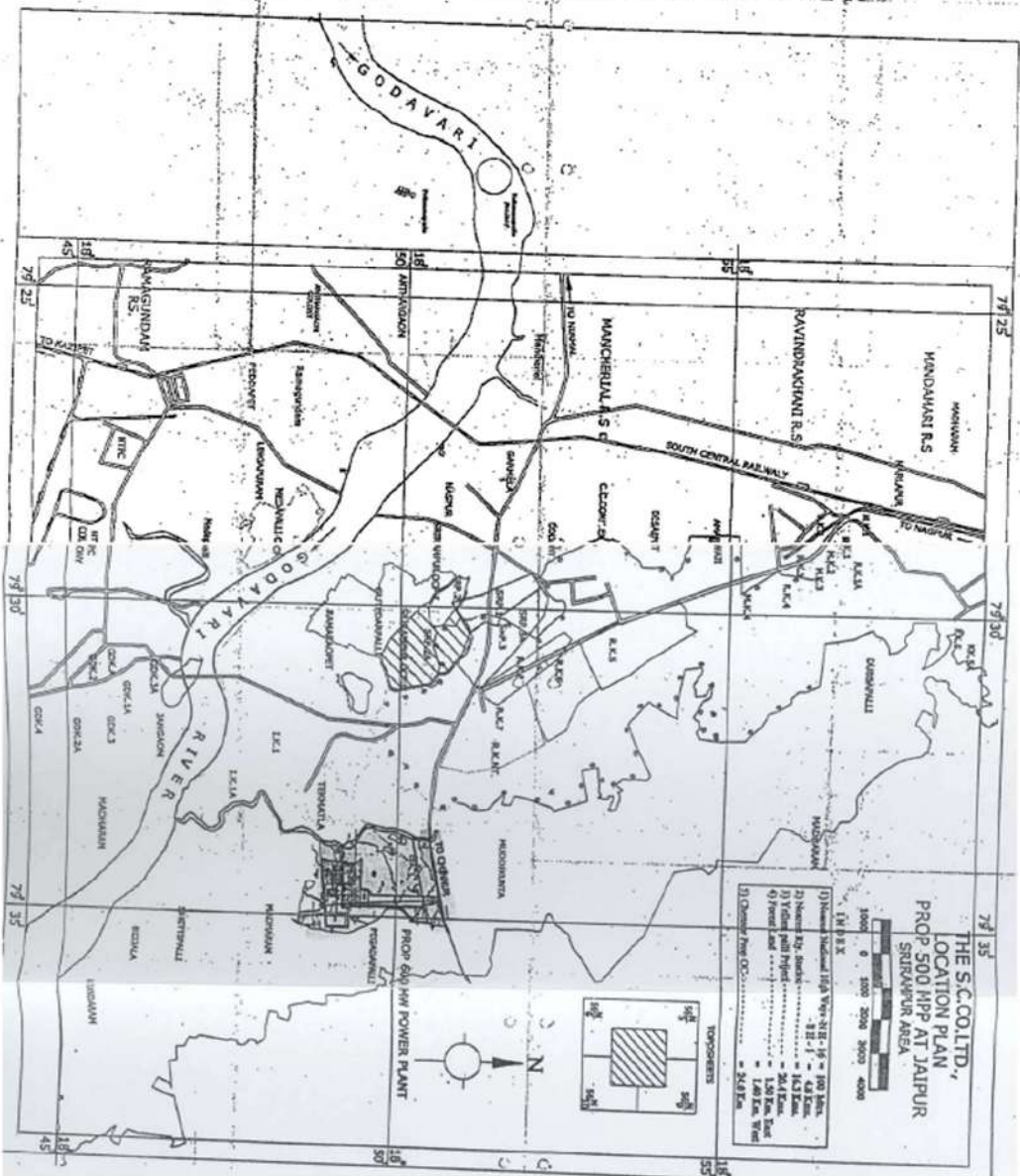
**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	PROJECT INFORMATION			
	SINGARENI TPP STAGE-II (1X800 MW)			
1.00.00	BACKGROUND The Singareni Collieries Company Limited is a government coal mining company jointly owned by the Government of Telangana and Government of India on a 51:49 equity basis. Company has also ventured into power generation with two units of 600 MW that are already commissioned and in operation. The present proposal is for setting up of 2nd Stage of coal based Singareni Thermal Power Project (1x800 MW) to be owned by the Singareni Collieries Company Limited, which is A Government Company. This unit shall be adjacent to the units already commissioned/in operation and in the same compound.			
2.00.00	PROJECT HIGHLIGHTS			
2.01.00	Location The Singareni TPP is located near Pegadapalli village, Jaipur Mandal, District Mancherial of Telangana. The latitude and longitude of site are 18° 48' 30" to 18° 50' 35" N and 79° 34' 00" to 79° 35' 30"E respectively. The site is 14.6 Km from nearest town Mancherial and 4.6 Km from State Highway. Distance from NH-16 (Nirmal-Chinnur section) is 500M. The road distances of proposed site from major cities/towns are as follows: Hyderabad City : 250 Kms. Nagpur City : 250 Kms. Rail Link Nearest railway station is Mancherial railway station on Nagpur-Kazipet main rail line of South Central Railway, located at a distance of about 14.6 kms. Airport Nearest airport is Shamshabad Airport , Hyderabad at a distance of about 250 KM. Vicinity Plan of the proposed project is placed at Annexure-I.			
3.00.00	BASIC INPUTS			
3.01.00	Land Land has been identified for main plant, CHP, AHP, ash dump area, coal conveyor corridors, water pipelines and Green belts as indicated in GLP.			
3.02.00	Water Water requirement has been assessed as (4200+2400) 6600 cum/hr for both Stage-I & II. (As per latest MOEF guidelines).			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IB PROJECT INFORMATION	PAGE 1 OF 16

CLAUSE NO.	PROJECT INFORMATION			
	Irrigation & CAD Deptt., Govt. of Andhra Pradesh(Erstwhile) has allocated 1.0 TMC of water per annum from Pranahita Chevella Lift Irrigation Scheme vide Memo No. 17556/Maj.Irr.VIII(1)/08 dated 02.07.2008 During the no-flow period in the river, Govt. of Andhra Pradesh(Erstwhile), Ground Water Department vide their letter No. 157/T/2008 dated 07.08.2008 addressed to SCCL have accorded approval for drawal of 18 MGD (3409 cum/hr) water through infiltration galleries in River Godavari at Shetpally Village for the project. SCCL has approached Govt. of Andhra Pradesh (Erstwhile) vide letter dated 29.08.09 to get allocation of 2 TMC of water from Sripada-Yellempalli Project including already allocated 1 TMC of water for the Power Project. Suitable intake system developed at a location suggested by Ground Water Deptt., Govt. of Andhra Pradesh (Erstwhile).			
3.03.00	FUEL			
3.03.01	Coal Requirement, Availability and Linkage			
	Coal requirement for 800 MW capacity has been assessed as 4.2 mtpa. Coal will be sourced from own coalmines of SCCL. The primary fuel for the main steam generator shall be coal. The domestic coal quality parameters are indicated in Annexure-IV-2 and imported coal parameters are indicated in Annexure-IV-4 are to be considered for steam generator design.			
3.03.03	Coal Transportation			
	Transportation of coal of (-) 200mm size is planned through railway line connecting STPP with Mancherial Railway station on Kazipet - Ballarsha main line en-route Srirampur coal handling plant & Srirampur open-cast mines of SCCL. (-) 200 mm size Coal required for the power plant can be transported from SCCL mines. BOBRN and BOXN wagons will be deployed for transportation of coal from mines to STPP. The track-line will be provided with Over-Head Electrification and signalling & Telecommunication facilities. Power (electric) engines will be deployed for movement of rolling stock.			
3.03.03	Fuel Oil			
	The fuel oil to be used for start-up, coal flame stabilization and low load operation of the steam generator shall be Light Diesel oil (LDO) having the characteristics given at Annexure-IV-1 and HSD Oil characteristics given at Annexure-IV-3.			
4.00.00	STEAM GENERATOR TECHNOLOGY			
	The steam generators shall be super critical once through type, water tube, direct pulverized coal fired, top supported, balanced draft furnace, single reheat, radiant, dry bottom type, suitable for outdoor installation. The gas path arrangement shall be single pass (Tower type) or two pass type.			
5.00.00	FLUE GAS DESULPHURIZATION SYSTEM (FGD):			
	The project is envisaged with Flue Gas Desulfurization (FGD) system meeting Ministry of Environment, Forest & Climate Change notification dated 07.12.2015. Limestone to be used for design of FGD system shall be as per the characteristic given at Annexure-IV-5.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IB PROJECT INFORMATION	PAGE 2 OF 16

CLAUSE NO.	PROJECT INFORMATION 			
6.00.00	METEOROLOGICAL DATA The meteorological data from nearest observatory is placed at Annexure-II .			
7.00.00	Plant Water Scheme The Plant water scheme is included in Part-E of Technical Specification.			
7.01.00	Condenser Cooling (CW) Water System It is proposed to adopt a recirculating type cooling water system with cooling towers for the project. For the re-circulating type CW system it is proposed to supply clarified water as make up. Circulating water from CW pumps to TG area and from TG area to cooling tower will be carried through pipes/ducts. Cooled water from cooling tower will be led to CW pump house through the cold water channel by gravity.			
7.02.00	Equipment Cooling Water (ECW) System (Unit Auxiliaries) All plant auxiliaries shall be cooled by De-mineralized water (DM) in a closed circuit. The primary circuit DM water shall be cooled through plate type heat exchangers by Circulating Water tapped from CW system in a closed secondary circuit. The hot secondary circuit cooling water shall be cooled in the cooling towers and shall be returned back to the system. It is proposed to provide independent primary cooling water circuit for TG & its auxiliaries and Steam Generator & auxiliaries (including station auxiliaries) on Unit basis.			
7.03.00	Other Miscellaneous Water Systems CW system blow down water shall be used for the FGD process requirement, ash slurry pumps sealing, sealing of Vacuum pumps (if applicable) of Ash Handling plant, make-up to fire water system. The service water shall be taken from CW blowdown. The service (wash water) water collected from various areas and coal handling plant shall be treated as per requirement and reused. The drinking water requirement shall be provided from existing stage-I system. The quality of Raw water is given in this sub-section at Annexure-III			
8.00.00	POWER EVACUATION SYSTEM In view of above and considering the present capacity of the project (800 MW), it is proposed to adopt the step-up/power evacuation voltage as 400kV. Accordingly provision for 4 Nos. of 400 kV line bays has been considered in the generation switchyard. Station supply shall be derived directly from 400kV voltage level through 400kV Class station transformers. The issue of power evacuation of the project shall be taken up with appropriate Transmission Utility as per regulatory provision.			
9.00.00	Criteria for Earthquake Resistant Design of Structures and Equipment All power plant structures and equipment, including plant auxiliary structures and equipment shall be designed for seismic forces as given in Part-B of this section.			
10.00.00	Criteria for Wind Resistant Design of Structures and Equipment All structures and equipment of the power plant, including plant auxiliary structures and equipment, shall be designed for wind forces as given as given in Part-B of this section.			
11.00.00	Vulnerability Atlas of India(VAI), prepared by Building Materials, Training and Promotion Council (BMTPC) under Ministry of Housing and Urban Affairs, is a comprehensive			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IB PROJECT INFORMATION	PAGE 3 OF 16

CLAUSE NO.	PROJECT INFORMATION			
	document which provides existing hazard scenario for the entire country and presents the digitized State/UT-wise hazard, maps with respect to earthquakes, winds and floods for district-wise identification of vulnerable areas. It also includes additional digitized maps for thunderstorms, cyclones and landslides. The main purpose of this Atlas is its use for disaster preparedness and mitigation at policy planning and project formulation and construction stage. The VAI provides necessary information for risk analysis and hazard assessment and is available at website www.bmtpc.org. As per Government's directive, it is mandatory for the bidders to refer VAI for multi-hazard risk assessment and include the relevant hazard proneness specific to project location while planning, designing and execution of the project in terms of following details: i) Seismic zone (II to V) for earthquakes ii) Wind velocity iii) Area liable to floods and Probable max. surge height iv) Thunderstorms history v) Number of cyclone storms/sever cyclone storms and max sustained wind specific to coastal region vi) Landslides incidences with Annual rainfall normal vii) District wise Probable Max. Precipitation Accordingly, bidder should refer VAI while planning, designing and execution of the project. However, for design of structures/facilities and equipment, the criteria for earthquake resistant design of structures and equipment, the criteria for Wind Resistant Design of Structures and Equipment and design parameters for drainage facilities, stipulated in the Technical Specification shall be followed. For other information like area liable to floods, probable max. surge height, landslide, thunderstorm, cyclone etc. agencies are required to refer the VAI.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IB PROJECT INFORMATION	PAGE 4 OF 16

CLAUSE NO.	PROJECT INFORMATION			
	ANNEXURE-I			
				
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IB PROJECT INFORMATION	PAGE 5 OF 16	



CLIMATOLOGICAL TABLE

Rainfall data by Indian Meteorological Department (IMD) for Pegadapalli, Jaipur mandal (near Ramagundam) is attached (from 1951 to 1980). For additional data, Bidder has to arrange for necessary input directly from IMD under intimation to the owner.

पल्लवपल्ली सारणी CLIMATOLOGICAL TABLE

स्थान: पल्लवपल्ली
STATION: Ramagundam

अक्षांश: 18° 44' N
LONG: 78° 28' E

ऊँचाई: 158 METRES
HEIGHT ABOVE M.S.L.

1951 से 1980 तक के अवधि के अवलोकन
BASED ON OBSERVATIONS FROM 1951 TO 1980

वायु तापमान														वर्षा											
MEAN														RAINFALL											
EXTREMES														CLOUD AMOUNT											
HUMIDITY														HIGHEST MONTHLY RAINFALL											
RELATIVE HUMIDITY														TOTAL IN HIGHEST MONTH WITH YEAR											
WIND														TOTAL IN HIGHEST MONTH WITH YEAR											
WIND DIRECTION														TOTAL IN HIGHEST MONTH WITH YEAR											
WIND VELOCITY														TOTAL IN HIGHEST MONTH WITH YEAR											
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WIND VELOCITY														TOTAL IN HIGHEST MONTH WITH YEAR											



ANNEXURE-III

RAW WATER ANALYSIS

RAW WATER ANALYSIS REPORT ON 19.03.2022		
PARAMETERS	UNITS	VALUE
pH		8.58
CONDUCTIVITY	(μ s/cm)	548
TDS	ppm	356
TOTAL HARDNESS	ppm	172
Ca-HARDNESS	ppm	116
Mg-HARDNESS	ppm	56
P-ALKALINITY	ppm	10
M-ALKALINITY	ppm	154
CHLORIDE	ppm	80
SILICA	ppm	27.5
TURBIDITY	NTU	6.1
SODIUM	ppm	58.4
POTASSIUM	ppm	13.7
IRON(TOTAL)	ppm	0.5
ORGANIC(KMnO4)	ppm	1.2

Bidder to design the system for worst case parameter.

CLAUSE NO.	PROJECT INFORMATION					
	ANNEXURE-IV-1					
	TABLE-1					
	<u>LIGHT DIESEL OIL CHARACTERISTICS</u>					
	AS PER IS 15770-2008					
	Characteristics		LDO			
	1.	Pour Point (max)	21 °C & 12°C for Summer and Winter respectively			
	2.	Kinematic viscosity in centistokes at 40 deg.C	2.5 to 15.0			
	3.	Sediment percent by mass (max)	0.10			
	4.	Total sulphur percent by mass (max)	1.5			
	5.	Ash percentage by mass (max)	0.02			
	6.	Carbon residue (Rams bottom) percent by pass (max.)	1.50			
	7.	Acidity inorganic	Nil			
	8.	Flash point (Min.) - Pensky Martens	66 deg.C			
9.	Copper strip corrosion for 3 hours at 100°C	Not worse than No. 2				
10.	Water content, % by volume (max)	0.25				
11.	GCV(kcal/kg)	10,000				
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-IB PROJECT INFORMATION		PAGE 8 OF 16


DOMESTIC COAL CHARACTERISTICS ANNEXURE-IV-2
TABLE-1 – A
COAL CHARACTERISTICS

S No.	Characteristics (As received basis)	Range of 95% coal supplies			Range of 5% coal supplies	
		Column-1	Column- 2	Column- 3	Range of Adequacy coal	
1.0	PROXIMATE ANALYSIS	Design	Worst	Best	Worst	Best
1.1	Total Moisture (%)	16	17	13	17.5	13
1.2	Ash (%)	40	43	33.5	44	31
1.3	Volatile matter (%)	21	19	23	19	23
1.4	Fixed carbon (%)	23	21	30.5	19.5	33
2.0	ULTIMATE ANALYSIS					
2.1	Carbon (%)	34.7	30.4	42.85	29.1	43.03
2.2	Hydrogen	2.8	2.3	2.1	2.3	3.58
2.3	Sulphur(%)	0.4	0.6	0.4	0.5	0.35
2.4	Nitrogen (%)	1	0.9	1.23	0.84	0.57
2.5	Oxygen (%) (By difference)	5.1	5.8	6.92	5.41	9.17
2.g	Total Moisture (%)	16	17	13	17.5	10
2.7	Ash (%)	40	43	33.5	44	31.5
2.8	GCV (kcal/kg)	3550	3000	3900	2900	4100
2.9	Hard grove index	50	48	65	45	70
2.10	YGP Index (mg/kg)	75	80	70	85	65
3.0	ASH ANALYSIS					
3.1	Silica (%)	58.59	56.81	60.2	56.29	60.42
3.2	Alumina (%)	26.77	27.42	26.1	27.5	25.9
3.3	Iron Oxide(%)	8.8	9.8	7.8	10.1	7.6
3.4	Titania(%)	1.66	1.78	1.56	1.86	1.52
3.5	Phosphoric Anhydride(%)	0.19	0.1	0.24	0.08	0.32
3.6	Lime (%)	1.39	1.48	1.32	1.52	1.28
3.7	Magnesia (%)	1	1.13	0.97	1.17	0.92
3.8	Sulphuric Anhydride (%)	0.05	0.04	0.1	0.04	0.15
3.9	Sodium Oxide (%)	0.2	0.08	0.4	0.08	0.5
3.10	Balance Alkalies (By Difference) (%)	1.35	1.36	1.31	1.36	1.39
4.0	ASH FUSION RANGE (Under reducing atmosphere)					
4.1	Initial Deformation Temperature (degree Celsius)	1150	1100	1200	1100	1200
4.2	Hemispherical temperature (degree Celsius)	1300	1250	1350	1250	1350
4.3	Flowtemperature (degree Celsius)	1400	1350	1400	1350	1400

CLAUSE NO.	PROJECT INFORMATION				
	TABLE-2 ANNEXURE-IV-3 HIGH SPEED DIESEL OIL CHARACTERISTICS [AS PER IS 1460-2005 (BS-II)]				
	S. No.	Particulars	Unit	Value	
	1.	PHYSICAL PROPERTIES			
		a. Distillation volume recovery @ 350 ⁰ C	% vol. (min)	85	
		b. Distillation volume recovery @ 370 ⁰ C	% vol. (min)	95	
		c. Kinematic Viscosity @ 40 Degree C	cSt	2.0 – 5.0	
		d. Density @ 15 Degree C	kg/m³	820 – 860	
		e. Pour Point			
		- Summer	Degree C (max)	15	
		- Winter	Degree C (max)	03	
		f. Cold Filter Plugging Point			
		- Summer	Degree C (max)	18	
		- Winter	Degree C (max)	06	
		g. Flash Point (Abal)	Degree C (max)	35	
		h. Lubricity WSD 1.4 @ 60 Degree C	Microns (max)	460	
2.	HEATING VALUE				
	a. Higher Heating Value (HHV)	Kcal/Kg	11,000		
	b. Lower Heating Value (LHV)	Kcal/Kg	10,300		
3.	ACIDITY				
	a. Inorganic	mg KOH/g	Nil		
	b. Total	mg KOH/g	0.2 (max.)		
4.	Copper Strip Corrosion 3 hours @100 ⁰ C	No.	1 (max)		
5.	RCR on 10% residue	% wt.	0.3 (max)		
6.	CONTAMINANTS				
	a. Ash	ppm (wt.)	100 (max)		
	b. Sediments	% wt	0.05 (max)		
	c. Total Sulphur	% wt	0.05 (max)		
	d. Water Content	% volume	0.05 (max)		
	e. Trace Metals				
	- Na + K	ppm (wt)	0.30 (max)		
	- Vanadium	ppm (wt)	0.50 (max)		
	- Lead	ppm (wt)	0.50 (max)		
	- Calcium	ppm (wt)	2.0		
	- Ni + Zn	ppm (wt)	Nil		
7.	Nitrogen content (FBN)	% wt.	0.015		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IB PROJECT INFORMATION	PAGE 10 OF 16	

CLAUSE NO.	PROJECT INFORMATION 																																																																																																																																																								
	ANNEXURE-IV-4 TABLE – 4 TYPICAL IMPORTED COAL AND ASH CHARACTERISTICS <table> <tr> <th rowspan="2">SI.No.</th><th rowspan="2">Characteristics (as received basis)</th><th colspan="2">Imported Coal</th></tr> <tr> <th>Worst</th><th>Best</th></tr> <tr> <td>1.0</td><td>Proximate Analysis</td><td></td><td></td></tr> <tr> <td>1.1</td><td>Total Moisture (%)</td><td>20</td><td>16</td></tr> <tr> <td>1.2</td><td>Ash (%)</td><td>10</td><td>10</td></tr> <tr> <td>1.3</td><td>Volatile Matter (%)</td><td>30</td><td>45</td></tr> <tr> <td>1.4</td><td>Fixed Carbon (%)</td><td>40</td><td>29</td></tr> <tr> <td>1.5</td><td>Total (%)</td><td>100</td><td>100</td></tr> <tr> <td>2.0</td><td>Ultimate Analysis</td><td></td><td></td></tr> <tr> <td>2.1</td><td>Carbon (%)</td><td>56.4</td><td>62.4</td></tr> <tr> <td>2.2</td><td>Hydrogen (%)</td><td>4.5</td><td>4.9</td></tr> <tr> <td>2.3</td><td>Sulphur (%)</td><td>0.9</td><td>0.8</td></tr> <tr> <td>2.4</td><td>Nitrogen (%)</td><td>0.9</td><td>0.5</td></tr> <tr> <td>2.5</td><td>Oxygen (%) (By difference)</td><td>7.3</td><td>5.4</td></tr> <tr> <td>2.6</td><td>Carbonates (%)</td><td>0</td><td>0</td></tr> <tr> <td>2.7</td><td>Phosphorous (%)</td><td>0</td><td>0</td></tr> <tr> <td>2.8</td><td>Total Moisture (%)</td><td>20</td><td>16</td></tr> <tr> <td>2.9</td><td>Ash (%)</td><td>10</td><td>10</td></tr> <tr> <td></td><td>Total</td><td>100</td><td>100</td></tr> <tr> <td>2.10</td><td>GCV (Kcal/Kg)</td><td>5800</td><td>6500</td></tr> <tr> <td>2.11</td><td>Hard Grove Index</td><td>45</td><td>60</td></tr> <tr> <td>2.12</td><td>YGP (mg/kg)</td><td>100</td><td>70</td></tr> <tr> <td>3.0</td><td>Ash Analysis</td><td></td><td></td></tr> <tr> <td>3.1</td><td>Silica (SiO₂) (%)</td><td>32.74</td><td>34.94</td></tr> <tr> <td>3.2</td><td>Alumina(Al₂O₃) (%)</td><td>30.5</td><td>28.43</td></tr> <tr> <td>3.3</td><td>Iron Oxides(Fe₂O₃) (%)</td><td>18.2</td><td>15.2</td></tr> <tr> <td>3.4</td><td>Titania (TiO₂)</td><td>1.56</td><td>1.76</td></tr> <tr> <td>3.5</td><td>Phosphoric Anhydride(P₂O₅) (%)</td><td>0.44</td><td>0.54</td></tr> <tr> <td>3.6</td><td>Lime (CaO) (%)</td><td>6.12</td><td>7.62</td></tr> <tr> <td>3.7</td><td>Magnesia (MgO) (%)</td><td>1.83</td><td>1.93</td></tr> <tr> <td>3.8</td><td>Sulphuric Anhydride (%)</td><td>6.95</td><td>7.65</td></tr> <tr> <td>3.9</td><td>Sodium Oxide (Na₂O) (%)</td><td>0.3</td><td>0.4</td></tr> <tr> <td>3.10</td><td>Balance alkalies (by difference)</td><td>1.36</td><td>1.56</td></tr> <tr> <td></td><td>Total</td><td>100</td><td>100</td></tr> <tr> <td>4.0</td><td>Ash Fusion Temperature reducing temperature</td><td></td><td></td></tr> <tr> <td>4.1</td><td>Initial deformation Temp (°C)</td><td>1100</td><td>1250</td></tr> <tr> <td>4.2</td><td>Hemispherical Temp. (°C)</td><td>1300</td><td>1350</td></tr> <tr> <td>4.3</td><td>Flow Temp. (°C)</td><td>1400</td><td>1400</td></tr> </table>			SI.No.	Characteristics (as received basis)	Imported Coal		Worst	Best	1.0	Proximate Analysis			1.1	Total Moisture (%)	20	16	1.2	Ash (%)	10	10	1.3	Volatile Matter (%)	30	45	1.4	Fixed Carbon (%)	40	29	1.5	Total (%)	100	100	2.0	Ultimate Analysis			2.1	Carbon (%)	56.4	62.4	2.2	Hydrogen (%)	4.5	4.9	2.3	Sulphur (%)	0.9	0.8	2.4	Nitrogen (%)	0.9	0.5	2.5	Oxygen (%) (By difference)	7.3	5.4	2.6	Carbonates (%)	0	0	2.7	Phosphorous (%)	0	0	2.8	Total Moisture (%)	20	16	2.9	Ash (%)	10	10		Total	100	100	2.10	GCV (Kcal/Kg)	5800	6500	2.11	Hard Grove Index	45	60	2.12	YGP (mg/kg)	100	70	3.0	Ash Analysis			3.1	Silica (SiO ₂) (%)	32.74	34.94	3.2	Alumina(Al ₂ O ₃) (%)	30.5	28.43	3.3	Iron Oxides(Fe ₂ O ₃) (%)	18.2	15.2	3.4	Titania (TiO ₂)	1.56	1.76	3.5	Phosphoric Anhydride(P ₂ O ₅) (%)	0.44	0.54	3.6	Lime (CaO) (%)	6.12	7.62	3.7	Magnesia (MgO) (%)	1.83	1.93	3.8	Sulphuric Anhydride (%)	6.95	7.65	3.9	Sodium Oxide (Na ₂ O) (%)	0.3	0.4	3.10	Balance alkalies (by difference)	1.36	1.56		Total	100	100	4.0	Ash Fusion Temperature reducing temperature			4.1	Initial deformation Temp (°C)	1100	1250	4.2	Hemispherical Temp. (°C)	1300	1350	4.3	Flow Temp. (°C)	1400	1400
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SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IB PROJECT INFORMATION	PAGE 11 OF 16																																																																																																																																																						

CLAUSE NO.	PROJECT INFORMATION			
	Annexure – IV-5			
	LIMESTONE CHARACTERISTICS			
	Chemical Analysis(% by mass)			
	1.	CaO	%	47-51.0*
	2.	MgO	%	0.9-3.8
	3.	Fe ₂ O ₃	%	0.45-1.0
	4.	Al ₂ O ₃	%	1.19-2.1
	5.	Si ₂ O ₃	%	2.1-4.5
	6.	Mn ₂ O ₃	%	<0.12
	7.	P ₂ O ₅ ,	%	Traces
	8.	Cl ₂	%	<0.015
	9.	Na ₂ O	%	<0.16
	10.	K ₂ O	%	<0.01
	11.	TiO ₂	%	<0.02
	12.	Total Sulphur	%	<0.1
	13.	LOI	%	39.0-41.3
	Physical properties			
	1	Bond Index	kWh/t	13
	2	Granule size		Medium
	Notes:			
	1. *Guaranteed parameters (guarantee on limestone consumption, auxiliary power consumption & gypsum purity) shall be based on available (reactive) CaCO ₃ content of 89%. The design of Flue Gas Desulphurisation (FGD) system &auxiliaries shall be based on available (reactive) CaCO ₃ content of 79%.			
	2. For the purpose of volumetric computations of limestone handling & storage system the bulk density of limestone shall be taken as 1400 kg/m ³ . However for torque, drive & structural load requirements the density of lime stone shall betaken as 1700 kg/m ³ . For gypsum, the bulk density shall be taken as 900 kg/m ³ for volumetric computation and 1250 kg/m ³ for torque, drive & structural load requirements.			
	3. For the purpose of sizing of equipments and guarantee, MgCO ₃ shall be considered as unreactive dolomitic form.			
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CLAUSE NO.	PROJECT INFORMATION			
	Annexure-IV-6			
	METHANOL CHARACTERSTICS			
	SN	Fuel Property	Unit	Methanol
	1	Chemical Formula		CH3-OH
	2	Fuel Carbon	Wt%	38
	3	Fuel Oxygen	Wt%	12
	4	Density at 20 deg C	kg/m3	792
	5	LHV	Kcal/kg	4800
	6	Boiling Temp	°C at 1 bar	65
	7	Vapour Pressure	bar at 20°C	0.13
	8	Kinematic viscosity	cSt at 20°C	0.74
	11	Auto Ignition	°C	470
	12	Heat of Vapourization	kcal/kg	260
	15	Flammability limit	vol %	6-36
16	Flash Point	°C	12	

CLAUSE NO.	PROJECT INFORMATION			
	Annexure-IV-7(A)			
S.N.	Technical Data	Unit	Specifications for Torrefied Pellet	
1.	Base Material		Agro residue: Which means the leftover portion of the agriculture produce such as stubble/straw/stalk/husk of those agro residue which are surplus and not being used as animal fodder such as paddy, soya, arhar, guar, cotton, gram, jawar, bajara, moong, mustard, sesam, til, maize, sunflower, jute, coffee etc., groundnut shell, coconut shell, castor seedshell etc., pine needle, elephant grass, sarkanda and horticulture waste such as dry leaves and trimmings generated during the maintenance and pruning of trees and plants. Wood obtained from tree cutting shall not be treated as agro residue and shall be not to be used as base material or mixing purpose whatsoever.	
2.	Diameter	mm	In case of cylindrical shape: Diameter: Not more than 35 mm Length: Random For other shapes: No dimension should exceed 35 mm.	
3.	Fines % (<3 mm) (ARB*)	Wt%	fines ≤ 5%	
4.	Gross Calorific Value (GCVARB*)	Kcal/Kg	Refer below	
5.	Moisture (ARB*)	Wt%	<= 15% (not more than 15%)	
6.	Bulk density	Kg ³	600	
	*ARB – As Received Basis			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-IB PROJECT INFORMATION
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Annexure-IV-7(B)

The sample was prepared by torrefying rice straw at 300 deg C with a holding time of one hour. Following analysis are carried out at NETRA using the powdered torrefied rice straw samples and the results of various testing for the specific sample is tabulated below:

a. Proximate Analysis (wt %, Air Dried Basis)

M	Ash	VM	FC
6.68	21.66	47.68	23.98

b. Ultimate Analysis (wt %, Air Dried Basis)

C	H	N	S	O
46.65	3.93	1.13	0.14	19.81

c. GCV : 4201 kcal/kg

d. Ash Fusion Temperature under reducing conditions: °C

IDT	ST	HT	FT
1134	1357	1374	1422

e. Ash Elemental Analysis (Elements expressed as Oxides in %w/w)

Na2O	MgO	Al2O3	SiO2	P2O5	SO3	K2O	CaO	TiO2	MnO	Fe2O3
2.423	7.783	4.623	67.48	1.9	1.9	6.15	4.21	0.39	0.03	2.83

CLAUSE NO.	PROJECT INFORMATION		
	Annexure-IV-7(C) For the Torrefied Rice Straw Pellets (Prepared by torrefaction of rice straw at 300 deg C with holding time of 1 hr) tested at NETRA, the test results are as follows: A. For Anion (ISO 16994:2016 E-Solid Biofuels- Determination of total content of sulphur and chlorine)-reported as wt % dry basis a. Chlorine (Cl): 0.32% b. Fluorine (F) : 0.09% B. For Cation (ISO 16967:2015 E-Solid Biofuels- Determination of major elements ...)- Reported as wt % dry basis a. Sodium (Na): 0.31% b. Potassium (K): 2.04% Note: The above details as at Annexure-IV-7(A), IV-7(B& IV-7(C) are indicative only and shall vary based on the exact raw material and its subsequent processing.		
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SUB-SECTION–IIA

SCOPE OF SUPPLY & SERVICES

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
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SUB-SECTION–IIA-01

STEAM GENERATOR AND AUXILIARIES INCLUDING ESP

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES		
1.00.00	GENERAL SCOPE OF SUPPLY AND SERVICES		
1.01.00	The scope of work for the equipment and accessories to be furnished in accordance with this Sub-section “Steam Generators and Auxiliaries including ESP” and other sub-sections for “Flue Gas Desulphurisation (FGD) System” shall include design, manufacture, engineering, inspection and testing at suppliers works, packing, forwarding to site, unloading, erection, supervision, pre-commissioning, testing and commissioning and performance testing of the equipment/system and works indicated in this Sub-section of the technical specification. Any item or works though not specifically mentioned in this specification but needed to complete the equipment & systems to meet the intent of the Specification shall also be furnished.		
1.02.00	Tests The scope of the Contractor includes all shop tests, type tests, site tests, routine tests, etc., fulfillment of complete quality assurance & inspection requirements and related activities for all the equipment & systems covered under the scope of work of bidder as per the stipulations of Technical Specifications.		
1.03.00	Pre-commissioning and Commissioning Activities Contractor's Scope shall include all pre-commissioning and commissioning activities, required for successful performance of all equipment and systems under this Sub-section and shall include, but will not be limited to, activities detailed in Part-B of Technical Specification. Contractor's scope shall also include supply of all materials and services including the following for successful conductance of pre-commissioning and commissioning activities:		
1.03.01	Complete pre-commissioning work including tests of facilities such as line flushing, hydraulic testing of pressure parts, air and gas tightness tests of steam generator enclosure, duct work and ESP, FGD System, chemical cleaning of pressure parts, steam blow off, pressure drop test of ESP System, gas distribution test of ESPs, etc. and all other tests as mutually agreed in the Contractor's quality assurance program as well as those identified in the specification.		
1.03.02	Commissioning and initial operation of the facilities.		
1.03.03	Supply of all consumables (except coal oil and limestone) like chemicals for chemical cleaning, passivation, inhibition etc., Catalysts, fuel oil & coal for firing beyond declared predefined quantity limits as specified in clause no. 4.02.00, Sub-Sec-I, sec-VI, Part A, oil for line flushing, nitrogen for blanketing, consumables for air/ gas tightness tests and any other consumable as may be required for above pre-commissioning/ commissioning activities. And the total required limestone shall be issued free of charge by the employer for such purposes.		
1.03.04	(a) Supply of all temporary equipment such as tanks, piping, including supports, valves, Electrically Operated Temporary Valves (EOTVs) including one (1) no. as a spare in addition to the required number for Steam blowing process, nitrogen blanketing and purging equipment including nitrogen cylinders, pumps, blowers and all necessary instrumentation for successful conductance of pre-commissioning and commissioning activities. All temporary equipment, pumps, blowers, valves etc. brought to sites, by the Contractor for pre-commissioning/commissioning purpose shall be in good working condition to ensure its safe and reliable operation at site. All such temporary equipment/components shall be brought to site atleast three (3) months prior to commencement of relevant pre-commissioning/commissioning activities. On receipt of the temporary equipment/components at site, the same shall be inspected by the Employer to ensure its safe and reliable operation and if in the opinion of the Employer the temporary equipment/components are not in satisfactory conditions to ensure it's safe and reliable operation the same shall be immediately replaced by the Contractor.		
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	(b) The temporary equipment specifically brought by the Contractor solely for the pre-commissioning and commissioning work shall on completion of these activities, remain the property of the Contractor. However, the nitrogen blanketing and purging equipment including nitrogen cylinders and one (1) no. spare Electrically Operated Temporary Valve (EOTV), required for pre-commissioning/commissioning activities of Steam Generator & Auxiliaries, shall get included in the Contractor's permanent scope of supply and become property of the Employer. (c) The selection of material of all the temporary equipment/ instruments shall be compatible with the service conditions expected during pre-commissioning/ commissioning activities. (d) All temporary equipment and instruments along with the respective control system shall be clearly listed out in the bid.			
1.03.05	Supply of all labour, skilled/ semi skilled supervisors, engineers and any other manpower.			
1.03.06	The scope of Contractor shall also include necessary approach & Platforms for all the instruments required during commissioning and testing. These approach platforms shall be provided to meet all required safety norms and these shall be of permanent nature.			
2.00.00	STEAM GENERATOR AND AUXILIARIES The Contractor's scope of supply & services for Steam Generator(SG) shall include all equipment required for one (01) number of once through, single/double pass (tower type/two pass type), single reheat, radiant furnace, dry bottom, balanced draft, outdoor type, pulverised coal fired steam generating units having supercritical steam parameters with all necessary auxiliaries, integral piping, elevators, etc. Items though not specifically mentioned but needed to complete the equipment and systems to meet the intent of specification, shall be deemed to be included in scope of work of Contractor. The scope of supply and services for steam generating unit shall include all items indicated but will not be limited to the following:			
2.01.00	Furnace/Evaporator (a) Water cooled furnace complete with separator(s), water wall, headers, steam generating tubes, risers, furnace bottom hoppers, drains, observation ports, inspection doors/manholes, sample connections, Metal Temperature Measurement (MTM) thermocouples etc. (b) Two (2) numbers of retractable type temperature probes with duplex type elements at the furnace outlet or Reheater inlet, complete with all accessories like guiding supports, cooling arrangement, motor with position indicator etc.			
2.02.00	Separator(s) & Drain collection vessel Minimum Two (2) numbers of steam separators along with a drain collection vessel at the evaporator outlet. The separator(s) and drain collection vessel shall be of welded construction/ forged construction/ seamless tube with all its internals (if applicable), safety valves, mountings, fittings and accessories including the nozzle for connections and suitable arrangement for checking and maintenance, necessary tapping points along with root valves for level measurement, drains, valves, piping and associated fittings.			
2.03.00	Super heater(s) Superheater(s) including safety valves, main steam stop valves at superheater outlet with integral bypass valves, drains, start-up vents, air release valves, nitrogen connections, sampling connections, MTM thermocouples etc.			
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2.04.00	Reheater(s) Reheater(s) including safety valves, drains, start-up vents, air release valves, sampling connection, reheater inlet and outlet isolators, MTM thermocouples etc.			
2.05.00	Economizer In line, bare tube economizer, including vents, drains and sampling connections etc.			
2.06.00	Start-up Recirculation & Drain system The scope for above shall include but will not be limited to the following (to be read in conjunction with applicable tender drawing “Startup Drain system”): (1) 1x100% start-up drain recirculation pump complete with connecting pipe work between separator/drain collection vessel and the pump and between pump and the feed water supply pipeline along with necessary separator/drain collection vessel level control and isolation valves. (2) Double isolation (one motorised and one manual) valve at the suction and Motorised isolation, Electrohydraulic operated control valve and a non-return valve on the discharge of the pump. Alternatively, Electrohydraulic operated control valve and a motor operated stop cum check valve is also acceptable. (3) A mixing box on the pump suction, a non-return valve and motorized isolation valve upstream of the mixing box on the recirculation line from separator. Piping between the mixing box and the feed water supply line with a NRV on this line. Other proven standards systems with startup drain circulation pumps are also acceptable provided Contractor has proven experience on satisfactory performance of such system(s) in sub critical/supercritical units of similar capacity which are designed for variable pressure operation. In case Bidder offers startup circulation system without mixing box, the Bidder in his bid proposal shall furnish necessary data/information in support of provenness of system offered. (4) An alternate drain connection to enable start-up of steam generator even when the start-up drain recirculation pump is not in service shall also be provided. The system shall comprise of an atmospheric flash tank and drain receiving vessel located in the Steam Generator area and shall be complete with all necessary valves, piping, level control system etc. The start-up drain from the separator(s)/ Drain collection vessel to atmospheric flash tank shall be led through twin piping leg, each leg being provided with a motorised isolation valve and an Electro- hydraulic operated control valve. 2X50% pumps to transfer condensate from the receiving vessel to the main condenser, either directly or through a flash tank shall also be provided along with all necessary valves and discharge piping. (5) Vent pipe from atmospheric flash tank terminated above steam generator roof level. (6) Circulating water pump motor shall be provided with cooler along with necessary valve and connecting cooling water pipelines. (7) All necessary instruments, like level transmitters, pressure gauges etc., with necessary root valves to function in conjunction with the above.			
2.07.00	Superheater and Reheater Desuperheating Spray Systems Desuperheating spray type attemperators with headers shall be provided for the spray for Superheaters and Reheaters. The superheater spray water shall be tapped off from a suitable location downstream side of HP heaters or intermediate banks of economiser or			
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2.07.01	economizer outlet. However, for Reheater desuperheating, the spray water shall be tapped off from the intermediate stage of Boiler Feed Pumps. The requirements indicated below for each leg of each stage of desuperheating spray system is for superheater spray system. Similar system shall be provided for reheater spray system also. (a) Two (2) nos. pneumatically operated spray control valves, each rated for full duty with two (2) nos. pneumatically/motor operated isolating valves upstream & two (2) nos. manually operated isolating valves down stream of the spray control valves (b) Drain lines with individual isolating valves. (c) Quick acting pneumatically/motor operated block valve (with solenoid) at upstream of each superheater spray control station in the common super heater attemperation line. (d) Non-return valves in each individual spray leg nearest to the spray point. (e) Welded type attemperation water flow nozzle before/ after spray control valve in the common line along with all accessories for flow measurements and controls.			
2.08.00	VALVES All necessary isolating, control, regulating, check and relief valves whether pneumatically operated, motor operated valves, hydraulic or manually operated including main steam stop valves, vent valves, drain valves, root valves, safety valves, mountings etc., as required for the steam generator integral piping system and associated piping system. All power operated valves shall be complete with actuator assemblies and accessories like limit switch assemblies, position transmitters, air locks etc. Integral bypass valves with actuators and accessories, for all high pressure isolating valves as specified. Any valve/ mounting not specifically indicated but required for safe/efficient/reliable operation of the steam generator shall also be included. The valves and accessories shall comply with the following requirements and shall include: (a) All drain, vent, air release, instrument root, isolation drains and sampling lines shall be provided with two valves in series if the pressure is equal to or above 40 Kg/cm²(a) or temperature is above 300 degree Celsius. However, single isolating valve shall be acceptable in the other case. (b) Main steam stop valves with motor drives along with double motorised integral bypass valves and piping. (c) All necessary level control valves, electro hydraulic operated fast acting valve with safety features, their isolating valves, bypass valves, non-return valves and drain valves etc., for the start-up recirculation circuit. (d) One non-return valve and flow element on feed line(s) at inlet and as close as possible to the economizer. (e) Separator safety valves and drain pans. (f) Superheater and reheater safety valves and the drain pans for these. (g) Electromatic Relief Valves (ERV) /Electromatic ball valve (EBV) on SH outlet and RH outlet. Each of these valves at SH and RH outlet(s) shall be composite unit including solenoid valve assembly, pressure sensing device, impulse piping, accessories, and the drain pans etc. A motorised remote operated isolation valve shall be provided on			
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	upstream side of each relief valve. The control of ERV along with the motorised valve shall be performed from SG C&I system. (h) Start-up drain and vent regulating valves with motor drives and position feedback transmitter with control from SG C&I system. (i) Start-up drain and vent isolating valves with motor drives with control from SG C&I system. (j) All start-up vents, lowest set pressure spring loaded safety valve and Electromatic Relief valves (ERV)/Electromatic ball valves (EBV) at superheater & reheater outlet and lowest set pressure spring loaded safety valves on Separator shall be provided with silencers for each safety valve. The silencers shall enable meeting specified noise levels and the safety/ relief valve floats. (k) All instrument tapping point with root valves. Two root valves in series shall be provided for lines above 40 kg/cm² (g) pressure or temperature above 300 deg.C. (l) Isolating and drain valves for all gauge glasses. (m) Necessary drain system including low noise drain valve to ensure draining of the steam generators in one hour without any assistance. (n) A non-return valve and isolation valve on steam generator fill line. (o) Any other valves not mentioned specifically but needed to complete the system with drives, wherever required. (p) Valves on atmospheric flash tank drain cooling water pipelines. (q) The start-up, load maneuvering and shut down of steam generator is proposed from the central control room. The Contractor shall provide all required valves with their actuators and remote operation facilities to achieve this. (r) All other operational requirements specified elsewhere shall also be complied with. The Contractor shall provide all required valves with specified type of actuator to meet such operational requirements.			
2.09.00	Soot Blowing System			
2.09.01	Soot blowers and soot blowing system shall be provided to effectively remove all ash deposits from the heat transfer surfaces of the Steam Generator. Short retractable rotary wall blowers shall be provided for the furnace, long fully retractable rotary blowers for superheater, reheater and economizer and sweep action/ swing arm/Long retractable non rotating blowers for regenerative air preheater. Each blower shall be provided with motor drive with coupling and coupling guards, base plate frame and holding bolts, speed reducers, cam, chain drives and other ancillaries, emergency hand cranks, flanges, gaskets, seals and bearings for each soot blower and its supporting structures.			
2.09.02	Soot blower piping including supply piping to all soot blowers through pressure reducing station, drain piping, vent piping, relief valves and escape piping with silencer, support & hangers etc. Complete soot blower piping shall have warm up and automatic self draining features to preclude water being blown on to the heat absorption surfaces.			
2.09.03	Steam from Cold Reheat Line shall be predominantly used for soot blowers. However, during low load operation or during non-availability of soot blowing steam of appropriate parameters, alternate source can be taken from Super Heater circuit. For this purpose, soot blowing steam shall be taken from the Cold Reheat (left & right) lines and also from Super Heater circuit (left & right) with suitable provision of interlock and protection to use CRH source at			
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	high load and super heater circuit steam at low load as per pressure and degree of superheat required. Valves for soot blower operation shall include pneumatically operated pressure reducing control valves, (one control valve of 0-100% capacity for all types of blowers taken in service in any combinations, one standby 0-100% capacity motorised inching valve with position feedback, drain valves), isolating valves with motor drives up stream of each of pressure control valves, all other valves and steam supply lines as required for soot-blower operation, coupling, air purge, vent and relief valves etc. Manually operated isolation valves on steam supply line shall be provided at each stream of furnace blowers or as per standard proven practice of the bidder. These valves shall be designed for full flow and shall be tight shut off type.			
2.09.04	Complete soot blower control system inclusive of control system components, control cabinets, transmitters, sensors, temperature elements, interlocks, prefabricated cables and all required accessories shall be provided.			
2.10.00	Auxiliary Steam Pressure Reducing and Desuperheating Station (Aux. PRDS) The scope shall be read in conjunction with applicable tender drawing “Auxiliary Steam System P&ID” and shall include but not limited to the following: Contractor shall provide complete auxiliary steam pressure reducing and desuperheating station (Aux PRDS) system to meet the auxiliary steam requirement during unit normal operation, intermittent auxiliary steam requirement of units and station and auxiliary steam requirement for the startup of units. Each unit shall be provided with a high capacity pressure reducing and desuperheating station (HCPRDS) taking tap off from Main Steam (MS) or intermediate stage of superheaters (as per bidder's standard practice) and a low capacity pressure reducing station (LCPRS) taking tap off from Cold Reheat (CRH) lines. Auxiliary steam header(s) shall be taking steam from both the above PRDS/PRS stations. The auxiliary steam systems of all units shall be suitably interconnected, so as to enable startup of unit by taking auxiliary steam from any of the other running unit of the station. Further it should be possible to meet the auxiliary steam requirement of station auxiliaries from any of the running units of the station. The Bidder shall provide an interconnection arrangement at the station header with the Aux. steam header of existing stage-I (2x600 MW) units for this purpose.			
2.10.01	High Capacity PRDS (HCPRDS) The bidder may offer combined pressure reducing cum desuperheating valve or a pressure reducing valve with separate desuperheater,as per bidder's proven. standard practice. HCPRDS shall comprise of following as a minimum: a) One electro-hydraulically/electro pneumatically operated steam pressure reducing valve (either combined pressure reducing valve cum desuperheating or pressure reducing valve with separate desuperheater) rated for full duty with a motorised isolation valve with integral bypass at the upstream and one number non-return valve and one number manual isolating valve at the downstream. b) Spray control station comprising of one number of electro hydraulically / electro pneumatically operated temperature control valve or one number each of pressure and temperature control valve, as the case may be, on the desuperheating spray water line rated for full duty with a motorised isolation valve at the upstream and one number non-return valve and one number manual isolating valve at the downstream. c) Spray control station shall be provided with 100% capacity bypass arrangement.			
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	downstream of and including the NRV on the feed water piping at economizer inlet, all piping associated with start up recirculation drain system, all auxiliary steam piping to SCAPH, mill fire fighting etc. and drain piping from SCAPH tank(s) to atmospheric flash tank			
2.11.02	Drain collection headers and drain connection lines up to atmospheric flash tank.			
2.11.03	All drain piping from safety valves and drains of vent lines led to and terminated at ground level. All free drains, wash water drains discharge of fire fighting water etc, shall be taken up to and connected to the nearest drain.			
2.11.04	All vent pipes and safety valves escape pipes to a level above boiler house roof. The vents on the headers and links shall be provided with drain lines connected to a common trough and further to and terminated at the drain trench at the ground level.			
2.11.05	All hangers and supports with auxiliary steel structure, including columns and beams, base plates, foundation bolts, nuts and washers wherever applicable, weather hoods for pipes crossing ceiling & walls, drain funnel.			
2.11.06	Thermal insulation with cladding and accessories for all piping covered herein.			
2.11.07	Cooling water lines upto drain receiving Tank for cooling of tank drains.			
2.11.08	Superheater (SH) & Reheater (RH) attemperation lines along with attemperation system			
2.11.09	Boiler fill lines, Start-up vent piping, Soot blower piping, Instrument air & service air piping			
2.11.10	All the above piping systems shall be complete with valves, specialties, stubs including instrument stubs pipe headers, manifold, bends, elbows, reducers/expanders, matching flanges and suitable gaskets, nuts and bolts, etc. T-connections along with root valves in impulse pipes from where tappings are required to be taken for remote measurement in case provision does not exist for separate tapping points from the equipment for remote measurement and control. However all such T-connections and tapping points shall be subject to Employer's approval.			
2.11.11	Drain lines up to atmospheric flash tank, as applicable.			
2.11.12	Complete purge/ fill piping for Steam Generator start-up recirculation pump and complete drain piping for this pump.			
2.11.13	The auxiliary steam station headers shall be provided with necessary isolation valves for interconnection between the units.			
2.11.14	Interconnecting auxiliary steam piping from auxiliary steam station header(s).			
2.11.15	Interconnecting auxiliary steam piping from existing stage-I (2x600 MW) units to auxiliary steam station header of upcoming stage-II (1x800 MW) unit.. The complete engineering, routing, hanger, support and auxiliary structure shall be in the Contractor's scope.			
2.11.16	Contractor to provide a tap-off with an isolation valve for auxiliary steam piping from upcoming stage-II (1x800 MW) unit for further connection of future units.			
2.11.17	NOT USED			
2.12.00	Atmospheric flash tank and drain receiving vessel.			
2.12.01	One (1) number atmospheric flash tank (located in the SG area) as indicated in clause 2.06.00 of this sub-section, One (1) no. of Drain receiving tank (located in SG area), including level gauges, redundant level transmitters for remote level control through SG C&I systems,			
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	control valves, vents, drains etc. All other local instruments like gauge glass, level switch for high/low level alarms and pressure/temperature instrumentation shall also be provided			
2.13.00	Draft Plant			
	Complete draft plant for the balanced draft system including the following:			
2.13.01	Forced Draft Fans			
	Two (2) nos. of axial type, constant speed variable pitch controlled FD fans each with drive motor, base plates, foundation bolts & nuts, inlet bird and trash screen, suitable arrangement to prevent rain water entry to fan motor, coupling and coupling guard and acoustic silencer. Each fan shall be provided with bearing lubrication and hydraulic blade pitch control unit(s) consisting of:			
	(1) 2x100% oil pumps, each with motor drive, coupling and coupling guard.			
	(2) 2x100% oil coolers.			
	(3) 2x100% filters, Differential Pressure transmitter, Pressure Transmitter, Level Transmitter, Temperature element with temperature transmitter etc.			
	(4) One (1) oil storage tank.			
	(5) Instrumentation, vibration monitoring, interconnecting piping, valves and fittings including pressure relief valves and NRVs etc.			
	(6) Electrical actuators with all accessories			
	(7) Stall detection probe along with stall duration integrator			
	Alternatively, a forced oil lubrication system (consisting of 1 to 6 above) common to bearing lubrication and for servo motor operation to each FD Fan will also be acceptable.			
	Silencers shall be provided at the suction of the fans to limit the noise levels to specified values.			
	FD fans shall be suitable for the type of foundation being provided.			
	Each fan bearing shall be provided with three (03) numbers duplex RTD's connected to three (03) numbers dual input transmitters with display for bearing metal temperature measurement, control & monitoring.			
2.13.02	Induced Draft Fans			
	Two (2) nos. two stage ID fans (Axial type, Constant speed, variable pitch controlled) each with drive motor, base plates, foundation bolts and nuts, inlet box, discharge case, coupling, coupling guard and suitable arrangement to prevent rain water entry to fan motor. Each ID fan shall be provided with bearing lubrication and hydraulic blade pitch control unit(s) consisting of.			
	(1) 2x100% oil pumps each with motor, coupling and coupling guard.			
	(2) 2x100% oil coolers.			
	(3) 2x100% filters, Differential Pressure transmitter, Pressure Transmitter, Level Transmitter, Temperature element with temperature transmitter etc.			
	(4) One (1) oil storage tank.			
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	(5) Instrumentation, vibration monitoring, interconnected piping, valves and fittings including pressure relief valves and NRVs. (6) Electrical actuator with accessories etc. (7) Stall detection probe along with stall duration integrator Alternatively, a forced oil lubrication system (consisting of 1to 6 above) common to bearing lubrication and for servo motor operation to each ID Fan will also be acceptable. Each fan bearing shall be provided with three (03) numbers duplex RTD's connected to three (03) numbers dual input transmitters with display for bearing metal temperature measurement, control & monitoring. ID fans shall be suitable for the type of foundation being provided. 2.14.00 Regenerative Air Pre-heater (RAPH) and Steam Coil Air Pre-Heaters (SCAPH) 2.14.01 Regenerative Air Pre-heater (RAPH) Two (2) Bisector type RAPH for secondary air system and two (2) Bisector type RAPH for primary air system, each complete with following: OR Alternatively, Two (2) Trisector type RAPH, each complete with following: (1) One (1) peripheral ACVFD drive connected to drive the Airheater along with automatic clutching/declutching arrangement. Alternatively, a centrally mounted APH ACVFD Drive system having sufficient space for mounting emergency drive and having handling facility with proven experience may also be acceptable. (2) Independent air motor drive along with automatic clutching/declutching arrangement. (3) Air receiver with storage capacity which can facilitate not less than 10 minutes continuous operation of air motors. (4) Piping and fittings, air filters, regulators including suitable solenoid valves for automatically admitting air for starting air motors in case of air motor solenoid power supply failure, pressure transmitters on air line to air motor(s) etc. (5) Air heater stand still sensing device with necessary logic components & accessories for Air Heater rotor stoppage alarm. The motions to be precluded up at appropriate location of the rotor shaft. (6) Permanent fire fighting equipment on both gas as well as airsides and also on both cold as well as hot end sides including, spray nozzles, valves and pipe work connected to fire water system. (7) Thermocouple type fire sensing devices complete with accessories. (8) Dust hoppers with bracing, stiffeners, supporting structure, baffles, access door, matching flanges, expansion joints, RF type ash level switches (for high level) etc., and suitable approach platform for each hopper & ash level switches. (9) Oil carry over probe for detection of oil during oil firing for each RAPH. (10) Soot Blowers in the Flue gas hot end and cold end. (11) NOT USED		
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2.14.02	(12)	Off load water washing facility with the water supply pipe work and the drainage piping with valves to connect drains from air heater to the nearest station drains.		
	(13)	Adequate number of thermocouples or platinum resistance temperature detectors (RTD) for measuring cold and hot end bearing metal temperature for interlock, protection and monitoring shall be provided.		
	(14)	Forced lubrication system for bearing of each air heater shall be provided and shall include two (2) x 100% capacity oil pumps with motor, two (2) x 100% oil coolers and two (2) x 100% oil filters etc.		
	(15)	Any other equipment/accessories/instrument etc., to make the system complete for reliable and safe operation.		
	Steam Coil Air Pre-Heaters (SCAPH)			
	Two (2) Steam Coil Air Preheaters for secondary air and two (2) for primary air systems*suitable for the type of RAPH offered.			
	The SCAPH shall be installed on the bypass duct at Primary Air (PA) fan and FD fan outlets with necessary dampers, along with drain pipe up to atmospheric flash tank, auxiliary steam piping to supply heating steam to each SCAPH from the auxiliary steam system along with individual temperature control valves shall be provided.			
	* In case Bidder offers Tri-sector RAPH, Bidder at his option may or may not provide the SCAPH in primary air side if bidder can meet the specification requirement of preventing cold end corrosion with sizing of SCAPH in secondary air side. Bidder will furnish the relevant details, calculations, curves etc. along with his offer establishing the same			
2.15.00	Coal Preparation and Firing System			
2.15.01	Raw Coal Chutes and Bunker shut off valves, including following:			
	(i)	Manually operated rod type isolating gate at bunker outlet, Motor operated (sliding gate type) Raw Coal Bunker shut off gate at the bunker mouth and manually operated gate at RC feeder inlet (all shall be for each coal feeder).		
	(ii)	Chain wheel & chain for manual operation of bunker shut off and RC feeder inlet valve from the feeder floor.		
	(iii)	Coal chute between bunker shutoff gate and RC feeder inlet.		
	(iv)	Coal chute between outlet of feeder and inlet of mill along with motor/ pneumatic operated shut off gate at RC feeder outlet.		
	(v)	Permanent Chutes connection shall be provided from the feeder floor to ground near each feeder for unloading of coal from bunkers on trucks at ground level. A cover to be provided at the mouth of permanent chute when not in use.		
	(vi)	Bunker downspout shall have arrangement for fixing a temporary chute for diversion of coal flow to the permanent emptying chute near each feeder. Two (2 nos.) temporary chute shall be provided for the steam generator for the above purpose.		
	(vii)	Each feeder shall be provided with arrangement for fixing a temporary chute and diverting the coal from bunker to the permanent chute at feeder floor by running the feeder, for emptying the bunker. Two (2 nos.) temporary chutes shall be provided for the Steam Generator for the above purpose.		
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	(viii) Necessary handling/lifting arrangement & suitable platform & approach shall be provided for quick installations and removal of temporary chutes as mentioned at clause no (vi) & (vii) above. (ix) Slip on couplings with 410 stainless steel liner ring one on each chute between RC feeder and mill and one on each chute between coal bunker and RC feeder. (x) Devices to detect choking/flow/no flow of coal in the coal chute between coal bunker and RC feeder. (xi) Remote operated shut off gate between RC feeder and coal mill. (xii) A continuous operating platform for maintenance/ operation of bunker shut-off valves.				
2.15.02	Raw Coal Feeders Gravimetric type raw coal feeders with microprocessor-based precision weighing and calibration devices, one for each mill. The feeders shall be complete with motor, coupling, coupling guards, base plate, foundation bolts, sliding joints, paddle type switches to detect the presence or absence of coal on feeder or choking of feeder, speed variator, auto declutching arrangement to high/low level, speed sensors, coal motion monitors, and strain gauge type weight measuring system with all instrumentation.				
2.15.03	Coal Pulveriser (a) The coal pulveriser (to be read in conjunction with applicable tender drawing “Scheme for Pulveriser”) shall be vertical spindle type (like pressurized type bowl mills, ball and race mills, roller mills or the approved equivalent). The number of coal pulverisers to be provided shall conform to sizing /standby requirement stipulated elsewhere in the specification. Minimum Eight (8) nos. of coal pulverisers shall be provided for the steam generator. In case of Front Mill arrangement contractor will provide two number of hoist for Mill handling arrangement. Monorail shall be extended in both side so that one hoist shall be parked at either side while working with another hoist. (b) Each pulveriser shall be complete with all wear parts/ grinding elements and shall be provided with platforms around the pulveriser, lubrication systems comprising of 2x100% pumps, 2x100% coolers and 2x100% filters for each pulveriser, Hydraulic System (if applicable) comprising of 2x100% pumps, 2x100% coolers and 2x100% filters for each pulveriser, drive motors, gear units, instrument tapping points and other equipment necessary for safe and efficient operation of pulveriser. The Pulveriser shall also include dynamic classifier with Variable Frequency Drive and all the automatic auxiliary equipment necessary to make the pulveriser self contained. Adequate number of temperature sensors, temperature transmitters, local indicators for bearings and lube oil systems shall be provided as per standard practice of Contractor. Independent purge meters, air filter cum regulator sets, local pressure indicators, instruments and sensing device for milling system including the instrument requirements as indicated in the relevant tender drawings shall be provided. Primary airflow measuring devices shall be provided at air inlet of each coal pulveriser. Adequate number of thermocouple type fire detection system with temperature transmitters as a composite & complete unit with all required accessories with adequate redundancy shall be provided. The control of Mill lubrication system (including mill lube oil pumps) and the logic for Mill Fire detection shall be implemented in SG-C&I System. If lubrication of various bearings of mill gear box is done by common lubricating oil feed line having single flow switch, an additional flow switch with necessary interlock				
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2.15.04	and protection should be provided in input shaft bearing lubricating oil feed line. Oil supply line for input shaft bearing should be taken from side/top of the common line, having a collection chamber at the bottom side to trap debris if any. (c) Proven fire detection and fire extinguishing systems in line with the standard practice of the manufacturer shall be provided. In case of CO₂/N₂ based system, the scope of supply shall also include the required cylinder/piping and valves network etc. The mill inerting system (as also required during start-up/ shut-down) shall be provided with suitable features along with all piping, valves, instrumentation, interlock system etc. to ensure safety of operation. All required control etc. shall be implemented in SG-C&I System. (d) The coal mill shall be suitable for installation on RCC block type foundations and also at a suitable height in order that complete mill reject system as (described at sub section II A -17 of Part A) should be above the finished floor level of mill area or zero meter whichever is higher. Adequate maintenance space all around the mill zero meter have to be provided. However, the non drive end part of bucket elevator may be allowed to be placed at minus meter with adequate maintenance space. Primary Air Fans (a) Two (2) numbers of two stage axial PA fans for the steam generator, with hydraulic blade pitch control system each with motor, base plates, foundation bolts, inlet box, inlet bird and trash screen, inlet rain water canopy, inlet cone, diffuser, coupling, coupling guard and silencer. (b) Lubrication and hydraulic blade pitch control unit(s) for each fan consisting of: (1) 2x100% oil pumps, each with motor, coupling and coupling guard. (2) 2x100% oil coolers. (3) 2x100% filters, Differential Pressure transmitter, Pressure Transmitter, Level Transmitter, Temperature element with temperature transmitter etc. (4) One (1) oil tank. (5) Instrumentation, vibration monitoring—interconnecting piping, valves and fittings including pressure relief valves and NRVs etc. (6) Electrical actuators with all accessories. (7) Stall detection probe along with stall duration integrator Alternatively, a forced oil lubrication system (consisting of 1 to 6 above) common to bearing lubrication and for servo motor operation to each PA Fan will also be acceptable. (c) PA fans shall be suitable for the type of foundation being provided. (d) Each fan bearing shall be provided with three (03) numbers duplex RTD's connected to three (03) numbers dual input transmitters with display for bearing metal temperature measurement, control & monitoring.			
	2.15.05	Seal Air Fans		
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	2x100% seal air fans common for all the pulverisers of one Steam Generating unit shall be provided. The fans shall be complete with motors, base plate, foundation bolts, coupling and coupling guard, seal air piping, electrically operated Inlet Guide Vanes(Alternatively Electrically operated 'Inlet dampers' shall also be acceptable based on bidder's proven practice), dampers, supports etc. Each fan shall be provided with self cleaning type filters etc. along with manual isolation dampers at suction and pneumatically operated dampers at discharge for maintenance of fans. Self cleaning type filters shall be provided at the suction of the fans along with manual isolation dampers at suction and discharge for maintenance of filters. The seal air fans shall take suction preferably from cold primary air header. However if the Contractor wishes to take suction from some other source, justification for the same shall be provided by the contractor for Employer's approval.			
2.15.06	Coal Burners			
	Coal Burners with burners tilt mechanism (if applicable), tilt drives, linkages and complete actuator assemblies, burner tilt position transmitters etc.			
2.15.07	Air Nozzles			
2.15.08	Piping including the following:			
	(a)	Lube oil piping for lubrication units.		
	(b)	Seal air piping to coal mills		
	(c)	All piping valves, fittings etc. required for inerting system for mills.		
	(d)	All piping along with necessary valves fittings etc. for mill fire protection.		
	(e)	Seal air piping to coal feeders.		
	(f)	Any other piping required for the completeness of the system.		
	(g)	All hangers and supports with auxiliary steel structure including columns, beams, base plates, foundations bolts, washers where applicable.		
2.15.09	Pulverised Fuel (PF) Piping			
	(a)	Pulverized coal piping from mills to burners including ceramic lined pipe and bends as per the specifications.		
	(b)	Power operated (Electric/Pneumatic) shut off gate before each coal burner and a power operated (Electric/Pneumatic) flap/knife type mill discharge valve at each classifier outlet on each pulverised fuel pipe.		
	(c)	For coal pipe temperature monitoring, one number of Temperature element with temperature transmitter shall be provided in each coal pipe upstream of burner.		
2.15.10		Rota probe type coal sampling system for obtaining samples from PF outlets of all the mills using the methods specified in ISO 9931 "Coal sampling of pulverized coal conveyed by gases in direct fired coal system". The minimum number of coal sampling systems to be provided for the steam generator shall be equal to at least the number of PF pipe outlets from one coal pulveriser.		
	(i)	Each of Sampling system shall necessarily include the following:		
	(a)	Sampling probe with 'Motorized' Rotable head(s), rotated by electric motor, each with four (4) sampling nozzles, suitable for the coal pipe ID along with		
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	snap lock / fast lock connector for quick connection to the dustless connector. (b) Portable control unit for 'automatic' start and stop of sampling, adjustment of sampling air velocity & calculation of fuel flow rate, including weighing scale for sample, venturi flow meter, electric heater with controller, main fuse and control valves, Electric components shall be suitable for power supply of 240 Volts, 50 Hz. (c) Calibration curves for venturi flow meter. (d) Cyclone, sample collecting jar, and three (3) disposable backup fabric filters. (e) Suitable Carrying case(s) for control unit, probes, sampling bottles & other accessories. (f) Connecting hoses (ii) Dustless connector with fast lock / snap lock, by short turn of handle suitable for connection to 50 mm female pipe thread or matching the sampling port connection shall be provided in all PF pipes. Dustless connector shall be capable of working in conjunction with rotor probe specified above.			
2.15.11	Contractor scope shall also include supply of dirty pitot tubes for checking on line pulverized coal / primary air flow balance between PF pipes of each mill. The dirty pitot tube should also have a fast lock/ snap lock arrangement & shall be capable of working in conjunction with motorized probe sampling system specified at clause no 2.15.10 of this chapter. It should be supplied complete with a combined pressure & temperature measuring hand held digital instrument, showing also fuel pipe air velocity etc. & with facility of data transfer through blue tooth from the instrument to control unit. Necessary technical details/ calibration curves of the pitot tube shall be furnished to the Employer. The number of dirty pitot tubes provided for the Steam Generator shall be equal to at least the number of burners being served by one coal pulveriser.			
2.15.12	Adjustable valve/orifice of erosion resistant/ceramic coated material suitable for highly abrasive pulverised coal applications. The adjustable valve/orifice shall be provided on each P.F. pipe supplying pulverized fuel to each coal burner and shall enable on/off adjustment of coal flow in PF pipelines.			
2.16.00	Ducting The scope of ducting shall be read in conjunction with applicable tender drawing of "Scheme of Air and Flue Gas Path" (with bisector type RAPH or trisector type RAPH) (2Sheets) and shall include but not limited to the following:			
2.16.01	Cold air inlet duct to FD fan suction, from FD fan discharge to RAPH (secondary for Bi-sector type) or RAPH (Tri-sector type), as applicable, bypass ducting for locating SCAPH downstream of FD fan.			
2.16.02	Cold air inlet duct to PA fan suction, from PA fan discharge to RAPH (primary for Bi-sector type) or RAPH (Tri-sector type), as applicable, bypass ducting for locating SCAPH downstream of PA fan incase primary SCAPH is offered.			
2.16.03	Cold air duct from each PA fan discharge to coal mills.			
2.16.04	Hot air duct from each RAPH (secondary air system for Bi-sector type) or RAPH (Tri-sector type), to burner wind box and from each RAPH (primary air system for Bi-sector type) or RAPH (Tri-sector type), as applicable, to coal mills.			
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2.16.05	Flue gas duct from economizer outlet to each RAPH (Bi-sector or Trisector, as applicable) inlet and from RAPHs (Bi-sector or Trisector, as applicable) outlet to ESP inlets. Economizer dust hoppers, (if applicable) shall be provided with high level Radio Frequency (R.F.) type ash level switches along with suitable access and platform for each hopper & ash level switches.			
2.16.05A	Provision for Future Installation of SCR System Selective Catalytic Reduction (SCR) system may be installed by the Employer in the future, to meet the requirements of emission norms, intended to reduce the emission of NO_x (to be read as Oxides of Nitrogen) in flue gas produced by combustion of coal in the boiler. It is envisaged that for such a system the flue gas, downstream of the economizer, shall be passed through two (02) independent streams, each of which shall have one (01) number of SCR Reactor. The flue gas from the SCR reactor outlet shall be connected to the APH inlet. The following provisions shall need to be kept by the Contractor for this purpose in its bid proposal: 1. Space provision, as detailed in Sub Section G-03 of Part-B Section VI (technical specifications), for future installation of the SCR system. 2. Further, the suitability of the duct between the steam generator and the future SCR system interconnection with minimum modification must be considered. Suitable duct tap-offs (including the blanking plate) for Flue gas duct sections as indicated below shall be provided by the Bidders: a. Connection from the Economiser outlet to each SCR reactor inlet. b. Connection from each SCR reactor outlet to each RAPH (Bi-sector or Trisector, as applicable) inlet ducts. c. Connection for Economiser bypass duct from economizer inlet/intermediate position or from other alternative suitable location to SCR inlet for maintaining SCR Inlet flue gas temperature. d. Provisioning for future installation of the SCR bypass gate in the ducting from the economizer inlet to the APH inlet.			
2.16.06	Flue gas ducts from Electrostatic Precipitators (ESP) out-lets to ID fans inlets, from ID fans outlets to FGD system inlet, from FGD system outlet to chimney flue inlet and FGD system bypass duct including chimney.			
2.16.07	Gas recirculation ducting (if applicable) from downstream of ID fan to Steam Generator.			
2.16.08	Adequately sized flow splitters, plates/duct stiffening devices, bracing, side plates, expansion joints, matching flanges, access doors and brackets, sampling points, ash hoppers, etc.			
2.16.09	Supporting structure and hangers for all Ducting.			
2.16.10	Suitable metallic type expansion joints wherever necessary shall be installed.			
2.16.11	Economiser bypass ducting (if required) with gates and ash collection hopper as required along with high & low level RF type ash level indicators along with suitable access and platform for each hopper & ash level indicators. Material of the bypass duct, gates, dampers, hoppers and other fittings shall be selected as per the design metal temperature specified in Part-B of the specification.			
2.16.12	Common air ducting at FD fan, PA fan, SAPH, PAPH (for Bi-sector type RAPH) or RAPH (Trisector type) outlets, as applicable and common flue gas ducts at ESP inlet and outlet.			
2.16.13	Any other ducting required for the completeness of the system.			
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2.16.14	A suitable interconnecting header shall be provided downstream of the Economizer outlet before APHs (bisector/trisector) for equal distribution of the Flue gas flow between the two Flue gas paths to APHs.			
2.17.00	Dampers The dampers shall include but not be limited to the following (to be read in conjunction with applicable tender drawing of “Scheme of Air and Flue Gas Path” (with bisector type RAPH or trisector type RAPH) (2Sheets).			
2.17.01	Isolation dampers on all cold air, hot air, seal air, scanner air and flue gas ducting, before and after equipment on these systems and wherever required.			
2.17.02	Interconnecting dampers on air and flue gas ducting where necessary.			
2.17.03	Burner air registers (if applicable) with drives at burner wind box.			
2.17.04	Regulating dampers in cold and hot primary air ducts at each mill inlet for temperature control, at each air preheater outlet on flue gas path as per applicable tender drawing for bisector or trisector RAPH and wherever required.			
2.17.05	Fully gas tight, motor operated, gates before and after each ESP stream, before and after each ID fan, at inlet to each of RAPH on flue gas side, at discharge of each PA fans, FD fans and at each economiser bypass duct. Fully gas tight, pneumatic operated, gates at each hot air & cold air duct to the mills. Gas tight double multilouver (Bi-plane) damper before and after of each RAPH on air side.			
2.17.06	Supporting structure for all dampers & drives.			
2.17.07	Access and platforms for all dampers and drives including gratings, toe plates and hand rails.			
2.17.08	Any other gates/dampers required for the completeness of the system (including as per scope of FGD system) to ensure operational flexibility and on-load maintenance of any of the equipment or sections of the air/flue gas path, equipment & personnel safety etc.			
2.18.00	Fuel Oil System A LDO preparation and firing system shall be provided having a firing capacity equivalent to 30% BMCR requirements of one (01) Steam Generator. The above Fuel oil system shall also be capable of firing High Speed Diesel Oil (HSD) on sustained basis with fuel characteristics as specified in Table 2, Annexure-IV-3 , sub-section I-B, part-A, Section VI of technical specifications. The scope for above shall include but will not be limited to following (to be read in conjunction with applicable tender drawing of “Fuel Oil Scheme”): (1) Two (02) rotary positive displacement type LDO pumps with motor, coupling, coupling guards etc. (2) Two (02) duplex coarse filters at LDO pumps suction and one duplex fine filter in the supply line to each steam generator. (3) All Base plates, foundation bolts, nuts and bolts. (4) Fuel oil burners complete with diffusers, tips extension pipes, atomizers, burner shut off valves, flexible hoses and all other ancillaries. (5) Oil connections to each burner from ring main.			
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	(6) HEA/Light oil igniters for each burner. (7) Complete Piping along with suitable hangers, support etc, including following (i) Fuel oil piping (ii) Interconnecting fuel oil piping integral to the system to make it complete. (iii) All drain oil piping from drain point to drain oil tanks, from drain oil tank to drain oil pump and from drain oil pump to fuel oil storage tanks along with all valves and fittings. (iv) Vent piping along with local collection bucket for collecting of leak off oil from vents/relief valves. (v) Recirculation piping around firing aisle and to the fuel oil storage tanks. (vi) The LDO piping shall be complete with isolating valves, relief valves, check valves, drain valves, vent valves, pneumatically operated control valves strainers, accumulators, local instruments, sensing device, switches, flow meters, transmitters, controls such as pressure control, flow control, temperature control etc. All controls shall be implemented in fuel oil pump house (FOPH) control system. (vii) Atomising air piping complete with all valves, accessories, instrumentation etc. (8) One (1) drain oil tank of 6m³ capacity with one oil transfer pump with motor, duplex filter at suction and other accessories for Steam Generator to transfer drain oil from steam generator area to LDO storage tank(s). Control of the same shall be implemented in SG C&I system. (9) One (1) drain oil tank in pressurizing pump house area having 10m³ capacity and one oil transfer pump with motor, duplex filter at suction and other accessories to transfer drain oil from pump house to LDO storage tanks. Control of the same shall be implemented in FOPH control system. (10) Adequate local and equipment mounted instruments and devices with connections required for pressure, temperature and other controls for supervision and interlocking with all associated auxiliary during purging, shut down and of sensing device to remain unaffected by oil fill dirt or by ambient conditions where it will be installed. (11) Trip valves on common fuel oil line to steam generator and nozzle valves for each individual burner along with all accessories such as air filter, regulators, limit switches, control valves, and connecting fittings to make the system complete. (12) Recirculation valve of heavy duty type to work with the furnace safeguard and supervisory system. (13) All other piping valves and accessories as required to make the system complete. (14) Supply of one (1) no. of coriolis type mass flow meter including all its accessories. (15) Two (2) nos. sump pumps with motors. (16) All local instrumentation (gauges, switches, transmitters etc.) and associated control devices for LDO system in Contractor's scope.			
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2.19.00	(17)	Control system for pressurizing pumps, drain oil tank, pressure control loops, unloading & storage system, Unit Drain Oil tanks etc. shall be implemented in SG-C&I system.		
	(18)	Necessary approval is required from statutory authorities for the entire F.O. pumping installation. Contractor shall prepare all necessary drawings/data/documents as per the requirements of the Statutory Authority and obtain the necessary approval from the authorities.		
	Garbage Chute			
	A garbage chute of minimum 500 mm dia and made from minimum 10 mm thick mild steel pipe shall be provided for Steam Generator, from pent house level to ground level for disposal of debris & scrap generated during erection, operation and maintenance. The chute shall be provided with branch connections with doors & approach platforms at all platform levels. Garbage collection trolleys shall also be provided at the ground level.			
	Galleries, Walkways, Roofing, Platforms			
2.20.00				
2.20.01	Galleries, walkways, platforms, staircase, hand rails, ladders and gratings etc. as specified shall be provided at the Steam Generator floors including the interconnecting platforms between the Steam Generator floors and main building as per the details given in the technical specification Part-B Sub-Section G-03 clause no : 1.03.00			
2.20.02	Necessary access, platforms, walkways, handrails, staircase, ladders and gratings etc. for proper approach shall be provided for all instruments, actuators, power cylinders, control valves, equipment and accessories in the scope of this sub-section so that operators and maintenance personnel can function conveniently and safely. The above provision shall include but will not be limited to the following locations:			
	-	Bunker outlet gate.		
	-	Mill discharge valve.		
	-	All maintenance hoist levels.		
	-	All gates / dampers and their drives with associated instruments including HAG/CAG, SADC dampers and Burner inlet gate.		
	-	Furnace seal trough level.		
	-	All fans and associated motors.		
		(Continuous platforms shall be provided around the fans and their corresponding motors).		
	-	SCAPHs		
	-	Air preheaters		
	-	All valves.		
	-	All Observation ports, access manholes etc.		
	-	All soot blowers.		
	-	All Ash hoppers of economizer, Air-Preheaters, economizer bypass (if provided) and duct (if any) which require fly ash removal by the ash handling system.		
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	- Platforms below APH outlet duct interconnections with common flue gas duct header and below expansion joints at the inlet of ESP. - Platforms below expansion joints at the outlet of ESP. - All field control and instrumentation equipments. - Storage platforms for storing of scaffoldings, APH baskets and other maintenance item during overhaul of steam generator(s).			
2.20.03	Provision shall be made by the Contractor, for adequate space in various platforms, galleries etc. for locating local instrument enclosures, approach staircase and platform for Gates & Dampers, junction boxes, etc. under contractor's scope without encroaching upon specified width. The exact locations for the same shall be finalized during the Contract execution stage and the same shall be indicated in floor plan drawings.			
2.20.04	For meeting the above requirement in respect of platforms the Bidder shall include in his proposal platform area of 20,000 m ² (clear of all intervening pipes, columns, actuators, instrument enclosures, racks, gates, valves etc. and excluding area covered by stairways & landings and also excluding platforms required for ESP and FGD) The Bidder shall furnish unit rates for addition/deletion of the platform floor area with respect to the area mentioned above in relevant schedule of BPS.			
2.20.05	The exact requirements of the access platforms, walkways, stairs etc., depending upon the layout and location shall be subject to Employer's approval during detailed engineering. Contractor shall furnish detail floor plan drawings covering all platforms and shall clearly indicate all the dimensions of platforms and clear platform floor area in each drawing.			
2.21.00	Elevators One (1) no. passenger elevator* having a capacity of 1088 kg. (suitable for 16 persons) and one (1) number goods elevator having a capacity of 3000 kg for steam generator. The scope for each elevator shall include all items/accessories including all electrical equipment, services etc. required to meet all design, installation, operation, safety, protection and other requirements of IS:14665 (all parts) "Electrical Traction Lifts" (Latest Edition). The scope shall also include items/services needed to comply with requirements of IS:14665 and requirements indicated in Sub-Section-A-02 of Part-B, Section-VI. The scope shall also include provision of a Fireman's switch for each Elevator. Two nos., adequately sized Air conditioners each having minimum cooling capacity of 2.5 Ton shall be provided for each elevator machine room to make it dust proof. Note: * Bidder shall indicate the take off price of One (1) no. passenger elevator along with all associated civil works, machine room, machine room Air conditioners etc. in the relevant bid schedule.			
2.22.00	Refractories and Insulation Refractories and insulation including cladding, lagging, reinforcement, wire mesh, cleats and supports for all the equipment, auxiliaries, ducting, dampers, piping and valves (excluding coal pulverizers and PF pipes) in the scope of this specification so as to ensure skin casing temperature of any surface in Contractor's scope is not more than 60 deg.C. with ambient temperature of 45 deg.C. and air velocity of surface air being 0.25 m/s when the steam generator is operating at 100% BMCR.			
2.23.00	Field Control & Instrumentation Equipments			
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	All local sensors and gauges for pressure/temperature and process switch devices shall be provided as per process requirements of all associated system and auxiliaries of steam generator.			
2.23.01	Valve actuators conforming to specification requirement as detailed in relevant Sub-Section of Part-B shall be provided.			
2.23.02	For actuators in HOT AREA e.g. Burner tilt power cylinder, air line accessories such as air filter regulator, E/P convertor, remote positioner air lock etc to be mounted away from actuator body to minimize chance of damage from high temperature.			
2.24.00	Special Tools & Tackles and Test / Measuring Equipments			
2.24.01	One complete set for Steam Generator unit, of all special tools and tackles for maintenance of all equipments. Each set of tools & tackles shall necessarily include but will not be limited to following: (a) Special tools & tackles for mill required for erection, testing and maintenance of equipment system including those required for instruments and controls. (b) Set of maintenance tools, including following: (1) General Maintenance tools (i) Pulling cable, eyebolts, cable slings, chaining falls, snubbing lines or cables. (ii) Bar and sledge hammers. (iii) Brass and lead hammers. (iv) Power type jacks and jacking screws. (v.) Feeler gauges and shims. (vi) Dial indicators. (vii) Wire brushes & scrappers. (viii) Bearing and coupling pullers. (ix) Spanners and wrenches of various sizes. (2.) Special Maintenance Tools (i) Tube expanders for heat exchangers. (ii) Lapping plates, grinding stones and ring cap for the valves. (iii) The burner maintenance trolley with vice, burner. (iv) Spanners and wrenches specific to the equipment. (v) One intrascope suitable for inspection of all steam generator pressure parts. This shall be of the flexible optical fibre pattern appropriate to the design of the headers and shall incorporate low voltage lighting via either a portable transformer or rechargeable battery. A rigid type is not acceptable. It is envisaged that the instrument may be made in section to give adequate variations in			
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	reach to suit different headers. The viewing head must permit a vision of 90 deg., forward and/ or rear by interchangeable heads. The degree of magnification desired is 1:1 at a distance of about 70mm to 100mm with a maximum of 3:1 for very close viewing. (vi) Four (4) nos. of pneumatic emergency retract drives with matching crank tools for each type of soot blower shall be provided along with required length of connecting pipe, fitting etc. Service air points for actuation of pneumatic drive shall be provided at convenient locations.			
2.24.02	One (1) set of power operated gondola(s) or furnace maintenance cradle/cradles for furnace tube repairs and maintenance. Each set of gondola/maintenance cradles shall be suitable for complete and simultaneous coverage of all the four walls of a steam generator and shall be complete with all slings etc. Steam generator shall have suitable provisions for suspending the cradle from top of the steam generator such that cradle can be suspended without entering/accessing the pent house. For this purpose, cradle suspension rope/wire shall pass through suitable tubes in the pent house.			
2.24.03	Complete lifting tools and tackles. Contractor shall provide motorized hoists and trolleys for all items requiring maintenance and weighing 500 kg or more. All auxiliary structures, monorails, runway beams for all lifting tackles, hoists etc., are included in Contractor's scope of supply. Access ladders with suitable platform shall also be provided for approach to all motorized hoists/trolleys mounted on their runway beams for the maintenance of hoists/trolleys. Items weighing more than 50 kg and required to be replaced for maintenance shall be provided with manual hoists/trolleys with runway beams/supporting structure etc.			
2.24.04	One (1) sets of quick erect scaffolding erectable inside of the Steam generator ensuring full height coverage for capital overhaul. The man days required for erection shall not exceed 4 (four) and for dismantling 2(two) considering the workforce deployed for 24 hours in 3 shifts a day. The locking arrangement shall not call for any welding. The scaffolding shall have access to boiler roof in first pass and also cover access/coverage to SH/RH pendant/platen sections of first pass and horizontal pass up to the level where transverse tube pitching in the direction of gas flow path is equal to and greater than 750 mm. Further peripheral platform shall also be provided for access to all burners, soot blowers and water wall tubes (including those of the furnace hopper). The peripheral platforms shall be provided at elevation intervals of 2000 mm. In certain areas due to the requirement of equipment accessibility elevation interval upto 2500mm is acceptable. The width of the peripheral platforms shall not be less than 900mm. The main access for the complete scaffolding system shall be provided with stairs. The width of the stairs shall not be less than 1000 mm. Additionally a ladder system shall be provided as a means of emergency escape at the end opposite to where stairs are placed. The scaffolding system shall include full deck assembly near furnace arch or intermediate header elevation and at the furnace hopper level. Supply of safety nets at minimum four levels along with supply of scaffolding shall be provided by the contractor. Material of scaffolding should be light weight material like Aluminium/ Aluminium alloy.			
2.24.05	A Complete set up for igniter testing shall be provided for checking of healthiness of each component of igniter. This shall include supply of a set of items (like carriage assembly, spark transformer, spark rod/ tip, cable) for one complete igniter. This shall also include stand for holding / fixing the igniter carriage assembly, LED for igniter advance/retract feedback, necessary airline accessories for solenoid/power cylinder operation, Pushbutton for advance/spark command, etc. Installation and commissioning of the Testing set up shall be in the contractor's scope.			
2.24.06	Contractor's scope shall include Instrument for Tube Thickness Measurement as follows:			
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2.24.07	The scope shall include 12 nos. ultrasonic thickness gauges suitable for measurement of the pressure part tube/pipe thickness. The above ultrasonic thickness gauge(s) shall also have a built in data logger to facilitate quick/automatic transfer of the measured data. The data logger shall have adequate memory and shall be programmable to configure the tube location geometry as required for automatic downloading to compatible PC based software.				
	One (1) number coal abrasion test apparatus along with all necessary accessories for steam generators for testing YGP index of coal, complying with the requirements of BS 1016 Part 111. The apparatus shall be complete with following basic components and accessories: (a) Mill pot or mortar (b) Drive Unit (c) Four blades (in addition to the blades fixed in the apparatus for abrasion testing, a set of four blades shall be supplied extra as spare). (d) Gauges for checking gap between the edges of the blades and the internal wall and bottom of the mill pot. (e) Heavy duty balance (f) Analytical balance (g) Jaw crusher (hand fed, electrically operated) (h) Mechanical sample divider. (i) Test sieves of woven wire cloth with nominal aperture size 6.70 mm and 16.0 mm and of perforated plate, square hole, with nominal aperture size 25.0 mm, complying with BS 410. (j) Hot air dryer. (k) Small brass brush. (l) Any other item to make the test set up complete. The material/construction/accuracy/specifications of the above items shall completely comply with the requirements of BS 1016 Part 111.				
2.24.08	One (1) number of miniature X-ray tube based portable non-destructive XRF alloy analyzer (for the project) for chemical analysis of not less than 20 elements, which essentially include elements- Bi, Co, Cr, Cu, Fe, Mn, Mo, Nb, Ni, Sn, Ti, V, W, Zn and Zr(grade identification, quantitative chemistry, spectra match) of coal & gas based power plant components namely, tubes, pipes, headers, valves, rotor shaft, blades, vanes, casing, diaphragm etc., in in-situ condition. The alloy analyzer should have features/capabilities like Low power air cooled miniature x-ray tube with silver/ gold anode target, minimum voltage 40 KV and adjustable current Excitation source. Equipment should have at least following analysis modes: - Empirical mode: Standard signature store/match - Fundamental parameters methods for standard-less quantitative chemistry - Grade identification Detector should be high resolution, high count rate Si-PIN Detectors or Silicon Drift Detectors (SDD) or better.				
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	Equipment should have provisions for storage of data, library of data and spectra (in case of memory card or stick, capacity of 64 MB or above or more than 6000 readings with spectra) and data transfer to a PC. It should have software for transfer of data to PC, data analysis & printing along with hardware, as required for connecting the instrument to PC are to be supplied along with memory card/ stick as required. Further, instrument should have facility to transfer data through bluetooth and USB ports. It should be equipped with High resolution colour display, Touch screen or TFT display and safety features. Further, calibration blocks for iron, nickel and cobalt matrixes shall be supplied. The weight of analyzer shall not be more than 2 kg. In addition, the relevant/ standard accessories of the analyzer as required (in addition to items mentioned above) along with two sets of O&M Manuals for the equipment and accessories shall be supplied.				
2.25.00	Base plates, foundation bolts, Anchor materials, matching pieces, inserts & packing shims etc. as required for steam generator and auxiliaries & associated equipment.				
2.26.00	Auxiliary steel for piping supports, including base plates, foundation bolts, nuts, washers, 'U' bolts and hangers for separator, superheaters, reheaters, furnace rear pass tubes (if applicable).				
2.27.00	Instrument air grid around boiler at following levels with one tapping at each corner (1/2" NPT each line tapped directly from min. 2" header) including suitable isolating valves and quick coupler plug kit in each line for supply of instrument air (max. 2 Nm³/min) for pneumatic tools (to be used by employer during maintenance and overhauling) shall be provided. a. S Panel manhole level b. Firing Floor First Level c. Firing Floor Top Level d. Economiser top bank floor e. LTSH / LTRH top bank floor f. Final Reheater manhole LHS & RHS g. Separator LHS & RHS				
2.28.00	Suitable temperature monitoring system should be provided for Bottom hopper, Pent House, Economizer, SCR hoppers (refer De-NOx section), APH hopper etc. as detailed out in C&I part of specification (Annexure C to Sub Section IIC).				
2.29.00	Suitable temperature monitoring system should be provided for Burner panel and critical piping areas as detailed out in C&I part of specification (Annexure C to Sub Section IIC).				
2.30.00	Specific features catering to boiler reliability In order to ensure the trouble-free operation and maintenance of the Steam Generator & associated systems, following specific features, as a minimum, shall be provided. Any related provisioning w.r.t. monitoring and control of the healthiness of these sub-systems (especially S.N.- 5 to 8) shall be ensured by hooking the feedback to the control system. - Each area maintenance feasibility to be ensured in Steam Generator design including coil tube replacement and APH basket removal. - High erosion prone area in first pass to be covered by shields and refractory - High erosion prone area in screen tubes and coils to be covered by sleeve shields - Ceramic removal pads insulation to be provided in area requiring frequent insulation removal like Burner panel area and soot blower area. - Final Super Heater and Final Reheater Coil inlet side also MTM to be provided for proper flow monitoring. Numbers shall be governed by sub-section-A-02 Part-B. - Flue Gas Ducts to be provided with strain gauge/ ash level meter at sharp bend locations of duct and common duct area after air preheater. - Boiler to be provided with vacuum cleaning system network to ensure proper hygiene. In this context portable system to capture the ash around the boiler peripheral surface shall be provided alongwith net worked transmission of captured ash to a common location.				
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	Following specific elevations of Boiler requiring installation of vacuum cleaning arrangement in Boiler Front, Rear, LHS and RHS are also to be covered other than required areas: 1) Penthouse Floor 2) Gooseneck area floor covering both first pass and backpass. 3) Boiler Scaffolding door floor covering both first pass and backpass 4) Top wall blower tier floor covering both first pass and backpass 5) Top burner top floor covering both first pass and backpass 6) Burner bottom floor covering both first pass and backpass 7) S Panel (approx.8.5 to 9M) 8. Safety valves and critical valves to be provided with temperature & sound monitoring (may be IOT based) to detect early passing and ensure reliability. Temperature point shall be provided on these valves/lines. For control and monitoring purposes the temperature values shall be taken between 50-75 Deg. C and sound value normally less than 75 dB as trigger. The necessary provision shall be accordingly provided with alarm signal in the control room. Further, following may be noted w.r.t. above scope for temperature measurement on critical valves for passing a. All valves including drain and vents in critical piping such as M.S.Stop valves and its integral bypass valves, Boiler Startup vent, M.S.Pipe drains and vents, CRH & HRH pipe drain & vents b. All master drains of SH and RH spray station. c. Drains & Vents of circulation system d. Sonic leak detection system installation in Safety valves & ERV: 1) Installation of Sonic leak detection system installation in all SLSV and ERVs of critical piping's such as M.S. Safety Valves & ERV/ EBV, CRH SV, HRH SV & ERV/ EBV. All the vital & critical valves, dampers etc. shall be designed for fail safe condition for any abnormalities, trips in the Boiler and its associated equipments/items. For details refer Part-C (GTR). Metal temperature measurement shall be done for valves mentioned at point a, b & c and sound monitoring for safety valves & ERVs mentioned at point d. 3.00.0 ELECTROSTATIC PRECIPITATORS (ESP) Contractor's scope shall include supply of one (01) Electrostatic Precipitator complete in all respects with all components and accessories etc, for one (01) steam generator of 1X800MW unit. Steam generator shall be supercritical, balance draft, dry bottom, pulverised coal fired type. The scope shall include but will not be limited to the following: 3.01.00 One ESP for Steam Generator of 1X800MW unit complete in all respects including all components and accessories stated in this section. 3.01.01 Each Electrostatic Precipitator serving one steam generator, shall have six (6) numbers of independently operated passes (gas streams) housed in six (6) nos. of independent casings including outside shell, structural steel supports and frame work (excluding foundation), access ladders, platforms, safety rails, stairways, walk ways, access doors and weather proof pent house etc. 3.01.02 Matching flanges along with all bolts, nuts, gaskets, and all the expansion joints etc. as required to connect the ESP passes to the duct work 3.01.03 Flue gas inlet distribution system complete with perforated plates, turning vanes, deflector plates, flow splitters, guide vanes and all necessary gas flow control devices in the inlet and outlet cones and duct, warranted by the results of flow model test, complete duct stiffening		
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	devices, interior bracings, slide plates, access doors, brackets, supporting structures, hangers, sampling connections, etc.				
3.01.04	Collecting and discharge electrode systems.				
3.01.05	Rapping system complete with structural supporting frame, drives, and automatic rapping control, etc.				
3.01.06	Ash hoppers complete with curved panel heating elements, matching with curved surfaces of conical hopper, level monitors and indicators, outlet flanges, jointing material, poke holes, access doors and walkways beneath the hoppers.				
3.01.07	Foundation base plates, bolts along with templates, nuts, anchor materials, packing shims, inserts & embedment along with lugs etc.				
3.01.08	For assessment and design of appropriate flue gas flow distribution in the ESP(s) and the duct work connected on the upstream and downstream sides of the ESPs, the Contractor shall conduct comprehensive model testing by developing physical Scale model by fabricating a three dimensional physical model of the Electrostatic Precipitator and it's ducting with a scale not less than 1:10.				
3.01.09	Opacity monitors complete with all accessories at the outlet of each pass (gas stream) of each ESP but upstream of the ID Fan i.e. six (6) nos. per ESP serving one steam generator.				
3.01.10	Inspection and maintenance access doors, frames and safety locks.				
3.01.11	Safety devices, safety barriers, etc.				
3.01.12	Monorails with electrically operated hoists including monorail beams on the roof for handling transformer rectifiers.				
3.01.13	Water washing system for the ESP and its hoppers along with all piping, valves and nozzles etc.				
3.01.14	Thermal Insulation, Lagging, Cladding & Refractories.				
	Thermal Insulation along with aluminum cladding, lagging, reinforcement wiremesh, cleats and supports, shall be provided for all the equipments/surfaces having skin temperature more than 60 degree Celsius. The insulation shall be as specified in Sub-Section-A-13, Part-B Section-VI.				
3.01.15	Dressing of foundations, grouting of pockets and underpinning of base plates for structures/ equipment etc., civil works associated with directly buried cables.				
3.01.16	Corrosion protection painting for structures as described in the specification.				
3.01.17	Sheeting work for roof (pent house)/ canopy/ side cladding of ESP.				
3.01.18	Associated Electrical and Control systems for ESP as detailed elsewhere in Part-A/Section-VI of this specification.				
3.01.19	For assessment and design of ESP hopper for ash flowability, the contractor shall conduct a comprehensive "Ash Flowability Study" of ESP hopper.				
3.01.20	Passenger Elevators for ESP control room (if applicable) The Passenger elevators for ESP control room be as under: (1) nos. conventional type elevator having capacity of 10 persons				
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3.01.21	The scope shall include all items / accessories, service along with all electrical equipment etc. Required to meet all design, installation, operation, safety, protection and other requirements of IS: 14665 (latest edition) (all parts), 'Lift' and service lifts'. This scope shall include all items / devices needed to comply with the requirements indicated elsewhere in the specification. The scope shall include but not limited to the following: (a) 1 No. fireman's switch for each elevator. (b) Machinery supporting Beam.																																																																								
3.01.22	complete erection, testing and commissioning including all testing and commissioning materials, consumables and other tools and tackles required for erection.																																																																								
3.01.23	To obtain necessary local administration permits / approvals and make arrangements for inspection and tests required thereby.																																																																								
4.00.00	e-Learning Package as specified elsewhere in the specification																																																																								
5.00.00	Provision for CO2 to Methanol in Singareni 1 x 800 MW Project In order to make the plant more efficient and environmentally friendly, provisions shall be provided for capturing carbon di-oxide from the flue gas generated from the plant. Provisions shall be provided in the flue gas duct i.e. from common duct after FGD system for tapping the desired flue gas quantity (2000 TPH) so as to capture 200 TPH of carbon di-oxide. The tap-off duct portion shall be provided with necessary isolation gates. These Gates are to be made of Carbon steel with C276 cladding of sheet of minimum thickness 1.6 mm along with 2x100 % Seal Air fans. Also, seals to be made of Alloy C-276 or better material. Blanking plates shall also be provided in each tap-off duct after isolation gates. Further, all the loads on account of such extraction shall be accounted in the duct design with suitable strengthening as may be required. The following details to be referred for the above provisioning of CO2 capturing: <table><tr><th colspan="6">Facility for 200 TPH CO2 Capture Plant at Singareni 1*800MW</th></tr><tr><th>SN</th><th>Description</th><th>Unit</th><th>Value</th><th>Space</th><th></th></tr><tr><td>1</td><td>Flue gas extraction</td><td>TPH</td><td>2000</td><td></td><td></td></tr><tr><td>2</td><td>CO2 Capture</td><td>TPH</td><td>200</td><td></td><td></td></tr><tr><td>3</td><td>CO2 Production</td><td>TPD</td><td>4800</td><td>3000</td><td>m²</td></tr><tr><td>4</td><td>H2 Requirement</td><td>TPD</td><td>600</td><td>34400</td><td>m²</td></tr><tr><td>5</td><td>Methanol Production</td><td>TPD</td><td>3000</td><td>14000</td><td>m²</td></tr><tr><td>6</td><td>Total Area for CO2 Capture Plant</td><td>m²</td><td></td><td>51400</td><td>m²</td></tr><tr><td>7</td><td colspan="5">Provision in duct for FG extraction</td></tr><tr><td>8</td><td>Duct tap off location</td><td colspan="4">From Common duct after FGD</td></tr><tr><td>9</td><td>Cross-sectional area for tap off</td><td colspan="4">To have FG velocity of 12 m/s velocity</td></tr><tr><td>10</td><td>Area of Cross-section</td><td>m²</td><td>50</td><td></td><td></td></tr></table> The above details shall be used to work-out the tapping configuration and size. Please refer the GLP for space provisions as shown.	Facility for 200 TPH CO2 Capture Plant at Singareni 1*800MW						SN	Description	Unit	Value	Space		1	Flue gas extraction	TPH	2000			2	CO2 Capture	TPH	200			3	CO2 Production	TPD	4800	3000	m²	4	H2 Requirement	TPD	600	34400	m²	5	Methanol Production	TPD	3000	14000	m²	6	Total Area for CO2 Capture Plant	m²		51400	m²	7	Provision in duct for FG extraction					8	Duct tap off location	From Common duct after FGD				9	Cross-sectional area for tap off	To have FG velocity of 12 m/s velocity				10	Area of Cross-section	m²	50		
Facility for 200 TPH CO2 Capture Plant at Singareni 1*800MW																																																																									
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9	Cross-sectional area for tap off	To have FG velocity of 12 m/s velocity																																																																							
10	Area of Cross-section	m²	50																																																																						
6.00.00	Provision for ready plant for methanol firing																																																																								

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7.00.00	The methanol as produced above (refer cl. 5.00.00) shall be utilized, as a co-firing fuel/support fuel, for future firing in the boilers under the package scope. The provisioning of methanol as a future fuel shall be for 30% BMCR load. The same shall be done by providing/identifying required space including necessary provisioning for pipe routings, cables etc. and for this purpose loads to be factored-in for the trestle design, cable design. The required space for this purpose has been shown in GLP. The space for the pumps, tanks etc. shall be kept for the above in fuel oil pump house and boiler area also. Also refer space provisioning requirements referred elsewhere in the specifications. Stress Condition Analyser for boiler thick-walled components: This module shall compute stress at different pre-defined components of the boiler along with predicted analysis. Boiler stress analysis shall include as a minimum main steam header, hot reheat header, Y pieces on main steam and hot reheat piping, separator. This module shall be supplied and installed from very initial stage so that all boiler startups and shutdowns can be captured. This will compute actual lifetime consumption of thick walled components based on creep and fatigue. All hardware and software required for above intent shall be supplied and commissioned by contractor. The above details may be referred in conjunction with other clauses related to this module where life of boiler components have been specified. Architectural Features for Steam Generator Enclosure Boiler structure being the heart of the power plant shall be architecturally treated to have an aesthetic appearance and shall be comparable with international buildings of repute. Boiler structure shall be in complete harmony with the main plant building, surrounding structures and environment. Accordingly, to achieve the same following provision (not limited to) shall be applied. - Boiler enclosure shall be covered with colour coated metal sheeting. The metal sheet shall display a visually appealing painting (which will be informed later) on outside. The height covered for sheeting will be from boiler roof to Penthouse and 15 m below from penthouse bottom. During Overhauling or repair, the covering should not restrict material movement from Top and Sides of the boiler. Accordingly, removable type sheet shall be provided for such location. Necessary approach and lugs shall be provided for this purpose. - Provision for ventilators / glazed windows shall be made as per functional requirements. The boiler enclosure shall have flat roof (alternatively pitched roof can also be provided with min. 10 deg. slope with basis during detail engineering stage) with access through staircase / lift.		
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SUB-SECTION–IIA-03

BIOMASS

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	<u>Scope for biomass co-firing in the Steam Generator</u> The unit should have biomass co-firing capability as follows- • Each milling system shall be capable of co-milling at least 10% non-torrefied biomass pellet along with coal on weight basis without any degradation in mill throughput and performance. • Also, each milling system shall be capable of co-milling at least 20% torrefied biomass pellet along with coal on weight basis without any degradation in mill throughput and performance. • Provision of view glass in mill feeder with adequate illumination and sealing air arrangement to prevent dust deposition to view presence of biomass pellets is to be made. Additionally, electronic monitoring of biomass pellet using camera may be provided in control room. • Boiler shall be capable for co-firing at least 10% of non-torrefied biomass on weight basis. The boiler shall also be capable of co-firing 20% torrefied biomass pellets on weight basis. • Due to presence of high volatile matter in biomass pellets, the mill and associated pulverised fuel piping (PF) systems shall be equipped with suitable & adequate fire detection system. Milling system and Bunkers shall be installed with CO monitor sensor with adequate redundancy for alarm in case of any possible fire hazard. • All the PF pipes shall be provided with RTDs and temperature of coal pipes to be hooked upto UCB. • Biomass pellet being a material having high volatile content and low ignition temperature, design of milling system and parameters shall take care of safety aspects/ any possible fire hazard during biomass co-firing. Mill inerting system with auto operated valves (motorised or pneumatic) operable from Control room at mill inlet along with pressure gauge after valve shall be provided. Provisions for continuous monitoring of mill inlet air temperature (Mixed air temperature), Mill outlet temperature, mill current, Mill DP is to be made. Provision of view glass in mill feeder with adequate illumination to view presence of biomass pellets is to be made. The scope shall include the unloading, storage, transportation & feeding to coal bunkers along with all the associated systems. The bunker area firefighting system shall be suitably reinforced to tackle biomass fire hazard also. The boiler & auxiliaries like pulverisers, ducting etc. including electrostatic precipitator system and all the associated system for handling the non-torrefied and torrefied biomass (as a fuel feed) and flue gas (as a combustion product) shall be compatible to the physio-chemical properties and composition of the specified biomass. These equipment & systems shall be designed and engineered accordingly based on the nature and behaviour of the biomass pellets. It should be ensured that the specified steam outlet parameters are maintained with the biomass co-firing for the entire control range. Additional pressure drops, if any, shall be factored in the PA fan sizing as also any additional soot blowers shall be provided on account of deposition while biomass co-firing. The milling system internals like classifier, mill throat for maintaining the correct velocities including any internal baffling to maintain the mill throughput shall be ensured. Burners shall ensure well			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.:		SUB SECTION-IIA-03 BIOMASS	Page 1 of 2

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	anchored flames and good flame detector signals to factor-in the impacts of such co-firing for effective results. The feeders shall be suitable to take care of biomass feeding, calibration requirements. The flame scanning should factor-in the impacts of such co-firing for trouble free scanning. Contractor shall provide a detailed write-up regarding the measures and features which have been adopted in heat transfer surfaces, milling system, burners and air supply system for NOx control including that in ducting & ESP/FGD design. The operating procedure for the mill with biomass co-firing shall be submitted for employer's approval. All the necessary civil, electrical & instrumentation on account of above co-firing shall also be included in the scope. Further, the related special monitoring & analytical instruments on account of bio-mass co-firing towards satisfactorily performance of the boiler & auxiliaries are also included. Control requirements for maintaining the mill inlet and outlet temperatures shall be provided. Write up for milling system and plant operating procedure during biomass co-firing with safety to be provided. Annexure-IV-7(A), (B) & (C) of Sub-Section-IB, Part-A, for "Torrefied Biomass Characteristics" may be referred. The non- torrefied biomass (agro-residue) shall have the meaning as identified in Government of India, Ministry of Power Addendum, F. No. 11/ 86/ 2017-Th.II (C.No 238797) dated 03.05.2023 placed at Annexure to this Sub Section.		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.:	SUB SECTION-IIA-03 BIOMASS	Page 2 of 2



F. No.11/86/2017-Th.II (C.No 238797)

Government of India

Ministry of Power

Shram Shakti Bhawan, Rafi Marg,
New Delhi, dated the 03rd May, 2023.

ADDENDUM

Subject: Addendum to Revised Policy for Biomass Utilization for Power Generation through Co-firing in Coal based Power Plants issued on 08.10.2021 - reg.

Ministry of Power had issued a Revised Policy for Biomass Utilization for Power Generation through Co-firing in Coal based Power Plants, vide letter dated 08.10.2021 (copy enclosed).

2. This is an 'Addendum' to the Policy referred to above, for addition of Para 4, after Para 3 of ibid policy, as under:

"4. Biomass pellets used for co-firing in TPPs can be made from the following:

(i) 'agro-residue' [as mentioned in Para 3(i), 3(ii) and 3(iii) above] i.e. the leftover portion of the agriculture produce such as stubble/straw/stalk/husk which are surplus and not being used as animal fodder. This includes agro-residue obtained from crops like Paddy, Soya, Arhar, Gwar, Cotton, Gram, Jawar, Bajra, Moong, Mustard, Sesame, Til, Maize, Sunflower, Jute, Coffee, etc. as well as Groundnut Shell, Coconut Shell, Castor Seed Shell etc.

(ii) In addition, pellets made from the following agro product/crop/waste can also be used for co-firing in TPPs

a. Bamboo and its by-products (e.g. Bamboo Chips, Cuttings, Bamboo Dust etc.).

- b. Horticulture waste such as dry leaves and trimmings obtained from maintenance & pruning of trees and plants.
- c. Other biomass such as Pine Cone/Needle, Elephant Grass, Sarkanda etc. "

3. This issues with approval of Hon'ble Minister of Power & NRE.


(J. Misra)

Under Secretary to the Government of India
Tele: 23063746

To,

- 1. Principal Secretary/Secretary in charge of Energy/Power Department, All States/UTs
- 2. Chairperson, CEA
- 3. CMDs of all CGSs/IPPs

Copy to:

- (i) PS to Hon'ble Minister of Power & NRE.
- (ii) PS to Hon'ble MoS for Power
- (iii) Sr PPS to Secretary(Power)
- (iv) PPS to SS&FA ,PPS to AS(AT)
- (v) All Joint Secretaries/EA/Chief Engineer, Ministry of Power
- (v) In-charge, NIC, Ministry of Power- with a request to upload this document on the website of MoP.



SUB-SECTION–IIA-04

FLUE GAS DESULPHURISATION SYSTEM

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES	
1.00.00 1.01.00 1.02.00 1.03.00 1.04.00 2.00.00 2.01.00 2.02.00 2.03.00 2.04.00 2.04.01	SCOPE OF SUPPLY The contractor's scope of supply shall include engineering, design, manufacture, supply, erection, commissioning and testing of complete mechanical, electrical, C&I and associated civil and structural works for Flue Gas Desulphurization system and its auxiliaries for one (01) number Steam Generator of 800 MW nominal rating, as detailed in this specification. The FGD system shall be necessarily based on Wet Lime Stone FGD technology and is intended to reduce the emissions of Sulphur Dioxide in flue gas produced by coal being fired in boiler to the limits specified elsewhere in the technical specification. Complete Electrical & Control & Instrumentation system as required for the FGD system shall be included in the scope of supply. All electrical drives and actuators required for the equipment/valves/dampers shall be in the contractor's scope. Complete Civil works, structures, foundation required for all the equipment etc. is included in the contractor's scope of work. The contractor shall also include all supporting and structural works, like pipe trestles, platforms, staircases in their scope of work. The scope of supply identified for FGD system here are minimum requirements and unless specifically excluded from the contractor's scope in sub-section-V (Terminal Points and Exclusions), any equipment/system not included in this specification but integral to the system offered by the contractor to meet the intent of this specification, shall also be included in the scope of the contractor. The FGD system shall have an independent absorber for unit, part of gypsum dewatering system for SINGARENI (1x800 MW) Project. The contractor shall also supply an auxiliary absorbent tank, for storage of absorber slurry of the unit. The contractor's scope shall include the absorber and part of gypsum dewatering system. All ducting, dampers, expansion joints, pumps, valves, supports, structures etc. as required for completeness of system of absorber and part of common gypsum dewatering system shall also be in the scope of the contractor for SINGARENI (1x800 MW) Project. SYSTEM DESCRIPTION The FGD system shall be based on Wet Limestone Forced Oxidation process. The unit shall be provided with an independent absorber. Gas from ID fan discharge shall be taken directly to the absorber inlet. In the absorber, SO₂ in flue gas shall be removed by a spray of recirculating slurry, pumped by slurry recirculation pumps. Alternatively, the gas shall be bubbled through the absorber slurry to remove the SO₂ from flue gas. Only proven system supplied earlier by the FGD vendor shall be supplied by the contractor. Compressed oxidation air shall be blown through the slurry in the oxidation tank, to oxidize the Calcium sulfite to gypsum. The oxidation system may be either grid sprage type or lance jet type or Jet Air Sprager or as per the proven practice of the FGD vendor. Clean gas from the absorber shall be taken to the Chimney through three stage mist eliminators. Treated flue gas from the absorber shall be discharged through a stack. Provision shall be made for isolation of the flue gas flow through the absorber and also for bypass of the absorber, to allow maintenance of the absorber with the unit in operation. The FGD System shall be in operation when Steam Generator is in operation. However, provision shall be made for facilitating operation of unit with FGD bypass. This shall also facilitate the online maintenance of absorber system and associated equipment's. The arrangement of the flue gas system shall allow complete isolation of the absorber from the gas side, with the unit in operation. For this purpose, Contractor shall provide Motorized Guillotine type gates at (i) hot gas inlet to Absorber, (ii) cold gas outlet from Absorber. The	
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIA-04 FLUE GAS DESULPHURISATION SYSTEM Page 1 of 7

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	Gates shall be provided with 2x100% seal air fans. Gates at outlet to Absorber shall also be provided with 2x100% electrical heaters. Further, regulating type pneumatically operated bi-plane damper with quick opening facility along with 2x100% seal air fans & 2x100% electrical heaters shall also be provided by the Contractor in the by-pass duct. Smart Positioner shall be provided for regulating purposes. Bidder to refer Clause 7.01.00 Sub Section IIIC-08 Part-B Section VI of Technical Specifications for the details of smart positioner. The design of the damper shall ensure 99.95% leak tightness, on flow basis, without seal air. The damper shall be 100% leak tight with seal air fans under the above conditions.			
2.05.00	Limestone slurry shall be pumped to absorber by dedicated limestone slurry pumps via tapping taken from the employer's limestone slurry tanks or from the common outlet headers of limestone slurry tanks already provided for the other units of SINGARENI plant.			
2.06.00	The gypsum from absorber shall be pumped by dedicated gypsum bleed pumps to part of Gypsum Dewatering system for the unit consisting of two streams of (2X100%) of primary and secondary hydrocyclones. The water removed from the Primary hydrocyclones and Secondary hydrocyclones shall be recycled to the absorber. The waste water from the system shall be collected and neutralized using lime and shall be pumped to the mixing tanks of HCSD System or in any other area with suitable treatment so as to suit/not disturb the destination fluid quality.			
2.07.00	An auxiliary absorbent tank shall be provided for storage of absorber slurry of the absorber along with slurry pumps for pumping the slurry back to the absorber.			
3.00.00	LIMESTONE GRINDING SYSTEM			
3.01.00	Limestone slurry shall be taken from the employer's limestone slurry tanks. 2x100% limestone slurry pump shall be connected to each of the limestone slurry tank. Limestone slurry pump suction can be directly taken from the tank or from the common header connecting both the tanks. For this purpose, Bidder may have to create openings for suction as well as for recirculation line in the tanks and restore back the lining (if damaged).			
3.02.00	Limestone slurry piping from the terminal point described above to the absorber along with recirculation lines of limestone slurry pumps, flush lines, all isolation and control valves is in bidder's scope. Pinch control valves shall be provided in the Limestone slurry recirculation lines. Alternatively, the bidder can also provide On/Off type Diaphragm valves as per its proven practice.			
3.03.00	Limestone slurry pumps recirculation line (if provided) shall be connected to each of the employer's limestone slurry tanks.			
3.04.00	Limestone slurry pumps shall be installed inside a shed.			
4.00.00	ABSORBER SYSTEM			
4.01.00	An independent Limestone Forced Oxidation (LSFO) type absorber system shall be provided for each unit. Each absorber system shall be complete with:			
4.01.01	Absorber tower complete with re-circulating slurry spray header(s) and nozzles, three stage mist eliminators, wash water nozzles, oxidation tank integral to tower, oxidation headers and nozzles, and agitators and all internal systems integral to the working of the absorber.			
4.01.02	2x100% re-circulating slurry pump for each level of spray. Alternately, the contractor may offer a spare level of spray with each spray level served by an independent 100% pump. In case the contractor offers a single level of spray, one number of standby pump of the same capacity & head as the working slurry recirculation pumps shall be provided.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-IIA-04 FLUE GAS DESULPHURISATION SYSTEM
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	(In case the bidder offers an absorber with gas bubbling through the slurry, the complete gas distribution system to the slurry shall be in bidder's scope. No re-circulating pump and spray header and nozzles shall be required in such case. In such a case Two (2) nos. of Booster fans, if required, can be provided by the Contractor downstream of the ID fans, for each unit, capable of handling the pressure drop in the FGD system & ducting and maintain required chimney inlet pressure)			
4.01.03	Complete Ducting System from ID fans to absorber tower, from absorber tower to absorber bypass duct and connecting duct to chimney.			
4.01.04	Motorized isolation gates at Absorber gas inlet, Absorber gas outlet along with 2x100% seal air fans for each gate and 2x100% heaters for absorber outlet gate. A bi-plane bypass damper along with 2x100% seal air & 2x100% heaters shall also be provided in the bypass duct.			
4.01.05	2x100% oxidation blowers.			
4.01.06	1 No. Emergency water tank for spraying water at inlet of Absorber for upset condition.			
4.01.07	All connecting piping and valves required by the system.			
4.01.08	2x100% gypsum bleed pumps.			
4.01.09	Piping from gypsum bleed pumps to gypsum dewatering system, along with recirculation lines (if required) necessary isolation and control valves. Pinch control valves shall be provided in the gypsum slurry recirculation lines. Alternatively, the bidder can also provide On/Off type Diaphragm valves as per its proven practice.			
4.01.10	Routing of the duct/piping system complete with supports, structures, trestles, absorber platforms, as required shall be in the contractor's scope of supply.			
4.01.11	Passenger cum Goods elevator for each Absorber.			
4.01.12	All Slurry re-circulating slurry pumps & Oxidation blowers shall be installed in a shed provided with roof sheeting to be provided by the Contractor as per specifications specified elsewhere. All pumps & Oxidation blowers shall be in straight line, however, if it is not possible due to layout constraints, in such case, arrangement for handling & maintenance should be properly & optimally designed. The shed must be complete in all respect specially facilitating the smooth operation and maintenance of associated equipment's of above systems by providing adequate maintenance space, handling facilities, walkways, staircase etc.			
5.00.00	GYPSUM DEWATERING SYSTEM			
5.01.00	The employer envisages a common gypsum dewatering system for the unit. The common dewatering system shall receive the gypsum slurry from the absorber through slurry feed pipes and shall comprise of two sets of dewatering equipment.			
5.02.00	Each set of dewatering equipment (01 working set + 01 standby set) shall comprise of the following items as a minimum requirement:			
	i. One set of primary hydro-cyclones			
	ii. One set of secondary hydro-cyclones			
	iii. Complete piping and valves for the system along with wash water line.			
	iv. Filtrate/Reclaim water tank			
5.03.00	The gypsum slurry from the Absorber shall be fed to Employer's common Primary hydro cyclone feed tank provided in other Stage of SINGARENI Project or to Bidder's own primary hydrocyclone feed tank (sized for minimum 1 hr storage capacity) depending on gypsum bleed concentration detailed in clause no 5.04.00, A-05, Part-B of technical specification from where it will be fed to each primary set of hydro-cyclone through 2x100% Primary hydro			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-IIA-04 FLUE GAS DESULPHURISATION SYSTEM
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	cyclone pumps. The primary hydrocyclone & equipments coming in down stream of primary hydrocyclone i.e Secondary hydrocyclone tank, secondary waste water hydrocyclone, waste water tank, lime solution tank and other items coming under waste water treatment system for Singareni TPP Stg-II (1x800 MW) shall be provided by the contractor.			
5.04.00	The overflow from the primary set of hydro-cyclone shall be taken to a Secondary hydro cyclone feed tank to be provided by the contractor. 2x100% Secondary hydro cyclone pumps shall be provided to feed 2x100% secondary hydro-cyclones. The underflow from the primary hydrocyclone shall be fed to the employer's 2x100% vacuum belt filter system. All modification in the existing chute connection of employer's PHC to employer's belt filter shall be in bidder's scope.			
5.05.00	The under flow from the secondary hydro-cyclone shall be taken to the filtrate water tank to be provided by the contractor. 2x100% Filtrate water pumps shall be provided to recycle the filtrate to the absorber. The overflow from the secondary hydro-cyclone shall be taken to waste water neutralization system to be provided by the contractor. The waste water system shall be complete with lime feeding & storage system, neutralization tank, waste water tank, 2x100% waste water pumps along with complete piping, instrumentation, valves, piping support etc. to discharge waste water after neutralization, at required pressure, sent to the mixing tanks of HCSD System or in any other area with suitable treatment so as to suit/not to disturb the destination fluid quality. All the piping with supports, trestles as required shall be in the contractors' scope. The contractor shall also include any other item not included above but necessary to make the system complete.			
5.06.00	The part of gypsum dewatering system (primary hydrocyclone & equipments coming in downstream of primary hydrocyclone i.e Secondary hydrocyclone tank, secondary waste water hydrocyclone, filtrate water tank, waste water tank, lime solution tank and other items coming under waste water treatment system etc.) for Singareni TPP Stg-II (1x800 MW) shall be provided in the Employer's gypsum dewatering building provided in other Stage of SINGARENI Project. Primary hydrocyclones underflow shall be connected to the existing chutes above the employer's vacuum belt filters. All modification in the existing chute connection of employer's PHC to employer's belt filter shall be in bidder's scope. Primary hydrocyclone shall be installed in such a way that the under flow shall be easily flowable to the existing vacuum belt filter. Any modification in flooring/roof of the existing building for installation and maintenance of all hydrocyclones, pumps, piping etc. shall be in bidder's scope.			
6.00.00	AUXILIARY ABSORBENT TANK			
6.01.00	The Contractor shall provide an auxiliary absorbent tank, of sufficient capacity for storage of absorber slurry of the unit.			
6.02.00	The contractor shall provide 1x100% slurry pumps for pumping the slurry back to the absorber of any of the units in 8 hrs (max.). All agitators, piping, valves, fittings and other structures required for the system shall be included in the scope of the contractor.			
7.00.0	PROCESS WATER & COOLING WATER STORAGE & PUMPING SCHEME			
7.01.00	Two (2x100%) Process water Storage tanks (each tank catering to the requirements of 1 x 800 MW unit) along with two numbers of 2x100 % Booster water pumps, if required (Each pump catering to the process water requirements of 1 x 800 MW unit) along with all necessary piping, valves, control & instrumentation to feed the tank. Process water Storage level is automatically controlled at operating level by controlling the waterflow from the makeup water from terminal point. The two tanks shall be interconnected with an isolation valve.			
7.01.01	2x100% Process Water Pumps connected to each of the Process water Storage tanks along with all necessary piping, valves, control & instrumentation. Each pump catering to process			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-IIA-04 FLUE GAS DESULPHURISATION SYSTEM
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES		
	water requirement of one unit.		
7.02.00	2x100% Mist Eliminator Wash Water Pump connected to each of the Process water Storage tanks along with all necessary piping, valves, control & instrumentation. Each pump catering to mist washing requirement of one unit. Alternatively, Contractor can use process water pumps for mist eliminator washing if it is the standard & proven practice of the Contractor or its Technology Collaborator.		
7.03.00	Not used		
7.04.00	Not used		
7.05.00	Not used		
7.06.00	Any other pump or storage system not specified but required to meet the system requirement shall be provided by the contractor with the approval of the Employer.		
7.07.00	All drains & overflow lines from the tanks shall be terminated to the nearest trench/drain.		
7.08.00	Corrosion protection requirements of all the storage tanks are specified at clause 13.00.00, A-05, Part-B of Technical Specifications.		
8.00.00	SUMP & SUMP PUMPS		
8.01.00	The contractor shall provide sumps of adequate capacity in absorber area. Waste water which might be generated during flushing and cleaning procedures of the equipment shall be collected in the sump and shall possibly be reused in the wet absorber. Waste water generated during flushing of pumps/line/equipments in gypsum dewatering area and in limestone slurry area shall be send via pipes/pumps to the sump already provided in the respective areas.		
8.02.00	The contractor shall provide agitators and sump pumps of required capacity in absorber area along with necessary pipes, isolation / control valves etc for pumping back the water in the sump into the respective system. The Interior surface of the Sumps shall be lined with FRP lining / PP lining of minimum 5 mm thickness or acid resistant tiles.		
9.00.00	ELEVATOR		
9.01.00	One (1) number passenger cum goods elevator of minimum capacity of 1000kgs for the Absorber (to be provided in case height of absorber is higher than 15m) shall be provided for easy access & movement of man/materials. Passenger Elevator of minimum capacity of 680kg for MCC cum control room building of FGD plant irrespective of building height shall be provided.		
9.02.00	The scope shall include all items / accessories, service along with all electrical equipment etc. required to meet all design, installation, operation, safety, protection and other requirements of IS: 14665 (latest edition) (all parts), 'Lift' and service lifts'. This scope shall include all items / devices needed to comply with the requirements indicated elsewhere in the specification. The scope shall include provision of fireman's switch.		
9.03.00	One (1) nos. adequately sized, Air conditioners each having minimum cooling capacity of 2.5 Ton shall be provided for each elevator machine room to make it dust proof.		
9.04.00	Complete erection, testing and commissioning including all testing and commissioning materials, consumables and other tools and tackles required for erection.		
9.05.00	To obtain necessary local administration permits / approvals and make arrangements for		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIA-04 FLUE GAS DESULPHURISATION SYSTEM	Page 5 of 7

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	inspection and tests required thereby.			
10.00.00	THERMAL INSULATION, LAGGING, CLADDING & REFRACTORIES Thermal Insulation along with aluminum cladding, lagging, reinforcement wiremesh, cleats and supports, shall be provided for all the equipment/surfaces having skin temperature more than 60 degree Celsius. The insulation thickness shall be designed based on criteria specified in Part-B, Section-VI.			
11.00.00	BUILDINGS			
11.01.00	Contractor shall provide buildings for Compressors & FGD control room. Slurry re-circulating pumps & Oxidation blowers shall be located in a shed provided with roof sheeting. The buildings/structure must be complete in all respect specially facilitating the smooth operation and maintenance of associated equipment's of above systems by providing adequate maintenance space, handling facilities, walkways, staircase etc.			
11.02.00	Contractor shall provide air conditioning for the FGD control room and Analyser room (if separately provided) & ventilation for the Compressor buildings.			
12.00.00	Contractor shall provide Corrosion protection painting for structures & equipment as described in the specification.			
13.00.00	Contractor's scope shall include all Platforms, walkways, staircase, safety rails for access of each equipment, valves, dampers, gates, instruments etc. handling facilities adequately each component of FGD system.			
14.00.00	BOOSTER FAN & ISOLATION GATES (If Required)			
14.01.00	For the unit, two (2) nos. Booster Fans of axial type, Constant speed, variable pitch controlled each with drive motor, base plates, foundation bolts and nuts, inlet box, discharge case, coupling, coupling guard and suitable arrangement to prevent rain water entry to fan motor. Each Booster Fan shall be provided with bearing lubrication and hydraulic blade pitch control unit(s) consisting of (1) 2x100% oil pumps each with motor, coupling and coupling guard. (2) 2x100% oil coolers. (3) 2x100% filters, differential pressure switches, etc. (4) One (1) oil storage tank. (5) Instrumentation, vibration monitoring, inter connected piping, valves and fittings including pressure relief valves and non return valves. (6) Electrical actuator with accessories etc. Alternatively, a forced oil lubrication system (consisting of 1to 6 above) common to bearing lubrication and for servo motor operation to each BF Fan will also be acceptable. At least two (02) nos. of duplex thermocouples or duplex platinum RTDs (100 ohm at 0°C) and one no. of temperature indicators shall be provided for bearing metal temperature measurement, control and monitoring. Booster fans shall be suitable for the type of foundation being provided.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-IIA-04 FLUE GAS DESULPHURISATION SYSTEM
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 		
14.02.00	Motorized Guillotine type gates with 2x100% seal air fans shall also be provided at suction & discharge of each Booster Fan. 2x100 % seal air fans common for both the guillotine type gates at suction side and 2x100 % seal air fans common for both the guillotine type gates at discharge side of booster fans shall also be acceptable. The Gates shall be designed for tight shut-off. The design of the gates shall ensure 99.95% leak tightness without seal air. The gates shall be 100% leak tight with seal air fans under the above conditions.		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIA-04 FLUE GAS DESULPHURISATION SYSTEM	Page 7 of 7

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	STEAM TURBINE AND AUXILIARIES			
1.00.00	GENERAL The scope of work for the equipment and accessories to be furnished in accordance with this specification shall include design, manufacture, engineering, inspection and testing at Contractor's work(s), packing, forwarding to site, unloading, erection, supervision, pre-commissioning, testing, commissioning and performance testing of the equipment/systems indicated hereunder. Items though not specifically mentioned in the specification but needed to complete the equipment and systems to meet the intent of specification, shall also be deemed to be included unless otherwise specifically mentioned under exclusions.			
2.00.00	STEAM TURBINE & AUXILIARY SYSTEMS The scope includes all equipment required for One (1) Steam Turbine Generator unit along with auxiliaries of the type specified. The unit will include but not be limited to the following:			
2.01.00	Steam Turbine			
2.01.01	The steam turbine shall be of tandem compound construction, condensing type with minimum eight (08) number of extractions with extraction for the top HP heater from the HP turbine for regenerative feed heating. HP turbine shall be of double casing design. Separate HP, separate IP and two separate LP cylinders OR combined HP-IP and two separate LP cylinders shall be provided. HP inner cylinder, IP cylinder and LP cylinders shall be horizontally/vertically split as per standard practice of turbine manufacturer.			
2.01.02	Steam turbine shall be complete with casings, rotors, bearings, temperature detectors, couplings, steam gland seals, rotor turning gear preferably hydraulic type and having remote operation facility, hand barring gear, emergency stop and control valves and reheat stop and control valves with their servomotors, removable type steam strainers for start up and normal operation upstream of emergency stop and reheat stop valves, cross-over/cross around piping and electric motors for all its integral subsystems. Steam strainers integral with main steam emergency stop and reheat stop or control valves are also acceptable as per standard practice of the bidder.			
2.01.03	Bidder shall provide Hydraulic / Pneumatic power operated/ supported Quick closing type & ordinary NRVs for each Steam extraction line (except for extractions from LP Turbine) including steam extraction line to BFP drive turbine. For each CRH line and extractions from LP Turbine (except for heaters in condenser neck) minimum one hydraulic/ Pneumatic power operated / supported QCNRV shall be provided.			
SINGARENI TPP STAGE-II (1X800MW), EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A	SUB-SECTION-IIA-06 TURBINE GENERATOR AND AUXILIARIES	PAGE 1 OF 10

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 			
	NRV shall be suitable for on load testing and shall be provided with fail safe design. Also, ensure valves closure during unit trip. TSR analysis to be carried out by the successful Bidder for any additional requirements which shall be met by Bidder. The type of actuation i.e. hydraulic/pneumatic shall be as per the standard proven practice of the manufacturer. 2.01.04 Turbo generator set shall be suitable for installation on solid RCC foundation as well as spring supported Reinforced Cement Concrete (RCC) foundation. 2.01.05 In case free standing blades for last stage and/or last but one stage of low pressure (LP) turbines are offered, then, bidder shall provide On-Line integrated blade vibration monitoring system for this/these stage(s). The On-line integrated system shall consists of suitable number of Non-contact eddy current/inductive/magnetic sensors, including hardware, software for monitoring blade vibrations for last stage and/or last but one stage free standing blades (both Turbine end & Generator end) of low pressure turbines. 2.02.00 Steam Turbine Auxiliary Systems 2.02.01 Turbine gland sealing steam system shall be provided with gland steam condenser, 2x100% capacity gland steam exhausters (AC Motor drive) all associated motors, associated piping, valves and fittings, specialties, hangers and supports, necessary insulation and complete with all instrumentation and control hardware including electro hydraulic/ electro pneumatic controller, actuator, electro hydraulic / electro pneumatic converter etc. as to make the system complete in all respects. 2.02.02 Cross over/cross around piping between IP and LP casings including necessary hangers and supports for piping and secondary structural steel shall be provided, if required. 2.02.03 Lubricating Oil System (common for Turbine Generator Set) shall be complete with oil tanks, oil purifying system, oil pumps and jacking oil pumps with drive motors, oil coolers, strainers, vapour extractors with drive motors, all interconnecting piping, valves and fittings, hangers and supports, necessary instrumentation and control hardware to make the system complete in all respects. Centralised oil storage and purification system shall include clean oil tank, dirty oil tank, unloading tank, transfer pumps, purifying unit with interconnecting piping, necessary instrumentation and control hardware to make the system complete in all respects. 2.02.04 Steam turbine control fluid and its purification system along with its conditioning system shall be complete with control fluid tank, control fluid pumps with drive motors,			
SINGARENI TPP STAGE-II (1X800MW), EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A		SUB-SECTION-IIA-06 TURBINE GENERATOR AND AUXILIARIES
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	strainers/filters (as per standard practice), accumulator, control fluid coolers, waste fluid tank (If Required), purification equipment including fluid circulation pumps with drive motors, associated piping, valves, fittings and specialties, hangers and supports, Instrumentation and control hardware to make the system complete in all respects for the 800 MW unit. Fire Resistant Fluid for main turbine control fluid system shall be preferably sourced from Domestic Manufacturer. 2.02.05 Steam turbine governing and protection system shall be complete with electro hydraulic governor with suitable back up as per standard practice of the manufacturer. Electro hydraulic converter, hydraulic converter, tracking devices, hydraulic speed governor, electrical speed sensors, speed/load adjusting gear, motor drives shall be provided as per applicability and standard practice of the manufacturer. The system shall be complete with remote trip solenoids and trips on overspeed, low condenser vacuum, low lube oil pressure, high axial shift and other trip/protection devices etc., electrical components associated with electro hydraulic system, test devices etc. and hydraulic components like accumulator, strainers etc. alongwith associated piping, valves, fittings and specialties, hangers and supports etc. 2.02.06 Steam turbine exhaust hood spray cooling system shall be complete with spray arrangements, associated piping, instrumentation and control devices, valves and fittings, motor/solenoid operated valves and specialties, hangers, supports and insulation etc. 2.02.07 Steam turbine, associated piping & equipment drain & vent system shall be complete with turbine flash tanks, piping, valves and fittings, valve motor drives, specialties, hangers and supports, insulation, instrumentation and control etc. The drains shall be led to the suitable location inline with the zero liquid discharge principle and the vents shall be led to atmosphere upto a suitable location outside the main plant building. 2.02.08 Portable main turbine preservation system consisting of adequate numbers of air driers including, fans, motors, filters, heater drying wheel, connecting pipings, valves, fittings etc. for preservation against corrosion of turbine during idle periods shall be provided. One number system per station shall be provided. 2.02.09 Boroscopic inspection ports in turbine for in situ inspection of turbine internals shall be provided as per bidder's standard practice. One set of Portable, Boroscopic Inspection system complete with applicable tools, per station shall be provided. 2.02.10 HP/LP Bypass system shall be complete with steam and spray valves, spray control station, throttling devices, fittings, desuperheaters, hydraulic power pack, solenoid valves, quick acting devices, blanking devices for steam blowing, supports, associated piping including warm up arrangements, valves, instrumentation and control hardware, electrical devices and actuators/motors etc.			
SINGARENI TPP STAGE-II (1X800MW), EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A	SUB-SECTION-IIA-06 TURBINE GENERATOR AND AUXILIARIES	PAGE 3 OF 10

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
2.02.11	Clarified water cooled, divided water box, horizontal surface condensers for the unit shall be complete with all accessories such as hotwells, valves, drains, vents, strainers, CW line expansion joints and fittings, isolating butterfly valves with matching flanges, associated CW piping to and from the condenser, suitable handling arrangement(s) for water box & butterfly valves, steam throw off devices for HP-LP bypass system, extraction steam piping routed through the condenser to low pressure feed water heaters and heater(s) within the condenser neck and with provision for installation of low pressure feed water heater(s) in the condenser neck, shall be provided. Each of the two LP cylinders shall be provided with separate condenser shell arranged in series on cooling water side such that the condenser shall operate under dual pressure mode.			
2.02.12	Drainage System for Turbine and Auxiliaries Flash tanks / vessels / flash boxes shall be provided for accepting all turbine and cycle recoverable drains including those from main steam, cold reheat and hot reheat lines, HP-LP bypass lines, heater drains etc. These flash tanks / vessels / flash boxes shall be connected to condenser and shall be complete with all associated spray system, piping, valves and fittings, specialties, hangers and supports and insulation, instrumentation and controls etc. shall be provided. Bidder to however note that manifolds on condenser shall not be acceptable. Start-up drains shall be led to atmospheric flash tank(s). For pipelines where continuous warm-up is required, the drain line shall be provided with a continuous (orificed) drain across the bypass of drain valve. For drainage system of turbine and its auxiliaries, requirements of ASME-TDP-I (latest) shall be duly met by the bidder.			
2.02.13	Bidder to provide Condenser air evacuation system complete with 2 x 100% vacuum pump per condenser shell along with associated motors, all accessories, associated piping, valves & fittings, specialties, duplex filter, instrumentation and control etc.			
2.03.00	TG Integral and Other Miscellaneous Piping The scope of work for TG integral and miscellaneous piping covered under this specification shall include but not be limited to the following systems: (a.) Condenser air evacuation system (b.) Condenser cooling water system (c.) Cycle make-up system (d.) Control fluid system			
SINGARENI TPP STAGE-II (1X800MW), EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A	SUB-SECTION-IIA-06 TURBINE GENERATOR AND AUXILIARIES	PAGE 4 OF 10

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES		
	(e.) Gland steam sealing system (f.) Lube Oil system (g.) Central oil storage and purification system (h.) Exhaust hood spray system (i.) Gland sealing (of valves and pumps) system (j.) Equipment cooling water system (k.) Compressed air system (Service Air and Instrument Air) (l.) Steam evacuation line (HPT exhaust) from CRH piping system. Piping shall be complete with fittings / accessories and specialties, expansion joints, valves, insulation, hangers, supports, restraints / guides, snubbers and auxiliary steel etc. The design and engineering of the piping system shall include but not be limited to pipe sizing, hanger / snubber engineering, engineering of thermal insulation etc.		
3.00.00	CONDENSER ON LOAD TUBE CLEANING SYSTEM Sponge rubber ball type condenser on load tube cleaning system separately for each half of the condenser. Each Condenser on load tube cleaning system shall be complete with one number Ball recirculation pump, one number Ball separator, one number Ball collecting vessel, differential pressure measuring system, Ball monitoring system (comprising of ball recirculation monitor and ball oversize monitor), associated piping, valves and accessories, instrumentation and controls, all drives, power and control cables, motors and accessories, etc.		
4.00.00	CONDENSATE EXTRACTION PUMPS 3 x 50% capacity motor driven condensate extraction pumps with variable frequency drive for the unit along with all accessories, drives, suction strainers, associated piping, and valves, instrumentation and control etc. shall be provided. One number cannister drainage pump per station shall also be provided-		
5.00.00	DEAERATOR LEVEL CONTROL STATION		
5.01.00	Deaerator level control station for condensate water flow control, consisting of the following for the unit: (1) 1 x 30 % capacity pneumatically operated low load control valve.		
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	(2) One motor operated gate valve on upstream and one manual operated gate valve on downstream of pneumatically operated low load control valve. (3) 1 x 100% capacity motor operated regulating valve. Deaerator level shall be controlled by variable frequency drive system of condensate extraction pumps and during low load operation pneumatically operated condensate control valve shall be used for deaerator level control.			
5.02.00	Flow measuring system as indicated in Tender P&ID in condensate line to deaerator for measuring condensate flow to deaerator shall be provided.			
6.00.00	FEED WATER HEATING PLANT			
6.01.00	Complete regenerative feed heating system including full capacity drain cooler, minimum four (04) nos. of low pressure heaters, deaerator and feed storage tank, minimum three (03) nos. of high pressure heaters, all accessories, associated piping, valves, Centralised Nitrogen gas filling arrangement (Refer tender drawing in this regard), instrumentation and controls etc. shall be provided for the unit. One set of test kit for measuring oxygen content at deaerator outlet shall also be provided for the station. 2 x 100% (if offered) capacity motor driven drip pumps for the unit along with all accessories, drives, suction strainers, associated piping, and valves, instrumentation and control etc. shall be provided.			
7.00.00	BOILER FEED PUMPS			
7.01.00	One thirty percent capacity (1x30%) motor driven boiler feed pump for the unit complete with booster pump along with it's drives, mechanical seals, flexible couplings, hydraulic coupling, gear box, base plate(s), forced oil lubricating system (including oil pumps, oil tank, lube oil coolers, working oil coolers, duplex oil filters etc.), regulating type low load recirculation flow control valve, mobile trolley, integral piping and valves, temporary and permanent strainers, local instrument racks/enclosures, instrumentation and control etc. shall be provided. One (1) number portable centrifuge of adequate capacity per station shall also be provided.			
7.02.00	Two half capacity (2x50%) steam turbine driven boiler feed pumps for the unit complete with booster pump, step down gear box, flexible couplings, mechanical seals, foundation base plate, regulating type low load recirculation flow control valve, mobile trolley, integral piping and valves, local gauge boards, instrumentation and control etc. shall be provided.			
7.03.00	Two (2) steam turbine drives for the turbine driven boiler feed pump for the unit complete with ESV, control valves, non return valves for single admission drives, permanent & temporary steam strainers, preferably hydraulic turning gear, hand barring device, atmospheric relief diaphragm and it's vent piping, all inter connecting			
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	piping, foundation base plates, integral gland seal system, complete lube oil and control oil system including oil tank, oil coolers, duplex oil filters, 2X100% vapour exhausters, 100% capacity centrifuge for each steam turbine driven pump, jacking oil system (if required), Electro-hydraulic governing system, Turbine Supervisory system along with all control and accessories as specified elsewhere in the specification shall be provided. If bidder offers separate condenser for each drive turbine then separate 2x100% vacuum pumps, COLTCS system for each half of the condenser, 2x100% CEP for each drive turbine condenser (if required), associated piping fittings, instruments etc. shall be provided by the bidder. The design and sizing of these equipments shall be in line with the requirement for main turbine condenser.			
7.04.00	Boiler feed pump sets shall be suitable for installation on conventional RCC foundation as well as spring supported Reinforced Cement Concrete (RCC) foundation.			
7.05.00	Feed regulating station (FRS) for feed water flow control during unit start-up, consisting of the following for the unit: (1) One pneumatically operated (0 to 30% BMCR capacity range) feed control valve. (2) Two numbers motor operated gate valves with motor operated integral bypass valve, one each on upstream and downstream of feed control valve. (3) Two motor operated gate valve (each 50% BMCR capacity) in parallel to the feed control valve to bypass the feed control valve in the unit operation range of 30 to 100% BMCR. Alternatively, bidder can offer one motor operated gate valve of 100% BMCR capacity in parallel to the feed control valve.			
8.00.00	MAKE UP SYSTEM Normal and emergency cycle make-up to condenser hot well for the unit consisting of piping, valves, flow measuring system as indicated in Tender P&ID, hot well make-up control station (normal and emergency) including control valves, drain, vents, etc. are in the scope of this contract. Likewise, condensate spill pipeline consisting of piping, valves, control station etc. are in the scope of contract.			
9.00.00	GLAND STEAM CONDENSER RECIRCULATION SYSTEM Minimum recirculation flow line from downstream of Gland Steam Condenser to main condenser for the unit consisting of piping, control valves, drain, vents etc. are in the scope of this contract.			
10.00.00	TURBINE HALL EOT CRANES			
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES	एनटीपीसी NTPC		
10.01.00	Two (2) number of electrically operated overhead travelling cranes with associated auxiliaries, along with electrical equipment, control & instrumentation as required and specified shall be provided in the turbine hall for erection and maintenance of turbo-generators and their auxiliaries. Each crane shall be capable of lifting at least 105% of the weight of single heaviest component/ equipment (except generator stator), including lifting beam and slings etc. (as applicable) to be handled in TG hall for erection as well as maintenance of the equipment provided in AB bay. The auxiliary hook capacity shall not be less than 20 Ton. In addition, it shall also be possible to handle Generator Stator with tandem operation of two Turbine hall EOT cranes for which necessary arrangements shall be provided. In such case, the combined capacity of two EOT cranes shall not be less than 105% of weight of Generator Stator, including the weight of lifting beam with swiveling arrangement and slings.			
10.02.00	EOT CRANE FOR BOILER FEED PUMP If BFPs are provided in BC bay or are not accessible to TG hall EOT crane as per layout requirement, one (1) no. of Electrically operated (Double Girder) travelling cranes for the unit with associated auxiliaries, along with electrical equipment, control & instrumentation as required and specified shall be provided in the BC bay for erection and maintenance of Boiler feed pump and their auxiliaries. The main hook capacity of each crane shall be 10% over and above the heaviest component/equipment (including Drive Turbine assembly) to be handled (including lifting beam, if applicable, and slings etc.) or 25 Tonne whichever is higher. Further the EOT crane shall have necessary facilities such as lifting beam with swivelling arrangement (if applicable) and slings for erection as well as maintenance of the equipment.			
11.00.00	PERFORMANCE GUARANTEE TEST Performance tests of all the equipments/systems in the contractor test facilities and performance guarantee tests at Employer's site as specified elsewhere in the specification are included in the scope of this specification. Performance guarantee/acceptance test for each turbine-generator unit shall be carried out as per ASME-PTC-6 (Latest Edition) and as specified otherwise in the specification.			
12.00.00	OTHER MISCELLANEOUS ITEMS: The scope of work for the equipment covered under this specification shall include but not be limited to the following systems:			
12.01.00	All weld neck counter flanges shall be supplied by bidder wherever nozzle ends on any equipment such as strainer, flow nozzles etc. are flanged.			
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES	एनटीपीसी NTPC	
12.02.00	All fixtures, embedded parts, steel embedments including fixing lugs and welding between them, foundation plates, nuts, bolts etc. for fixing all the equipments, piping on civil works shall be included in scope work of this package.		
12.03.00	All structures which would be required by the Bidder for supporting the piping shall be included in scope of work of this package.		
12.04.00	Initial charge of all the lubricants and fluids including one year topping up requirement.		
12.05.00	Paints and painting of all equipments as per approval of the Employer.		
12.06.00	Chemical cleaning of all equipment and systems after their erection shall be in Bidder's scope.		
12.07.00	Thermal insulation and removable metal cladding shall be provided for all the equipments, piping and piping support frames as required.		
12.08.00	Necessary blanking arrangements required to protect the valves and turbine internals and other auxiliaries during steam blowing shall be provided.		
12.09.00	Suitable HOT/Electric Monorail hoist cranes along with runway/monorails beams and approach ladders and/ or platform of adequate capacity to meet the need for erection, operation and maintenance.		
12.10.00	Operating platform around the deaerator, GSC, flash tanks, lube oil/ control oil tanks, HP/LP bypass valves, Emergency Stop Valves / Intercept valves, local platforms for various inaccessible valves and equipments etc. shall be in contractor's scope.		
13.00.00	TOOLS AND TACKLES One set of all special tools and tackles required for the installation, commissioning, testing, calibration, modification and maintenance of equipment(s)/ system shall be supplied. These tools and tackles shall not be used for erection/commissioning purposes and shall be in new condition, when handed over to the Employer. These tools and tackles shall be separately packed and brought to site. A list of all such special tools and tackles shall be submitted along with the offer.		
14.00.00	ERECTION MATERIALS		
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 		
15.00.00 16.00.00	All the erection materials and consumables like shims, welding rods, soldering and brazing alloys, insulating tapes, compounds, chemicals etc. required for the erection and commissioning work shall be included in the Bidder's scope of work. SPARES The offer shall cover all the mandatory spares, start-up spares, commissioning spares, consumable spares and others as specified in the specification. The list of mandatory spares is attached in this Part of the specification. Steam Turbine Generator & Auxiliaries and associated systems shall be designed for 40% Technical Minimum Load (TML); for meeting this mandatory requirement and ensuring the design life of Turbine including its auxiliaries, necessary changes in design to be made. Design changes to be considered shall include but not limited to the following: 1. Changes required in LP Turbine last stage and second last stage blades (as applicable) to take care of increased flow separation at 40% TML. 2. Bidder shall consider state of art design with respect to blade metallurgy and effective moisture separation methodology to avoid blade erosion & failures at 40% load continuous operation of Turbine. Bidder shall submit thermal stress analysis report of Turbine components at 40% TML operation. 3. Increased thermal stress in Turbine stages: To enable continuous operation of turbine at 40% load, Bidder shall take care of the increased stresses (due to ventilation) in turbine design and ensure that design life of turbine and its components is not reduced. Further, turbine and auxiliaries shall also be designed for complying the requirements related to flexibilization as mentioned in CEA (Flexible Operation of Coal based Thermal Power Generating Units) Regulations, 2023 in addition to the requirements specified else-where in the technical specifications.		
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SUB-SECTION–IIA-06

POWER CYCLE PIPING

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
1.02.00	Scope of Supply:			
1.02.01	The scope of supply for the piping systems identified above and / or as per schemes approved during detailed engineering shall comprises of but not be limited to the following:			
1.02.02	Pipes, pipe fittings, bends, Y-pieces, valves including safety valves, relief valves, instrument root valves & valve actuators, specialties like expansion joints, strainers, steam traps & orifice plates, stubs including thermo well & other instrumentation stubs, boss / half coupling, weldolet, plugs, flanges, caps, orifice assembly, hangers & supports including variable & constant spring hangers, restraints, anchors, snubbers, vibration dampers, etc. along with necessary auxiliary steel structures / beams / sections, steel insert plates, graphite / Teflon / Stainless steel plates, pipe / beam attachments like clamps, welding lugs etc., flash tanks, drip pan, weather hood for pipes crossing ceilings and walls and other accessories etc..			
1.02.03	The Contractor shall supply all standard and non-standard machined pieces / tube transition pieces as may be needed for the piping systems and for connection of these piping systems at terminal points, including those which are to be welded with dissimilar material of equipment nozzles, valves, specialties & piping.			
1.02.04	Supply and installation of creep measuring instrument on the piping operating in creep region viz. Main steam and Hot Reheat			
1.02.05	Supply & installation of thermal insulation and cladding along with all necessary accessories for the piping systems and equipment, tanks etc. in bidder's scope.			
1.02.06	Special accessories like floor stands, chain operator, extended spindle etc. as required for valve operation. Valve & specialties for which approach from existing floors are not possible for O&M, appropriate approach platforms with the access ladders for the same shall be provided.			
1.02.07	In case the steam to the turbine enters from the top casing, flange(s) shall be supplied for the piping connected to the steam inlet nozzle on turbine top casing. This is to facilitate dismantling of turbine top casing during maintenance without cutting the pipe. The material of flange shall be same or compatible with the material of connecting piping so that direct welding between pipe & flange can be done at site.			
1.02.08	Paints and primers for pipes, fittings, hangers & supports, valves, specialties, aux. steel structures etc. as specified elsewhere in this technical specification.			
1.02.09	All erection material such as bolts, nuts, washers, gaskets, electrodes, filler materials, welding gas, consumable inserts and backing rings, accessories and miscellaneous specialties including specialty bolts for fixing equipment/plates on concrete structure etc. required for the proper installation of piping systems.			
1.02.10	Complete temporary piping system including hangers & supports, valves, pipe spools for valves, control valves, flow nozzles & specialties, plugs, caps, blanking plates, pipe spools at terminal points for blanking of piping to carry out hydro test / steam blowing, temporary valve heads / valve blow down cover plate / flanges, blanking inserts, blow tools, target plates, pumps, tanks, strainers, hydraulic kits, instrumentation & control, gaskets, bolts & nuts, tools & tackles, special devices and any other accessories as required to complete the hydro testing, chemical cleaning (including chemicals) and steam blowing operation of piping systems as specified elsewhere in the technical specification in bidder's scope.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB SECTION-IIA-06 POWER CYCLE PIPING
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
1.02.11	All auxiliary steel structures (including structures in TG Building, CD bay, Boiler envelop etc.) required for providing proper supporting arrangement for the piping systems in bidder's scope.			
1.02.12	Providing all supporting arrangements including aux. steel structures, pipe trestles with foundation etc. required for Aux steam interconnection piping with existing stage shall be in bidder's scope.			
1.03.00	Scope of Services			
1.03.01	Complete design, engineering, etc. for the power cycle piping systems and other piping systems included in this specification shall be the responsibility of the Contractor. Employer's responsibility/ function in this connection shall be limited to review and approval of Bidder's design/ calculation, engineering, drawings, and documents. Bidder's scope of services for complete engineering of the power cycle piping systems shall include but not be limited to the following: Basic engineering as well as detailed engineering including static & dynamic analysis, hanger engineering and engineering of thermal insulation etc. for the power cycle piping systems. This also includes design and engineering of all temporary piping that are required for the pre-commissioning / commissioning activities of the power cycle piping system.			
1.03.02	Following drawing / documents shall be furnished by contractor for employer's review / record: (a.) For Employer's review & approval: (i) P&IDs, Composite piping layout drawings, design philosophy & design parameter selection for each piping system, Pressure drop calculation & flash tank sizing calculation (ii) System-wise or P&ID wise prepared pipe schedule, valve schedule, insulation schedule, hanger schedule and Piping isometric / fabrication isometric drawings for pipe size 65mm NB and above with BOM, (iii) painting schedule. Bidder shall submit all tabulated design calculations/ data (e.g. Pipe schedule, valve schedule, etc.), in both EXCEL format as well as in PDF format to enable Employer / its consultant for fast review /approval. (b.) For approval under information category: (i) Hanger / support arrangement drawing with BOM, (ii) Valve GA drawings (iii) Layout drawings for site routed piping (i.e. for pipe sizes below 65NB) along with BOM (and submission of the same to the employer / project manager before start of work) and (iv) System wise stress analysis / dynamic analysis report (including input) along with stress isometric drawing / sketch marked with node points. (c.) As-Built drawing for information & Records: (i) Piping fabrication isometric drawing (ii) composite piping layout drawing (iii) Hanger / Support arrangement drawing.			
1.03.03	It is the responsibility of the contractor to identify and obtain all necessary approvals from various Government agencies / board / statutory authorities / IBR (CBB, Delhi / CIB of the state in which the power plant is being installed) etc., as applicable for the material, design, manufacture, erection and testing of pipes, valves, fittings, specialties etc. and furnishing the same to employer. This includes furnishing all required documentation, certificates of manufacturing & testing in IBR formats, IBR fees, etc.			
1.03.04	Hydro static testing, steam blowing & chemical cleaning of piping systems, as specified elsewhere in the specification, after complete erection is to be carried out, which also includes supply, erection, making temporary closures, dismantling and removal of all temporary material / piping, equipment and materials from site, disposal of water / waste			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB SECTION-IIA-06 POWER CYCLE PIPING
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	water / effluent including providing of all facilities / equipment required for the same, clean up and reinstatement of the cleaned piping system.			
1.03.05	In case any localized modifications / re-routing / re-erection etc. is required for the piping systems / supporting arrangement after approval of the drawings or during erection, the same shall be carried out by the bidder / piping contractor under his scope with material in consultation with employer. Obtaining IBR approvals, if any required, for the modification work shall also be in the scope of the contractor.			
1.03.06	Providing all other necessary services for making the piping systems complete in bidder's scope.			
1.03.07	In order to ensure that all supporting elements, anchor and restraints etc. have been installed and adjusted in accordance with design documentation, the Contractor shall inspect and log the hanger readings for the hangers associated with the power cycle piping system as follows: (a.) After hydrostatic test with the piping in the cold position, with all travel stops removed, with the pipe completely insulated and in all respect ready for startup. (b.) Piping in hot position, with the unit operating at rated parameters. (c.) Piping in hot position (rated parameter condition) after six (6) months of operation. (d.) Piping in cold position during the first complete shutdown after at least six (6) months of operation. (e.) After steam blowing, in case steam blowing is applicable for the line.			
1.03.08	At the time of each inspection as mentioned above at 1.03.07 above, the Contractor will determine the necessity for revision, adjustment or replacement of pipe supporting elements, restraints, and anchors. Any changes proposed shall be subject to the concurrence of the Employer. The changes shall be incorporated by the Bidder after Employer's concurrence. A written record shall be furnished to the Employer.			
1.03.09	Performing all tests including all shop tests as required by the applicable codes, ANSI Standards, IBR and other standards enumerated or specified and implementing all quality control procedures as specified herein including provision of testing equipment, stress relieving equipment, radiography equipment and any other equipment necessary to meet the requirements of the specification.			
1.03.10	Certified copies of test reports for all tests and examinations specified elsewhere in the technical specification shall be furnished to Employer.			
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SUB-SECTION–IIA-07

LOW PRESSURE PIPING

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
1.03.00	the system / equipment complete shall also be furnished and treated as if included in the specification unless otherwise specifically excluded. Bidder's scope of supply & works shall include but not be limited to the following: a) Pipes, headers and manifolds, bends, elbows, returns, tees, laterals, crosses, reducers/ expanders, caps and closures, couplings, plugs, sleeves, and saddles, stubs and bosses, unions and other similar fittings, flanges, gaskets, fasteners and sealants, ring joints, backing rings, all types of valves including drain/ vent/ air release valves, 3-way valves(where applicable) with test connection for instruments/ manifolds etc. actuators, specialties, orifices, flow nozzles, etc. as per finalized single line flow diagrams and layout drawings/ isometric drawings. b) Complete assemblies of hangers, supports anchor, guides, restraints, etc. including welded attachments, clamps, devices tie-rods, turn-buckles, springs and spring cages, shoes, rollers, trapezes etc. c) Weather hoods for pipes crossing ceilings and walls. d) Instrument tapping and stub connections, root valves, 3-way valves (where applicable) with test connections, drains and vent valves & expanders / reducers as required and instruments as indicated else where for instruments supplied by the Contractor. e) Drain funnels, drip pans, moisture traps etc. wherever required shall be provided. f) Instrument tapping, stub connections, root valves and instrument tubing up to root valves for instruments supplied by the Employer for onward connections by the Employer. g) All supporting attachments like plates, saddles, stools, shoes, base plate, saddle plates, angles, channels, I-beams, trapeze, cantilevers, brackets, sways, braces, nuts, bolts, cleats, clamps, needed to complete the erection of piping system covered under this specification. Anchor bolts, bed & foundation plates, pipe sleeves and Nuts to be embedded in concrete for piping where ever indicated in the drawing. All grouting and chipping work (including supply of cement, sand and stone chips) for equipment foundations, pipe supporting etc. Reinforced concrete valve chambers wherever required for underground piping. h) Surface preparation, priming and painting of all non-insulated above ground piping and equipment except galvanized steel piping & surfaces, stainless steel piping & surfaces, and gun metal surfaces. Paints and varnishes, primers, thinners etc. as required for anti-corrosive protection of piping & equipment above ground. i) Bidder shall provide anti-corrosive protection anticorrosive tape or coating wrapping on the external surfaces of pipes to all directly buried piping including galvanized carbon steel piping. j) Excavation, preparation of bed, backfilling with compaction of soil and removal of			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB SECTION- IIA-07 LOW PRESSURE PIPING	PAGE 2 OF 4

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 		
	extra-earth to designated places in case of pipes to be buried. k) Bidder shall also design, supply, fabricate, erect, set and commission all hangers, tie-rods, turn-buckles, supports, guides, restraints, anchors, etc. as required for the, piping system. This includes the provision of all associated steel work including brackets, cradle supports, duck foots, channels, angles, etc. It is Bidder's responsibility to estimate these requirements and include them in their offer price. Whenever, straight run of the yard pipes are more than 300 meters, flexibility analysis shall be conducted by the contractor to identify the requirement of loops, type of supports etc. l) In covered concrete trenches bidder shall supply necessary supporting materials such as stools, saddles, base plates, clamps, U-bolts, angles, clips etc. m) Bidder shall supply all necessary drains and vents with drain & vent valves including anti-flash funnels and moisture traps for compressed air system as required for the safe and effective draining-venting of the piping systems based on the approved flow scheme / single line diagram. It is bidder's responsibility to identify the requirements of drains, vents, and supply the necessary pipe work, fittings, hangers and supports etc. for the same. n) Bidder shall supply and install necessary matching pieces as may be needed for connection of piping systems with equipment terminals, valves and specialties. o) Bidder shall erect all instrument impulse piping and fittings from the tap-off point of the last root valve including the root valve and instruments. p) Bidder shall perform necessary internal machining of pipe for installing orifices, flow nozzles, straightening vanes etc. q) The Bidder shall prepare the flow diagrams, detailed dimensional piping layout/ Isometric/ fabrication/ as built drawings of all the systems along with Cross sectional drawings, showing all supports and equipment as required. r) In addition to submission of drawings as stipulated above bidder shall also furnish the data/ documents with respect to following: 1) Thickness calculation of large diameter buried pipes as per AWWA-M-11. 2) System design calculation of Primary closed-circuit ECW and secondary circuit ACW system for flow & pressure balancing. 3) Design calculations for condensate storage tank and Drinking water tank. 4) Static Analysis for Long (more than 300-meter straight run) above ground piping wherever required. s) Bidder's scope of supply for fabrication, erection, cleaning, testing and commissioning of the piping systems installed by him shall include the following: - All welding consumables like welding electrodes, filler rods and wires; gases like oxygen, acetylenes, argon, carbon-dioxide, propane, backing rings etc. Films for radiographic examination of welds. X-ray and Gamma -ray equipment including isotopes, dye penetrants, and other required non-destructive testing materials and equipment (all to be taken back by the Bidder after completion of work).		
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES				
1.04.00	All heating and stress relieving equipment, thermocouples asbestos blankets, cables, temperature recorders, charts heat sensitive chalks and crayons etc. (All to be taken back by bidder after completion of work).				
	All machinery, equipment tools and tackles as required for transportation handling, fabrication and erection (All to be taken back by Bidder after completion of work).				
	All equipment/ materials as required for cleaning, flushing, blowing out and hydro testing of the piping systems; these shall include but not be limited to pumps and compressors with prime movers, instruments, pipe work with supports, valves, strainers and other specialties, blanks, plugs, spool pieces, dummy plates, electrical accessories, etc. (All to be taken back by Bidder after completion of work).				
	All scaffolding materials and false work (To be taken back by Bidder after completion of work).				
	The Bidder shall provide Services of erection superintendent and foremen, fitters and riggers, welders, transport and crane operators and other skilled and unskilled labour.				
	The design engineering and providing all temporary pipe work as required for erection, cleaning, flushing, blowing out, testing, and commissioning of the piping system is the responsibility of the Bidder.				
	The Bidder's scope shall include design, supply of required structural steel (except those which are specifically excluded), their fabrication and erection wherever required.				
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SUB-SECTION–IIA-08

WATER TREATMENT PLANT

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	MECHANICAL SYSTEMS & EQUIPMENT			
1.00.00	GENERAL			
1.00.01	The scope of the water Treatment plant includes Design, Engineering, Supply, Construction, Erection, Testing & Commissioning of complete Water treatment System including all Civil, Electrical and Control & Instrumentation works. Broad scope of work described below shall be read in conjunction with the Data Sheets, Electrical works, Control & Instrumentation works and Civil works, various subsections of Part-B of this Technical Specification and relevant Tender drawings. The broad scope of Water Treatment Plant includes but not limited to the following systems and equipment. The items/equipment though not specifically mentioned but are needed to make the system/plant complete shall also be furnished, erected, and commissioned unless otherwise specifically excluded.			
1.00.02	The analysis of Raw water to be adopted for design of water treatment plant is enclosed elsewhere in the technical specification. Bidder to decide the design filter water analysis for RO/DM based on the Pre-treatment.			
1.01.00	WATER PRE-TREATMENT PLANT			
1.01.01	PT- CW System a) Raw water pipe (CS) up to the aerator through a set of Control Valve & Isolation Valves for Control Valves. b) One (1) number Aerator and one (1) number stilling chamber of RCC Construction of required capacity along with isolation gates at the inlet to the inlet channels for PT-CW system clarifier. c) Two (2) numbers of inlet channels with flow measuring element in each channel (parshall flume) of RCC Construction with required isolation gates. d) One (1) number bypass channel of RCC Construction to by-pass clarifier(s) with required isolation gate(s). e) Two (2) numbers of reactor type clarifiers of RCC Construction each of required capacity including associated equipment and drives for PT-CW system. f) One (1) number Clarified Water Storage Tank/Clarified water distribution chamber of RCC Construction with required isolation valves/gates. g) Outlet channels of RCC Construction from Clarifiers up to the Clarified Water Storage Tank/Clarified water distribution chamber.			
1.01.02	Chemical House Equipment a) Two (2) numbers of electrically operated monorail hoists for transporting the chemicals from the ground floor to the respective preparation tanks and required number of weighing scales. b) Lime preparation & dosing system consisting of required number of RCC lime slaking tanks, RCC lime solution preparation tanks, agitators, lime slurry transfer pumps, lime solution dosing pumps complete with all necessary piping, fittings, feed piping, water supply piping, overflow and drain piping, sampling connections etc. c) Alum Solution preparation & dosing system consisting of required number of RCC Alum solution preparation tanks, agitators, alum solution dosing pumps complete with all necessary piping, fittings, feed piping, water supply piping, overflow and drain piping, sampling connections etc.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB SECTION- IIA-08 WATER TREATMENT PLANT	PAGE 1 OF 6

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
1.02.00	d)PAC dosing system consisting of required number of tanks, agitators, dosing pumps complete with all necessary piping, fittings, feed piping, water supply piping, overflow and drain piping, sampling connections etc. e)PE dosing system consisting of required number of tanks, agitators, dosing pumps complete with all necessary piping, fittings, feed piping, water supply piping, overflow and drain piping, sampling connections etc. f)One (1) number RCC overhead filtered water storage tank of required capacity, on top of chemical house with water supply line from the discharge of filtered water pumps, associated valves, piping, fittings etc. g)Mechanical Ventilation system for complete chemical house building covering chemical storage area, chemical preparation area, toilets etc.			
	CHLORINATION PLANT CW Chlorination a)Required numbers of Chlorine tonners, Evaporators, chlorinators, ejectors, Chlorine water booster pumps its drives, required piping, valves etc. from pumps up to fore bay and pump sumps/CT basin of CW pump house, diffusers for dosing chlorine, associated valves etc. b)Required Safety and supervisory Equipment such as Gas masks, Chlorine leak detectors and emergency kits. c)Required numbers of hoist(s) for handling Chlorine ton-containers in the chlorination plant building. d)Chlorine Leak absorption system (for CW & PT Systems) consisting of required number of hoods over the tonne containers, ducting arrangement, absorption tank, alkali recirculation pumps, blowers, piping, valves, chlorine leak detectors etc. as detailed out in Data sheets and Part-B of technical specification. PT Chlorination a)Required numbers of Chlorine tonners, chlorinators, ejectors, Chlorine water booster pumps, its drives, required piping, valves etc. from pumps up to the aerators & stilling chamber of clarifier, diffusers for dosing chlorine, associated valves, Safety and supervisory Equipment such as Gas masks, Chlorine leak detectors and emergency kits etc. Capacity of each of the equipment/items shall be as mentioned in the data sheets.			
	1.03.00LIQUID EFFLUENT TREATMENT PLANT 1.03.01PT- Plant Clarifier Sludge Disposal System a)One (1) number RCC sludge pit (2 sections) to collect sludge from all the clarifiers of PT-CW system, & Tube settlers/Lamella clarifiers (if applicable) of required capacity, sludge piping from clarifiers up to the pit, associated valves etc. b)Sludge disposal pumps of required capacity, its drives, associated valves, piping etc. c)Air blowers of oil free type of required capacity, its drives and associated accessories, air (Galvanised CS) piping from blowers to each section of the sludge pit for air scouring of sludge.			
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES				
1.03.03	Waste Service Water Treatment System				
	a) One (1) number RCC waste service water sump (WSWS) (2 sections) for collection of various wastewaters of the plant. b) Facility to collect free oil from these sumps to a MS oil drum of 200 litre capacity with the help of Drum type (2 Nos.) oil skimmers, Centrifuge (2x100%) of required capacity. c) Waste service water transfer pumps to transfer the waste service water from the sump to the tube settlers/lamella clarifiers, its drives associated piping (CS) & valves etc. d) Two (2) number tube settlers/lamella clarifiers of RCC Construction along with RCC flash mixers and RCC flocculation chambers. Both the flash mixers and flocculation chambers shall be provided with agitators (SS-316 construction). e) The capacity of waste service water sump and tube settlers/lamella clarifiers shall meet the requirement of waste service water & other wastewater collected from various plant areas other than coal slurry settling pond (CSSP). f) Sludge Pipeline (Cast Iron) with associated valves from the tube settlers/ lamella clarifiers by gravity flow up to the common sludge pit. g) Waste Service water Treatment System to be designed considering all waste water of stage-II and stage-I. Necessary connection of waste water from stage-I to Stage-II AHP & ETP including pumping, piping and valves etc. as required are in the scope of bidder. Bidder to design suitable treatment system for Stage-I waste water as per the waste water quality and re-use in stage-II facilities.				
1.03.04	Coal Handling Plant Run-Off Water Treatment System				
	a) Inlet connection channel from drain in Coal Stockyard area up to the Coal Slurry Settling (CSSP) Pond to transfer wastewater laden with coal dust to the CSSP. b) Coal Slurry Settling (CSSP) Ponds of RCC Construction each of specified size/capacity c) Coagulant-aid tanks of MS rubber lined construction. d) One (1) number decanted water sump of RCC Construction (2 sections) to receive decanted water from above settling ponds of required size/capacity and discharge channel from the CSSP to decanted water sump. e) Required number of Coal Decanted Water Pumps and Clarifier feed pumps (CSSP area) of required capacity, its drives, associated piping (CS), valves etc. f) Two (2) numbers portable submersible type pumps of capacity 100 m³/hr, 20 MWC for draining the water from the CSSPs, with hose pipes etc. g) One (1) number stilling chamber, One (1) numbers of reactor clarifiers of RCC construction, RCC channels, distribution chamber etc. of required capacity to receive excess storm water from settling ponds, required number of pumps, piping, valves etc. to discharge treated supernatant water to CW channel. Provision of diverting the treated supernatant water to storm water drain & WSWS shall also be provided. Necessary lime dosing facility for neutralization like preparation tanks, dosing tanks, pumps (2x100%), piping etc.				
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES					
2.00.00	h)	Lime preparation & dosing system consisting of required number of RCC lime slaking tanks, RCC lime solution preparation tanks, agitators, lime slurry transfer pumps, lime solution dosing pumps complete with all necessary piping, fittings, feed piping, water supply piping, overflow and drain piping, sampling connections etc.				
	i)	Alum Solution preparation & dosing system consisting of required number of RCC Alum solution preparation tanks, agitators, alum solution dosing pumps complete with all necessary piping, fittings, feed piping, water supply piping, overflow and drain piping, sampling connections etc.				
	j)	Suitable synthetic flocculent dosing shall also be provided to increase the settling rate suspended solids. Flocculent preparation & dosing system consisting of required number of preparation tanks, agitators, dosing pumps complete with all necessary piping, fittings, feed piping, water supply piping, overflow and drain piping, sampling connections etc. shall be provided.				
	k)	Chemical storage and dosing area for Coal Handling Plant Run-Off Water Treatment System shall be separately provided under shed. Chemical storage shall be designed to meet minimum 15 days requirement.				
	l)	The sludge removed from underflow of the clarifier shall be dewatered using the Filter press for dried coal particles to be reused. Required numbers of filter presses, necessary pumps, piping, valves etc. shall be provided.				
	DEMINERALISATION (DM) PLANT -ION EXCHANGE BASED DM PLANT					
	a)	One (1) No. Filtered Water transfer Pump of required capacity, its drives & associated piping from existing filtered water pump house (in PT area) to DM Plant.				
	b)	One (1) number of Activated carbon filter with all accessories.				
	c)	One (1) number of Cation exchanger unit (both weak and strong) with all accessories.				
	d)	One (1) number of Degasser system comprising of Degasser Tower, storage tank, Air Blowers [two (2) numbers] & its drives and required number of Degassed water transfer pump & its drives with all accessories.				
	e)	One (1) number of Anion exchanger unit (both weak and strong) with all accessories.				
	f)	One (1) number of Mixed bed unit along with Two (2) numbers air blower with its drives and all accessories.				
	g)	Two numbers of safety shower units and adequate number of Eye- fountains to protect against any chemical hazard.				
	h)	One (1) numbers of DM water storage tank with all accessories.				
	i)	Neutralizing waste disposal system - All DM plant Effluent drains (except backwash water from AC filters, rinse waste water and fast/final rinse waste water of Ion-Exchangers unit) shall be connected to the Existing Neutralization Pits. Backwash water from AC filters, rinse waste water and fast/final rinse waste water of Ion-Exchangers unit shall be connected to the existing backwash sump.				
	j)	First fill of filter media for AC filter.				
	k)	First fill of resins for all Ion Exchange unit.				
	SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB SECTION- IIA-08 WATER TREATMENT PLANT	PAGE 4 OF 6

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES				
3.03.00	f) One (1) number Clarified Water Storage Tank/Clarified water distribution chamber of RCC Construction with required isolation valves/gates. g) Outlet channels of RCC Construction from Clarifiers up to the Clarified Water Storage Tank/Clarified water distribution chamber. CHEMICAL STORAGE & DOSING SYSTEM a) Complete system for coagulant handling, preparation and dosing system comprising the necessary bulk coagulant storage tanks, required structures, operating platforms, ladders etc., Coagulant unloading cum transfer pumps, its drives, required suction & discharge piping, valves, fittings etc., required numbers of Coagulant preparation tanks & its accessories, required numbers of Coagulant dosing pumps, its drives, piping, valves, fittings etc., dosing piping from the pumps up to the clarifiers. b) Complete system for coagulant aid handling, preparation and dosing system comprising the necessary coagulant aid preparation tanks, required structures, operating platforms, ladders etc., required numbers of Coagulant aid dosing pumps, its drives, piping, valves, fittings etc., dosing piping from the pumps up to the clarifiers as the case may be and as required for the process. c) Required platform, ladders etc. to facilitate approach to various tanks, manholes/hand-holes, sight-glass, operation & maintenance of valves, instruments etc. shall be provided. d) Required number emergency safety shower with eye wash units in the Chemical Storage Handling facility at each location such as Acid/Alkali Storage area, Chemical storage area, Chlorination plant area and Chemical preparation & doing equipment area. e) All Interconnecting piping, valves, fittings etc.				
	3.04.00	Drainage pumps along with all accessories.			
	3.05.00	Mobile cranes of suitable capacity confirming to relevant IS code are to be provided as under.			
		a) PT Plant & DM Plant Area: 2 Nos. mobile cranes			
		b) The capacity of mobile cranes shall be calculated based on the maximum load to be lifted with 25% margin.			
	Note: Proper approach road for movement to pump house/shed is to be made.				
3.06.00	Any other equipment envisaged by the bidder to meet the system re				
4.06.00	In case the pumping system including drives, blowers, etc. are located outside the building(s), the complete system should be kept under covered shed with suitable handling arrangement and clear headroom.				
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SUB-SECTION–IIA-09

CW SYSTEM

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
1.00.0	CW SYSTEM The scope of the CW System includes Design, Engineering, Supply, Construction, Erection, Testing & Commissioning of CW pumps, Cooling Tower, ECW System, CW chemical treatment system and Auxiliary water pumps including Civil, Electrical and Control & Instrumentation works. Broad scope of work described below shall be read in conjunction with the Data Sheets, Electrical works, Control & Instrumentation works and Civil works, various subsections of Part-B of this Technical Specification and relevant Tender drawings. The broad scope of CW system includes but not limited to the following systems and equipment. The items/equipment though not specifically mentioned but are needed to make the system/plant complete shall also be furnished, erected, and commissioned unless otherwise specifically excluded.			
1.01.00	CW Pumps			
1.01.01	Complete CW Pumping System consisting of following: 1) Vertical wet pit type/ concrete volute (CV) type/ Metallic Volute (MV) type circulating water (CW) pumps with motor drives and all required accessories – 2 x 50% minimum capacity & one (01) common standby and of suitable head. The pumps shall be non-pull out type. Vertical Wet pit pumps shall have above floor discharge and forced water lubrication system. 2) One (1) number of Pump Discharge Butterfly valve of required size with all accessories and Electro-hydraulically operated actuators (to be installed) for each CW pump. 3) Two (2) numbers of Duct Interconnection Butterfly valves with all accessories, counter flanges, and Electric actuators for interconnecting the CW ducts (as applicable). 4) One (1) number of rubber expansion joint to suit CW pump discharge pipe with counter flanges, accessories including control rod assemblies, bolts, nuts, washers, gaskets for each CW pump. 5) Butterfly Valve (s) with all accessories in the re-circulation pipeline, with actuators. 6) All Associated piping and valves etc. as applicable for main CW system. 7) One (1) number 60 Tons (minimum) capacity EOT crane for CW pump house for handling of pumps, drives, discharge Valves, rubber expansion joint etc. during erection, operation and maintenance & one (1) number 5 Tons (minimum) capacity auxiliary monorail electric hoist for handling trash rack & stop log gate. 8) Carrying out transient analysis. 9) Carrying out physical sump model study and Conductance of computer based model study using Computational Fluid Dynamics (CFD) techniques, utilizing "Star CD", Fluent or CFX CFD modeling code for the CW sump including forebay, transition zone, CW channel from cooling tower to CW pump house. 10) Complete lubrication system consisting of 2x100% horizontal centrifugal type lubricating water pumps & its drives for each CW pump along with its all required accessories, piping, associated valves, strainer in the discharge of lube water pumps etc. and instrumentation & control system. 11) Sealing water system (applicable for CV & MV type configuration only) consisting of 2x100% capacity for each CW pump with its drives, associated piping, valves, fittings, filters, specialties, accessories & instrumentation, and control. 12) Two (02) numbers of drainage pumps for each pit (applicable for CV & MV type pumps configuration only) with its drives, associated piping, valves, fittings, filters, specialties, accessories & instrumentation, and control.			
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
1.02.00	13)	Minimum ten(10) nos of Automatic air release valves (ARVs) of 200 mm NB (minimum) size along with its isolation valves for CW system. Necessary stub connection in CW duct for mounting ARVs.		
	Cooling Tower (CT) System			
	Cooling Towers –one (1) no/unit. Type of tower indicated elsewhere in the spec.			
	Cooling Towers shall be as per the system requirements and the specification requirements as specified in Part-B.			
1.03.00	ECW System			
	Closed circuit type ECW system shall be provided with demineralized (DM) water in the primary circuit and water tapped off from CW system upstream of condenser in the secondary circuit. ECW system shall be provided Unit-wise and shall cater to cooling water requirements of TG, SG & its auxiliaries including station auxiliaries. Primary cooling circuits for auxiliaries of TG and SG shall be independent. The secondary cooling water circuit shall, however, be common for both the primary cooling systems. The system shall be comprising of following for each unit:			
	1)	3X50% for TG and 2 X100% or 3x50% for SG Primary (DM) cooling water pumps of required capacity and head.		
	2)	3X50% common Secondary (Auxiliary) cooling water pumps of required capacity and head with 2 X 100% self-cleaning strainers in discharge header		
	3)	3 X 50% for TG and 2 X 100% or 3x50% for SG Plate Heat Exchangers.		
	4)	ECW (DM water) tanks, Alkali dosing tanks, associated piping & valves and other accessories as specified in tender and/or required to complete the system.		
1.04.0	CW Chemical Treatment			
	1)	Complete CW Treatment System including acid handling, storage and dosing system, Chemical measuring tanks & dosing system for HEDP & PBTC (common), Polymeric dispersant, Bio-dispersant, Corrosion inhibitor (Zn) including monitoring equipment like Deposit monitor/fouling monitor, bio-fouling monitor, Corrosion test coupons with test racks, online instant corrosion rate monitor, online ORP monitor, analysis kits with reagents etc., online pH meter and conductivity meter etc. required for smooth operation of treatment program.		
	2)	Chemical day tanks (2x100%) for each of HEDP & PBTC (common), Polymeric dispersant, Bio-dispersant, Corrosion inhibitor (Zn) & dosing System consisting of dosing pumps (2X100% for each chemical), piping, valves etc. Capacity of each tank shall be adequate for minimum 1-day requirement (minimum capacity of each tank 500 liters).		
	3)	Two (2) numbers of safety shower units and adequate number of eye fountains to protect against any chemical hazard.		
	4)	Three (3) Nos acid storage tank (H ₂ SO ₄) of capacity adequate for minimum 15 days requirement (minimum capacity of each tank 50 cum).		
	5)	Two (2) nos (2x100%) acid dilution water pumps of suitable capacity.		
	6)	Monitoring equipment like depositor monitor/fouling monitor (01), bio-fouling monitor (01), Corrosion test coupons with test racks (6 nos.), on-line instant corrosion rate monitor (01) shall be provided.		
	7)	All interconnecting piping, fittings, valves etc. for the complete plant as per system requirement and as specified.		
	8)	Supply of all chemicals and O&M for complete CW Treatment System for one (1) year operation after PG test including first fill for all the units, etc. for the complete plant as per system requirement and as specified.		
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
1.05.00	Auxiliary Water Pumps			
	1) Raw water system to supply water to Water Pre-Treatment (PT) Plant and Ash water makeup including 3x50% Raw water PT pumps and 2x 100% Raw water Ash pumps. Both the systems Raw water (PT) and Raw water (Ash) should be designed with separate Forced water lubrication. 2) One number EOT crane (10 tons minimum capacity) shall be for equipment handling and 2 tons minimum capacity electric hoist for handling stoplog gates & trash racks in Raw water pump house. 3) Three (3) Nos.(3x50%) Make-up (clarified water) water system to CW System (if applicable). 4) 2x100% Make-up water system to Air-conditioning 5) 2x100% FGD Gypsum wash system. 6) CW Blowdown system 7) Service water system including 3x50% Service water pumps. 8) DM Cycle Make-up water system- Pumps (01 for each unit + common stand-by) and associated piping. (provision for interconnection with existing stage-I header to be kept) 9) Boiler Fill System- 1 x 100% Boiler Fill Pumps and associated piping and interconnection with existing header of boiler fill pumps of stage-I. 10) 2 x 100% Air preheater wash water pumps. 11) Two (02x100%) Condensate Transfer Pumps. 12) Butterfly valves, non-return valves at the discharge, recirculation pipe with Recirculation Butterfly valves for the above pumps. 13) All associated valves, piping, fittings etc. to complete the system. 14) Handling facilities such as EOT cranes/monorail hoists. 15) Various Sump Pumps, Drainage Pumps and Submersible Pumps. 16) All pumps shall be as per system requirement and as specified in design criteria and Part-B of the specification and head to suit system requirement. 17) Provision of interconnection with interconnecting Butterfly valve to be kept in raw water pumps (PT) header of stage-II with stage-I.			
2.00.00	General/ Others			
	1) Supply and application of external coating & wrapping for all the buried pipes. 2) Supply and application of painting of all the above ground pipes and other equipment's. 3) For buried pipes, excavation, laying, erection & backfilling shall also be carried out by the bidder. including thrust blocks, pedestals & hume pipes, wherever applicable. 4) Any additional equipment required to make the system complete and all miscellaneous items that are necessary to ensure safe and reliable operation of the plant during start-up, continuous running, shut-down, and emergency conditions, even if these are not explicitly mentioned in this specification. 5) The CW system shall be as per the system requirements and the specification requirements as specified in Part-B & elsewhere in specifications.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB SECTION IIA-09 CW SYSTEM	PAGE 3 OF 3



SUB-SECTION–IIA-10

PLANT UTILITY

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES			
1.00.00	AIR CONDITIONING SYSTEM			
	a)	General	Complete air conditioning system consisting of water cooled chilling units, condensing units, chilled water pumps & drives, condenser water pumps & drives, piping, valves & fittings, cooling towers, air handling units, VFD drives for motors (wherever applicable), hi-wall / cassette split air conditioners, fresh air fans, air distribution system (ducting, filters, isolation/volume control dampers, motorized fire dampers, diffusers, grills, VAV box as applicable, etc.) along with all electrical equipment and instrumentation as detailed out in Part-B of Section-VI.	
	b)	Centralized air-conditioning system for main plant TG building	There shall be one (1) central chilled water type air-conditioning plant comprising of screw chilling units, chilled water pumps, condenser water pumps, AHUs, cooling towers, etc. to cater to the A/C requirement of the areas identified for main plant areas like common control rooms, offsite control room, control equipment rooms, UPS/Battery charger rooms, static excitation control rooms (if applicable), SWAS room, water analysis lab, CEP VFD room, etc.	
	c)	Centralized air-conditioning system for Ash handling control room, HCSD VFD room, ESP control room buildings and FGD control room building	There shall be one (1) central, water cooled chilled water type air-conditioning plant comprising of screw chilling units, chilled water pumps, condenser water pumps, AHUs, cooling towers, etc. to cater the A/C requirement of the areas identified for Ash handling control room, HCSD VFD room, FGD control room, ESP control rooms, CER, etc.	
	d)	Air-conditioning system for Water System Control Building	Air cooled condensing units (D-X type) mainly comprising scroll compressor, drive unit, condenser, AHUs, interconnected refrigerant piping, controls, instruments, base frame, etc. to cater to the A/C requirement of the CER, control room, etc.	
	e)	Air-conditioning system for CHP Control Building	Air cooled condensing units (D-X type) mainly comprising scroll compressor, drive unit, condenser, AHUs, interconnected refrigerant piping, controls, instruments, base frame, etc.	
	f)	Air-conditioning system for switchyard (AIS Control Building)	Air cooled condensing units (D-X type) mainly comprising scroll compressor, drive unit, condenser, AHUs, interconnected refrigerant piping, controls, instruments, base frame, etc.	
	g)	Air-conditioning system for simulator building	Air cooled condensing units (D-X type) mainly comprising scroll compressor, drive unit, condenser, AHUs, interconnected refrigerant piping, controls, instruments, base frame, etc.	
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-A-10 PLANT UTILITIES	PAGE 1 OF 12

CLAUSE NO.	 SCOPE OF SUPPLY AND SERVICES			
2.00.00	h) Air-conditioning system for training center Air cooled condensing units (D-X type) mainly comprising scroll compressor, drive unit, condenser, AHUs, interconnected refrigerant piping, controls, instruments, base frame, etc. i) Packaged/Split air-conditioners for various auxiliary control rooms/RIO rooms/VFD rooms (including Wagon Tippler CR, Stacker reclaiming cabin, stacker reclaiming control equipment cabin, Biomass unloading cabin etc.) and office areas of offsite buildings as detailed out in Part-B of Technical Specification. j) Apart from the above, any area/building which are in the scope of the Bidder and require air conditioning, those areas/buildings shall be provided with air conditioning system, as detailed out in Part-B of Technical Specification. k) Supply of mandatory spares as specified. l) Any additional items which may not be specifically stated in the specifications but are required for completeness of the system shall be supplied by the Contractor. m) For air conditioning system, the Bidder shall provide all Instrumentation systems, accessories and associated equipment, which are included in Bidder's scope, in a fully operational condition. The Bidder shall also provide all material, equipment and services which may not be specifically stated in the specifications but are required for completeness of the equipment/systems furnished by the Contractor and for meeting the intent and requirements of these specifications. n) Control system of air-conditioning system is indicated in Sub-Section-IIC, Control & Instrumentation, Scope of Supply & Services, Part-A of Technical Specifications.			
	VENTILATION SYSTEM a) General Complete Ventilation system consisting of modular type air washer units, supply air fans, roof extractor fans, exhaust air fans, louvers, filters, ducting, diffusers, piping, instrumentation etc., for all the buildings which are in the scope of the Bidder, as detailed out in Part-B of technical specification. b) Turbine hall building and associated areas i) Minimum ten (10) nos. of air washer units (of metallic construction-modular type) each of minimum capacity 1,00,000 m³/hr, with all accessories, 1 no. DIDW centrifugal fan, 1 no. circulating water pump, etc. as detailed out in technical specification shall be provided for each unit. ii) Minimum one (1) no. of air washer unit (of metallic construction- modular type) of minimum capacity 50,000 m³/hr, with all accessories, 1 no. DIDW centrifugal fan, 1 no. circulating water pump, etc. as detailed out in technical specification shall be provided for boiler MCC of each unit.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-A-10 PLANT UTILITIES
		PAGE 2 OF 12		

CLAUSE NO.	 SCOPE OF SUPPLY AND SERVICES		
	iii) Ventilation of turbine hall is further assisted by means of roof extractor located suitably at the roof of TG hall building. The number and capacity of these roof extractor shall be selected in such a way that, it extracts approx. 60% of total discharge of air washer units. This will maintain a positive pressure within turbine hall and thus stop ingress of dusty outside air within the building. c) E.S.P. Control Room Building (Non-A/C areas) Minimum One (1) no. of Unitary Air Filtration (UAF) unit (of metallic construction-modular type) of minimum capacity 75,000 m³/hr, with all accessories, 1 No. DIDW centrifugal fan, 1 No. circulating water pump, etc. as detailed out in technical specification shall be provided for each unit. d) FGD Control Room Building (Non-A/C areas) Minimum One (1) no. of Unitary Air Filtration (UAF) unit (of metallic construction-modular type) of minimum capacity 75,000 m³/hr, with all accessories, 1 No. DIDW centrifugal fan, 1 No. circulating water pump, etc. as detailed out in technical specification shall be provided. Note: If ESP & FGD control room buildings are provided in a common building(s), evaporative ventilation system (UAF system) shall be provided for non-A/C areas (MCC/Switchgear/Cable Vault, etc.) of combined ESP & FGD control room building(s) accordingly. Further, evaporative ventilation system (UAF system) shall also be provided for non-A/C areas (MCC/Switchgear/Cable Vault, etc.) pertaining to FGD system in any other separate/common electrical/ control building(s). e) Miscellaneous areas: All other areas like compressor house, ash silo utility building, transport air compressor house, conveying air compressor house, Mill Reject Conveyors Tunnel (if applicable), all pump houses, MCC/switchgear rooms, Electrical & C&I battery rooms, AIS control room building, water system control building, workshops, stores, etc. covered under Bidder's scope and shall be ventilated by a combination of 'supply air fans & roof exhausters fans' or 'supply air fans & exhaust fans' or 'supply air fans & back draft dampers' or 'fresh air in-take louvers & exhaust air fans'. For ventilation of battery rooms and oil rooms, flame proof motor shall be used. Further, toilets shall be provided with propeller type exhaust air fans. f) Apart from the above, any area/building which are in the scope of the bidder and require ventilation, those areas/buildings shall be provided with ventilation system, as detailed out in Part-B of Technical Specification. g) Supply of Mandatory spares as specified. h) Any additional items which may not be specifically stated in the specifications but are required for completeness of the system shall be supplied by the Contractor.		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-A-10 PLANT UTILITIES	PAGE 3 OF 12

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES				
3.00.00	i) For ventilation system, the Bidder shall provide all instrumentation systems, accessories and associated equipment, which are included in Bidder's scope, in a fully operational condition. The Contractor shall also provide all material, equipment and services which may not be specifically stated in the specifications but are required for completeness of the equipment/systems furnished by the Contractor and for meeting the intent and requirements of these specifications. h) Control system of ventilation system is indicated in Sub-section IIC, Control & Instrumentation, Scope of Supply & Services, Part-A of Technical Specifications.				
	COMPRESSED AIR SYSTEM a) Three (03) numbers (2 working+ 1 standby) oil free, rotary screw/centrifugal type air compressors for instrument air duty for the complete plant each of adequate capacity & adequate pressure, with their motor drives and other accessories. b) Three (03) numbers (2 working+ 1 standby) Air Drying Plants (one for each instrument air compressor) of minimum capacity same as instrument air compressor with all interconnecting piping, valves, fittings, etc. c) Two (02) numbers (all working) oil free, rotary screw/centrifugal type air compressors for service air duty for the complete plant each of adequate capacity & adequate pressure, with their drives and other accessories. d) One number of air receiver of minimum capacity 10 m³ at the discharge of each air compressor (Total: 05 numbers). e) One number unit air receiver of minimum capacity 10 m³ for each unit to be located in TG building. (Total: 01 numbers). f) One number unit air receiver of minimum capacity 10 m³ for each unit to be located near ESP Buffer Hopper Area for Ash Handling System. (Total: 01 numbers). g) One number of air receiver of minimum capacity 10 m³ for Fly ash storage Silo area and Ash classification system to be located near Silo Utility building. h) One number of air receiver of minimum capacity 2 m³ for DM plant to be located in Water Treatment Area. i) Electrically operated overhead traveling type crane of minimum 8 tonne capacity (capacity of crane shall be 25% above the weight of the heaviest equipment to be lifted during operation and maintenance work.) in air compressor building for handling of various equipments. j) Complete instruments, control system with panels as required for compressor house. k) The compressed air scheme and piping network shall generally be in line with the enclosed tender drawing. l) Supply of mandatory spares as specified. m) Any additional items which may not be specifically stated in the specifications but are required for completeness of the system shall be supplied by the Contractor.				
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-A-10 PLANT UTILITIES	PAGE 4 OF 12

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES			
4.00.00	n)	For detailed specification of compressed air system and selection of the required capacity and discharge pressure of air compressors, please refer part B of technical specification.		
	FIRE DETECTION AND PROTECTION SYSTEM The fire detection and protection system shall consist of: a) Fire Water Pumping System Fire water storage tanks and pumping system provided in Stage-I shall be used for fire water requirements for Stage-II also. Fire water mains (Hydrants & Spray) shall be interconnected at multiple locations suitably. Further, hydrant booster pumps & drives, spray booster pumps & drives, batteries and battery chargers for the diesel engines drives, required instruments, controls, and panels as per the detailed specifications in Part-B of technical specification. Further, the bidder scope of work shall include dismantling, re-erection, commissioning of any system/equipments/items of Stage – I, which are required during/for construction of Stage – II facilities. b) Hydrant System Hydrant system shall consist of network of piping, hydrant valves, etc. and associated civil work shall be provided to protect the following areas/buildings of the entire power plant as per detailed specifications in Part-B of technical specification. 1) Main Plant (Steam generator area & turbine generator building) including transformer yard, feeding & bunker transfer point, feeding & bunker conveyor, etc. 2) ESP building & chimney area. 3) Ash handling plant including its conveying system. 4) Ash silo area 5) Air compressor house 6) CPU regeneration area 7) Flue-gas desulfurization (FGD) area 8) Coal handling plant (CHP) area 9) Limestone & Gypsum handling plant/area 10) Biomass handling plant 11) Fuel oil pumping areas 12) Fuel oil tanks area 13) Switchyard including control room building. 14) Water treatment plant area 15) Conveyors, TPs, crusher house and various other buildings of Limestone & Gypsum handling plant (if applicable) 16) Any other area/building in the scope of the Bidder and required to be protected with hydrant system.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-A-10 PLANT UTILITIES
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CLAUSE NO.	 SCOPE OF SUPPLY AND SERVICES		
	c) HVW Spray System Automatic fire detection cum high velocity water (HVW) spray system and associated civil works like DV housing, pedestal, etc. shall be provided for the followings as per detailed specifications in Part-B of technical specification: 1) HVW Spray system for boiler burner fronts along with fuel oil rake at boiler. 2) Various transformers of 10 MVA or reactors of 10 MVAR and above rating. 3) Various transformers of 10 MVA or reactors of 10 MVAR and above rating located at raw water pump house (as applicable). 4) Steam turbine lube oil storage tanks, oil coolers & purifiers, etc. 5) Central lube oil storage tanks (clean oil and dirty oil tanks) and purifier. 6) Turbine oil canal pipelines in main plant. 7) Generator seal oil units. 8) Boiler Feed Pump/Lube Oil Console & oil purifier. 9) Apart from the above any other equipment/system in the scope of the Bidder and which requires HVW spray protection. d) MVW Spray System Automatic fire detection cum medium velocity water (MVW) spray system and associated civil works like DV housing, pedestal, etc. for the following as per the detailed specifications in Part-B of technical specification: 1) Various cable galleries (in Main Plant area, in ESP control Building, in FGD Buildings, Switchyard, AHP control Building, CHP control Building, Water Treatment Control Building, raw water pump house (as applicable), etc.). 2) Boom & tripper conveyors of Stacker Reclaimer Machines. 3) Coal crusher house, coal transfer points & coal conveyors (excluding open coal conveyors), biomass conveyors & TPs. 4) Fuel oil pump houses 5) LDO tanks and Day Oil Tanks (as applicable) 6) Fuel oil tanks of DG sets 7) All cable trestles of main plant area (from transformer yard to chimney) 8) Any other equipment/system in the scope of the Bidder and which requires MVW spray protection. e) Bladder tank foam protection System Bladder tank foam protection system for the LDO tanks as per the detailed specifications in Part-B of technical specification. f) Inert Gas Fire Extinguishing System i. One (1) No. automatic total flooding inert gas fire extinguishing system with associated valves, piping, fittings etc. as per NFPA-2001 (latest edition) for main control rooms, control equipment rooms and associated C&I rooms like programmer/server rooms, PC rooms, panel room, UPS/Battery charger rooms of TG building (for both units) and associated civil works like shed for inert gas storage cylinders, etc. as per the detailed specifications in Part-B of technical specification.		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-A-10 PLANT UTILITIES	PAGE 6 OF 12

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES			
	8) Siren shall be provided on roof top of TG building (with coverage area of 3 km radius all around). PLC based control panels i) Dual processor PLC based control system with two OWS and one A4 size color Laser printer shall be provided in hydrant & spray booster pump house. ii) In addition to above PLC based control panels, each diesel engine driven drives of Hydrant booster and Spray booster system shall be provided with Diesel engine control panel along with 2 X 100 % Battery Charger and 2 X 100% batteries. However the detail spec of Battery charger and the batteries shall be as per sub-section: A-18, Section-VI, Part-B of the Technical specification. Fire Alarm System Bidder to provide fire detection system as described below: - i) Addressable fire alarm panels shall be provided in each CER and shall include but not be limited to the following elements: - Analog Addressable Fire Detection and Alarm System panels with Master processor module, monitoring modules, supervisory control modules, input/output modules, auxiliary relay modules, network modules and Power supply system (batteries and battery chargers, suitable for providing battery backup of 24 hours (stand by) and 30 minutes (in alarm conditions), etc. ii) Addressable fire alarm panels shall be provided in main plant CHP Control room, AHP control building, ESP/FGD control building, etc. and shall include, but not be limited to the following elements: - Analog Addressable Fire Detection and Alarm System panel with Master system CPU, monitoring modules, supervisory control modules, input/output modules, auxiliary relay modules, network modules, PC based monitoring station with color graphics display monitor, mini UPS, A4 size color printer and Power supply system (batteries and battery chargers, suitable for providing battery backup of 24 hours (stand by) and 30 minutes (in alarm conditions), etc. iii) Centralized PC based monitoring station with color graphics display monitor along with mini-UPS and one A4 size color laser printer shall be provided with Unit-1 FAP and to be located in Unit-1 Central Control Room. It shall serve the purpose of Central PC Station with facility of monitoring information related to all fire alarm system and of operating drives of fire water pump house and booster pump house. iv) One number addressable type repeater annunciation panel in Employer's central fire station with power supply system (batteries and battery chargers, suitable for providing battery backup of 24 hours (stand by) and 30 minutes (in alarm conditions), etc.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-A-10 PLANT UTILITIES	PAGE 8 OF 12

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES																																
5.00.00	iv) Above cables shall be provided along with necessary laying & termination accessories, hardware etc. meeting requirements specified under Part-B, Section-VI of Technical Specification.																																
	Type Test Requirement																																
	The type tests to be conducted for C&I systems & equipment's shall be as detailed out in Sub-Section Type Test Requirements, Part-B, Section-VI of Technical Specification.																																
	i) Fire Extinguishers																																
	i) Fire extinguishers shall be installed in all the buildings in the scope of the Bidder as per TAC requirement.																																
	ii) The Contractor shall supply the following quantities (minimum) of fire extinguishers and install the same at various locations.																																
	<table><tr><td>1.</td><td>Portable type:</td><td></td></tr><tr><td></td><td>Pressurized water type (9 lit. cap.) (IS:15683 operated by CO2 cartridge type)</td><td>80 Nos.</td></tr><tr><td></td><td>Foam type (9 lit. cap. IS: 15683)</td><td>40 Nos.</td></tr><tr><td></td><td>CO2 type (4.5 kg. Cap. IS: 15683)</td><td>80 Nos.</td></tr><tr><td></td><td>Dry Chemical powder (6 kg. Cap. IS: 15683)</td><td>80 Nos.</td></tr><tr><td>2.</td><td>Mobile type:</td><td></td></tr><tr><td></td><td>Foam type (60 lit. cap. IS: 16018)</td><td>5 Nos.</td></tr><tr><td></td><td>CO2 type (22.5 kg. Cap. IS: 16018)</td><td>20 Nos.</td></tr><tr><td></td><td>Dry Chemical powder (50 kg. Cap. IS: 16018)</td><td>20 Nos.</td></tr><tr><td></td><td>Multi-purpose Nozzles</td><td>02 nos.</td></tr></table>			1.	Portable type:			Pressurized water type (9 lit. cap.) (IS:15683 operated by CO2 cartridge type)	80 Nos.		Foam type (9 lit. cap. IS: 15683)	40 Nos.		CO2 type (4.5 kg. Cap. IS: 15683)	80 Nos.		Dry Chemical powder (6 kg. Cap. IS: 15683)	80 Nos.	2.	Mobile type:			Foam type (60 lit. cap. IS: 16018)	5 Nos.		CO2 type (22.5 kg. Cap. IS: 16018)	20 Nos.		Dry Chemical powder (50 kg. Cap. IS: 16018)	20 Nos.		Multi-purpose Nozzles	02 nos.
	1.	Portable type:																															
		Pressurized water type (9 lit. cap.) (IS:15683 operated by CO2 cartridge type)	80 Nos.																														
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	Dry Chemical powder (50 kg. Cap. IS: 16018)	20 Nos.																															
	Multi-purpose Nozzles	02 nos.																															
j) One (1) number monorail electric hoist of minimum two (2) ton capacity for fire water booster pump house.																																	
k) All pylons required for transformers, bus reactors, interconnecting transformers etc. shall be anchored to soak pit base slab of individual transformer / shunt reactor, paved area outside soak pit, etc. using anchor fasteners of adequate capacity. Subsequent to fixing the pylons, lower part of pylon which would be within filled up gravel portion shall be encased with concrete by Contractor for corrosion protection.																																	
l) Apart from the above, any area/building which are in the scope of the bidder and require fire detection & protection system, the same shall be provided with suitable Fire detection and protection system, as detailed out in Part-B of Technical Specification.																																	
m) Supply of Mandatory spares as specified.																																	
n) Acoustic enclosure (if required) for diesel engine of booster pumps shall be provided by the Contractor.																																	
GENERAL																																	
i. Set of commissioning spares as may be required during erection and commissioning.																																	
ii. One (1) set Special tools and tackles required for maintenance of all the Mechanical, Electrical and C & I equipments under the scope of bidder.																																	
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-A-10 PLANT UTILITIES PAGE 11 OF 12																														

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES			
	iii. All steel / cast iron inserts, plates, bolts, nuts, sleeves, metallic-fasteners etc. to be grouted in concrete work and used to hold/ support the equipment/piping / ducting being supplied and erected under this specifications. iv. Any additional items required to make the system complete. v. Initial charge of all lubricants and grease, etc. Further, all consumables like inert gas, etc. required for PG tests shall also be in Bidder's scope of supply. Grouting, dressing and final finishing of all foundations of various equipment, etc. vi. Repairing and making good/ sealing of cutouts / openings in floors, roofs and walls, for executing the works under this system and making them water tight as directed by the engineer. vii. Painting for all equipments / items and touch-up painting of Employer's structures damaged due to site welding by Bidder as detailed in relevant clauses of technical specification. viii. Associated civil works like construction of cylinder storage shed, DV housing, pipe pedestal, pipe trenches, etc. ix. Suitable acoustic enclosures (if required for equipment like diesel engines, etc.) shall be provided to meet noise level as per specification.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-A-10 PLANT UTILITIES	PAGE 12 OF 12



SUB-SECTION–IIA-11

COAL & BIOMASS HANDLING PLANT

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES	
1.00.00 1.01.00 1.02.00 1.03.00 1.04.00 1.05.00	DETAILED SCOPE Underground RCC Wagon Tippler Hoppers, underground transfer point, underground tunnels and pent houses, complete with civil, structural, architectural and electrical works including wagon tippler complex, structural shed over wagon tippler complex and machinery hatches, steel grating (over hopper portion), removable chequered plate covers over openings in machinery hatches for handling underground equipment below wagon tipplers and for all buildings. Equipment handling facilities for apron feeders below wagon tippler and other equipment / systems such as DS system, ventilation system, drinking water system, drainage system etc. as specified elsewhere in the specifications. Rails and its fixing over wagon tippler top are included in contractor's scope. Transfer point (TP) in railway siding yard has to be completely underground. Trough Belt Conveyors of 1500 MTPH rated capacity complete with conveyor galleries, underground Conveyor tunnels (wherever applicable), conveyor supporting structures, short supports, stringers, deck plate, seal plate, conveyor foundations, drive motors, drive units, pulleys, idlers, gravity take ups including guides, pits etc., internal and external belt cleaners, pull chord switches, belt sway and zero speed switches, electro-hydraulic thruster brakes, all electrical etc. including all civil, structural and architectural works for conveyor gallery, gallery supporting trestles and their associated foundations etc. Designated Conveyors shall have arrangements for manual stone picking arrangement at an appropriate location. Alternately, double stream pipe conveyor may be provided for the crushed coal conveying (after Crusher House) up to main plant. Combination of pipe conveyor and troughed belt conveyor is also acceptable. Trough Belt Conveyors of 1500 MTPH rated capacity in the bunker buildings complete with conveyor supporting structures, short supports, stringers, short support mounting stools, inserts (if any), deck plate, seal plate etc. drive motors, drive units, pulleys, idlers, gravity take-ups with guides up to ground including take up structures, take up maintenance platform at intermediate levels including platform supporting beams, monorail beams, guide rails etc., internal and external belt cleaners, pull chord switches, belt sway and zero speed switches, electro-hydraulic thruster brakes including all electrical, civil, structural and architectural works. Yard conveyors of rated capacity 1500 MTPH complete with conveyor supporting structures, short supports, stringers, deck plates, conveyor foundations, drive motors, drive units, pulleys, idlers, take-ups, take-up structure, internal and external belt cleaners, pull chord switches, belt sway and zero speed switches, electro-hydraulic thruster brakes, all electrical and accessories including all civil, structural and architectural works and their associated foundations. Crusher house complete with all civil, structural, architectural and electrical works etc. accommodating four (4) number crushers and associated Vibrating feeders, R&P and Rod gates etc., passenger cum goods elevator, belt feeders, conveyors, chute work along with actuator operated flap gates, monorails & hoists, hoist maintenance platform, two external and one internal staircases, hand rails and other equipments such as coal sampling unit, dust suppression, dust extraction system etc.	
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIA-11 COAL & BIOMASS HANDLING PLANT PAGE 1 OF 7

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
1.06.00	Two (2) nos. Side Discharge Wagon Tippler as per RDSO G-33 (Rev. 2) along with hydraulically driven Side Arm Charger and electronic weighing bridges including all accessories, electricals and associated civil structural & architectural works			
1.07.00	Two (2) no. Apron Feeder along with dribble conveyor complete with drives including all accessories, electricals, supporting structures, approach/maintenance platform and associated civil & structural works etc.			
1.08.00	Four (4) nos. Vibrating feeders to feed the coal to crushers complete with drives, dust hood, all mechanical, electrical accessories and supporting structures etc.			
1.09.00	Four (4) nos. Ring Granulators complete with drives, accessories all mechanical, electrical civil & structural works, including crusher supporting foundations, vibration isolation system with springs & viscous dampers, vibration monitoring system to monitor vibration of crusher with key phasors shall be provided. To mount vibration sensors suitable arrangement including vibration pads and notches in the shaft of Crusher for mounting Key Phasor shall also be provided etc.			
1.10.00	Four (4) sets of Gates each comprising of one rod gate and one actuator operated rack & pinion gate at inlet to each of the vibrating feeder feeding coal to crushers complete with drives, all mechanical, electrical, structural works etc.			
1.11.00	Two (2) nos. of Belt Feeders below Crushers in Crusher House i.e one belt feeder each below two nos. crushers in each stream of conveyor with drives, dust hoods, all mechanical, electrical accessories and supporting structures etc.			
1.12.00	Transfer points (along with underground RCC structures), tunnel and penthouse complete with all civil, structural, architectural and electrical works including chutes, monorails, hoists/chain pulley blocks, hoist maintenance platforms, external staircases, dust debris chutes etc. All overground transfer points shall have separate debris disposal chute up to the ground floor and upto last operating floor in case of all main plant TPs. Underground transfer point shall be provided with machinery hatches along with monorail, electric hoist for handling equipment from underground to overground.			
1.13.00	One (1) no reversible/ unidirectional Stacker cum Reclaimer complete with all equipment and conveyors, structural, electrical, cable reeling drums, all trailing cables, cable trays and accessories, rails, rail foundations, boom resting and maintenance platform, boom tie arrangement, boom maintenance platforms, lighting towers (with foundations), end buffer structures, provision of retaining wall in between machine foundation and stockyard, grade slab, drains, cable pit, cable trench/cable supporting pedestals, pipe support pedestals, fixing and grouting of rails along with all associated civil & structural works to operate in conjunction with yard conveyors.			
1.14.00	Complete chute work along with chute block switches and actuator operated flap gates, mobile discharge pulleys (as applicable) and belt feeders in all Transfer points and crusher house between various conveyors.			
1.15.00	Two (2) Nos. conventional type passenger – cum – goods elevators with drives, all electrical, mechanical, civil, structural & associated foundation works, accessories and electrical to serve various floors of crusher house and TP preceding main plant TPs			
1.16.00	In case of side mill arrangement, one no. motorized travelling tripper on each bunker conveyor shall be provided. In case of front/rear mill arrangement, four (04) numbers of travelling trippers shall be provided. In both the cases, travelling Trippers shall be complete with all mechanical, electrical equipment, rails, chute work, rail supporting structure (along with structural stools, as required), cables with cable festooning arrangement, thruster brakes, rail clamps, electric hoist, actuator flap gates etc. Bunker sealing and Grid/grating over the entire length of bunker slot on tripper floor.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-III-A-11 COAL & BIOMASS HANDLING PLANT	PAGE 2 OF 7

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
1.17.00	Adequate number of ventilation equipment for ventilating the wagon tippler complex, underground tunnel of Conveyors, underground portion of transfer points and bunker bays (housing travelling tripper conveyors) complete with all mechanical, electrical, civil and structural works and associated foundations.			
1.18.00	Pressurized Ventilation system for all Switchgear rooms, MCC rooms complete with all mechanical, electrical, accessories, civil and structural works.			
1.19.00	Exhaust fans to be provided in all battery rooms, all toilets complete with electrical, civil & structural works etc. Supply and exhaust fans along with required ducting shall also be provided for all underground Structures/Transfer Point.			
1.20.00	Air conditioning of Main CHP control room and office room in main CHP control building, RIO room, operator's cabin & MCC room on Stacker/Reclaimer complete with all electrical, civil & structural works etc. Air conditioning shall also be provided as elaborated elsewhere in-this specification.			
1.21.00	Minimum Four (4) nos. sump pumps (sludge duty) for wagon tippler complex, two (2) Nos. sump pumps in each TP's completely or partially underground complete with motors, local control panel, level switches, individual discharge piping with fittings and valves to Coal Slurry Settling Pit (CSSP) including pipes etc. up to disposal point.			
1.22.00	Suitable nos. of In-line Magnetic Separators on Conveyors (one no. on each conveyor feeding to crusher house, on conveyor feeding to Main plant and one no. on each yard conveyor discharge end & one on each conveyor receiving coal from existing stage) complete with reject chutes, reject trolleys, supporting arrangement, and all mechanical, electrical, civil, structural works and accessories.			
1.23.00	Suitable Nos. Electronic Belt weighers (min. one no. on each conveyor feeding to crusher house and on conveyors feeding to Main plant) complete with all mechanical, supporting arrangement, electrical, and accessories on conveyors			
1.24.00	One (1) No. Electronic Belt weighers mounted on each on stacker cum reclaimer complete with all mechanical, supporting arrangement, electrical, and accessories.			
1.25.00	Suitable Nos. Metal Detectors (one no. on each conveyor) on the conveyors feeding to crusher house, conveyor receiving crushed coal from crusher house, on conveyors conveying to feeding TPs of main plant, one on each conveyor receiving coal from existing stage conveyor, one on each conveyor receiving reclaimed coal from coal stockyard, complete with all mechanical, electrical, civil, structural works and accessories on Conveyors.			
1.26.00	One (1) No. belt vulcanizing machine of adequate size complete with all mechanical, electrical, accessories and consumables for one year consumption. Further, belt jointing facilities as specified shall be provided.			
1.27.00	Two (2) nos. of coal sampling units one for as received size coal in crusher house and one for as fired size coal in TP before main plant TPs, complete with all accessories and electrical, civil, structural works, supporting structures, approach/maintenance platforms, hoists etc.			
1.28.00	Complete dust suppression system for control of fugitive dust in Wagon tipplers, transfer points, crusher house, coal stock yard complete with pump houses, water tanks, pumps, drives, hoisting arrangements, piping, valves etc. electrical, accessories, civil, structural and architectural works as briefly specified below: a. Plain water dust suppression around wagon tippler top through fogging nozzles and for pre-wetting of wagons b. Plain water dust suppression around stockyard through sprinklers.			
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	c. Complete dry fog/cold fog type dust suppression system at all Transfer Points, Crusher House both at discharge and loading points including all electrical and accessories. d. Belt Sealing arrangement in Bunker bays for control of dust coming out of coal Bunkers. e. Water Pump houses & water tanks for dust suppression/ extraction, service water, cooling water and potable water system. f. Automatic Solenoid (of Stainless-Steel Material) operated plain water sprinkler system for dust suppression and extinguishing of hotspot detected through Stockyard Management System in stockyard to be provided. These solenoids shall be operated automatically through PLC of Automatic Sprinkler System (part of Stockyard Management System, refer C&I Annexure-I to A-23, subsection of the specification)			
1.29.00	Complete dust extraction system for control of fugitive dust at Vibrating feeder & Belt feeders at crusher house with complete water tanks, pumps, drives, hoisting arrangements, piping, valves etc. electrical accessories, civil, structural and architectural works. Particle size in discharge water from DE system shall not be more than 100 microns. Particle size in air let out by DE system shall not be more than 10 microns. Independent DE System shall be provided for each stream in Crusher house.			
1.30.00	Pipe conveyor drives wherever envisaged in the subject package shall be VVVF drives.			
1.31.00	Interconnection (Double stream, capacity 1400 TPH) from Stage-I to Stage II by providing TP at suitable location with fixed tripper/plough arrangement etc. to be provided			
1.32.00	Interconnection (Double stream, capacity 1400 TPH) at suitable TPs or conveyor gallery from Stage-II to Stage II by providing TP at suitable location shall be provided.			
1.33.00	Wind Barrier along with the supporting structure shall be provided all around the coal stockpile.			
2.00.00	DETAILED SCOPE OF BIOMASS HANDLING PLANT			
2.01.00	Biomass will be received to power plant through road by trucks. One (1) No. Pit-less type weigh bridge (100 T Capacity) shall be provided near Biomass unloading area for weighing of received Biomass Truck.			
2.02.00	One (1) number unloading system along with One (1) Truck Tippler for unloading of Biomass from trucks complete with drives, accessories all mechanical, electrical civil & structural works, including enclosure for dust containment during unloading. The truck unloading system shall comprise of either of the following: - One number Bulk material receiving units/Box feeders/Truck unloading system/ Surface feeder, for Torrefied Biomass of size (-) 35 mm each rated for 240 TPH along with access ramp as required, receiving hoppers/feeders, dust enclosure etc. The units shall be complete with drives, accessories all mechanical, Hydraulics (if applicable), electrical, civil & structural works including its supporting foundations etc. This unit shall feed Biomass onto the Biomass Bucket Elevator.			
2.03.00	Space and interface provision for one (1) additional stream of Truck Tippler, BRU/Surface Feeder and Bucket Elevator shall be kept for future eventuality. considering following as a minimum a. Ramp to be constructed considering for both truck tippler. b. BRU station / building to be sized considering two no's BRU unit & feeding system.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIA-11 COAL & BIOMASS HANDLING PLANT	PAGE 4 OF 7

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	c. Bucket elevator supporting arrangement shall be considered from silo for two no's bucket elevators. d. Silo is to be designed for two streams of conveyor feeding. (One is for St-II + One future stream) e. Handling arrangement to be designed considering future equipment also			
2.04.00	Biomass Bucket Elevator along with its supporting structures, Buckets, chain/Belt, drive motors, drive units, sprockets, pits etc., all electrical etc. including all civil, structural and architectural works for tower, tower supporting structures and their associated foundations. Biomass bucket elevator shall convey the biomass on the reversible belt feeder/Belt Feeder with plow diverter, placed over biomass storage silos. Reversible belt feeder/ Belt Feeder with plow diverter shall feed the biomass to either silo-1 or silo-2.			
2.05.00	Biomass Belt Conveyors/Belt Feeders along with its supporting structures, short supports, stringers, deck plate, seal plate, conveyor foundations, drive motors, drive units, pulleys, idlers, gravity take ups including guides, pits etc., internal and external belt cleaners, pull chord switches, belt sway and zero speed switches, electro-hydraulic thruster brakes, all electrical etc. including all civil, structural and architectural works for tunnel, conveyor gallery, gallery supporting trestles and their associated foundations.			
2.06.00	Biomass Transfer Point, complete with all civil, structural, architectural and electrical works including chutes, monorails, hoists/chain pulley blocks, hoist maintenance platforms, external staircases, dust debris chutes etc. All over-ground Transfer point shall have separate debris disposal chute up to the ground floor. Necessary modification works of existing Transfer Points required for feeding proposed conveyors, complete with all civil, structural and electrical works including chutes, monorails etc.			
2.07.00	Two (2) numbers of Storage Hopper/Silo/Bins for Biomass Pallets shall be provided. The storage Hopper/Silo/bin shall have the minimum effective storage capacity (each) of 750 MT of Biomass Pallets. Storage Hopper/silo/bin shall be complete with all mechanical, electrical civil & structural works. One number (1 No.) of Mechanical Extractor & Biomass Feeder below each Biomass storage silos with drives, dust hoods (for Feeder), all mechanical, electrical accessories and supporting structures etc. to feed the Biomass to downstream conveyors. Mechanical extractor also known as Silo extractor/Rotary extractor, is a machine for efficiently extracting materials having poor natural flowing properties such as fibrous, wet materials prone to blockage. Bidder to provide Silo extractor/Rotary extractor consists of rotating chute, extractor blade/sweeper arm/paddle wheel, slewing arrangement etc. Alternatively, rotary screw reclaimer/rotor extractor/any other extractor of proven design and suitable for the biomass application may also be provided Suitable temperature monitoring through-out the storage mass inside Silo/Hopper/Bin to be provided. Biomass feeder may be Belt feeder or Chain Feeders with VVVF drive. Suitable Biomass feed regulating mechanism to the Extractor and Biomass Feeder below silo/bins shall be provided for taking feed from silo and discharging onto onward conveyors. Each storage silo shall be equipped with suitable Air blasting/Vibrating Bin type arrangement to ensure			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-IIA-11 COAL & BIOMASS HANDLING PLANT
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	proper flowability of Biomass Pallets. Manual isolation gate shall be provided below each Silo/Bin. Biomass blending rate shall be controlled automatically based on feedback of Coal feed rate from Belt scale located at Coal and Biomass conveyors.			
2.08.00	One (1) number of Passenger cum goods elevator with drives, all electrical, mechanical, civil, structural & associated foundation works, accessories and electrical to serve various floors of Biomass storage Silo/bin complex.			
2.09.00	Two (02) Nos. Metal Detectors complete with all mechanical, electrical, civil, structural works and accessories on Conveyors			
2.10.00	Two (2) numbers of electronic type belt scales on Biomass conveyors for continuous weighing, complete with all mechanical, electrical, civil, structural works and accessories.			
3.00.00	COMMON SCOPE FOR COAL AND BIOMASS HANDLING PLANT			
3.01.00	Service water, potable water system and cooling water system for complete coal conveying and Biomass handling plant.			
3.02.00	Cooling water system for scoop couplings etc. for complete Coal and Biomass handling plant. Alternately air-cooled type scoop coupling is also acceptable for all conveyors with HT motors.			
3.03.00	Monorails and electrically operated hoist blocks as well as hand operated chain pulley blocks for servicing/installation/easy replacement of drive machinery, different types of pulleys for all conveyors, GTU and other equipment from ground level to their locations and vice-versa.			
3.04.00	All buildings in contractor's scope shall be complete with all electrical, civil, structural, architectural works, cable trenches, fire safety walls, foundation, earth mat, fencing, earthing for transformers. All cables, duct banks, trenches, cable trestles shall be complete with associated civil/ structural work and necessary civil foundations.			
3.05.00	Drainage of all buildings, tunnels, conveyor galleries and coal stock yard including all civil & structural works as detailed out elsewhere in the specification.			
3.06.00	All equipment/fittings, supporting structure, along with insert plates, bolts, accessories, MS sleeves, base plates, grouting as may be required and proper alignment etc.			
3.07.00	Complete unused set of all special tools and tackles, which are necessary or convenient for erection, commissioning and overhauling of any equipment, covered under the scope.			
3.08.00	First fill of all consumables e.g.; oils and lubricants for one year toppings requirements.			
3.09.00	Preservative shop coating, final painting of all structures and equipment under the scope.			
3.10.00	All inserts, anchor bolts, foundation bolts for Contractor's equipment, platforms etc. in the entire CHP.			
3.11.00	All necessary grouting & finishing of the floor after welding at all such pockets & else-where is in Contractor's scope.			
3.12.00	All electrical actuators used in this package shall necessarily be of non-intrusive field bus based integral actuators like Flap Gates, RPG, Dampers, Valves meeting requirements			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-IIA-11 COAL & BIOMASS HANDLING PLANT
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
3.13.00	specified in Electrical Actuator referred in C&I section Part –B of the specification, except for skid mounted / operated through only PLC/ local control panel systems like scoop coupling, tripper, paddle feeder, CSU where it is not possible to have above non-intrusive type actuators, the Contractor shall provide Electrical Actuators as per Standard practice. And in such case the Contractor shall provide justification for providing type of actuators offered and the same shall be subject to Employer’s approval. For measurement of Pressure, Differential Pressure and Temperature in process line of CHP including all associated systems, Analog measurement with Fieldbus protocol (complying to Measuring Instrument (Primary and Secondary) Part-B of specification) shall be provided. The above philosophy shall also be applicable for integral equipment like scoop coupling, if integral equipment supplier can provide the same. However, if integral equipment supplier provides proper technical justification for not able to do so then instruments as per Standard Practice of integral equipment supplier can be provided subject to Employer’s approval. The protocol of fieldbus (FF/Profibus) for actuators and fieldbus-based instruments shall be same and matching with fieldbus protocol of Employer’s CHP System DDCMIS and the same shall be subject to Employer’s approval.			
3.14.00	For measurement of tank level in water application ultrasonic type level transmitter and for slurry-based application Radar type level transmitter are to be provided. For the specification of these instruments and all other measuring instruments shall be complying to specification requirements of Part-B of Measuring Instrument (Primary and Secondary).			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIA-11 COAL & BIOMASS HANDLING PLANT	PAGE 7 OF 7



SUB-SECTION–IIA-12

FUEL OIL UNLOADING SYSTEM

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES			
	FUEL OIL HANDLING SYSTEM			
1.00.00	GENERAL INFORMATION			
1.01.00	LDO shall be received at the power station in road tankers/ rail wagons and unloaded at existing unloading rake/header by gravity. Existing LDO unloading cum transfer pumps located in existing unloading pump house shall be utilized for pumping to storage tanks. The LDO pressurizing pumps will pump the LDO to Boiler through piping.			
1.02.00	The LDO shall be pumped to two (2) nos. storage tanks each of capacity 1000 cu. meter.			
1.03.00	Dyke for LDO storage tanks shall be provided.			
1.04.00	Necessary modification works for interconnection with existing fuel oil system complete with all civil, structural and electrical works including chutes etc.			
2.00.00	SCOPE OF WORK			
	The scope of the equipment to be furnished & erected under this specification is detailed hereunder. The items though not specifically mentioned but are needed to make the equipment / system complete and safe from operational view point, shall also be treated as though included and the same shall also be furnished and erected unless otherwise specifically excluded.			
2.01.00	Mechanical Systems			
2.01.01	Tanks and Accessories			
	(a) Two (2) numbers storage tank each of capacity 1000 cu. meter for storage of LDO complete with accessories and instrumentation. The tanks shall be located in the same installation.			
2.01.02	Piping System consisting of pipes, valves, fittings, supports, insulation etc.			
	(a) LDO pipe lines, LDO drain pipe lines, all instrument air lines, complete with all supports, hangers, strainers, bends, flanges, counter flanges, gaskets, valves, fittings etc. All piping required to complete the system between the terminal points shown in tender drawings shall be furnished by contractor as specified.			
	(b) LDO tanks shall be provided with fixed fire protection system using foam and medium velocity water spray system. All necessary nozzle openings required for above fixed fire protection system on the storage tanks shall be in Bidder's scope of supply.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-IIA-12 FO Unloading system
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES			
2.01.03	Other Service Related to the system and forming part of Bidder's Scope of Work are: (a) Approval is required from statutory authorities for the entire LDO storage. The contractor shall prepare all necessary drawings / data / documents as per the requirements of the statutory authority and assist the Employer in obtaining the necessary approval from the authorities. (b) For piping system coming under the preview of Indian Boiler Regulations, detailed calculation of pipe thickness shall be submitted and approval as required from the Chief Inspector of Boilers shall be obtained. (c) Submitting detailed design of oil-water separator pit required for the system. The oil water separator pit shall be designed as per API manual.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIA-12 FO Unloading system	PAGE 2 OF 2



SUB-SECTION–IIA-13

ASH HANDLING SYSTEM

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 			
1.01.05	Notwithstanding the scope mentioned for various sub-systems in the following paragraphs, it is the responsibility of the contractor to carry out complete job on turnkey basis and integrate the sub systems with each other. Bottom Ash, Economizer/Eco Duct Hopper Ash, Air preheater ash, Duct hoppers (if applicable) ash Handling System Scope under this specification for bottom ash handling system starts from the boiler furnace bottom to the disposal of Bottom ash slurry into the slurry sump of Bottom ash slurry disposal pump house and from bottom ash slurry disposal pump house up to ash dyke/dewatering bins consisting of: - (A) JET PUMP SYSTEM In case the bidder offers intermittent type bottom ash handling system employing triple (V) water impounded hoppers and jet pumps, the plant shall include, at least, the following basic elements. i) One (1) number water impounded bottom ash hoppers of structural steel complete with hydraulically operated discharge gates, refractory cooling arrangement, hopper overflow, water seal boxes, sluicing headers with nozzles, seal trough with overflow connection, refractory lining, access doors, observation and inspection glass windows, poke holes, supporting steel structures, platforms, stairs and all accessories as specified and as required. ii) Six (6) numbers of clinker grinders complete with drive motors, rails, fluid coupling, gear reducers and accessories as specified and as required. iii) Six (6) numbers of jet pumps along with discharge gate housing, using flushing and drain connection etc. as specified and as required. iv) Six (6) numbers of bottom ash slurry transportation MS pipelines with basalt lining (one no. independent pipeline for each Jet pump) complete with basalt lined pipe bends, fixtures, elbows, gaskets, nuts, bolts, structural steel supports and other accessories as specified and as required, from the outlet of jet pumps to the ash slurry sump in the ash slurry pump house. v) All make up, overflow, drain and other piping, valves and accessories; including hangers, pipe supports etc. as required and necessary to complete the bottom ash handling system. (B) Submerged Scraper chain system In case the bidder offers continuous type bottom ash handling system employing dry type bottom ash hopper cum transition chutes and sub-merged scraper chain conveyor, the plant shall include at least the following basic elements. (i) One (1) numbers of dry type bottom ash hoppers of structural steel, each hopper complete with hydraulically/electrically operated hopper isolation gates with provision for manual operation, seal troughs with overflow connection, refractory lining, access doors, inspection glass windows, poke holes, quenching nozzles supporting steel structures, platforms, stairs and accessories as specified and as required.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-IIA-13 ASH HANDLING SYSTEM PAGE 2 OF 19

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	(ii) Four (4) nos. of 50% capacity (two (2) nos. working and two (2) nos. standby) submerged scrapper chain conveyors, each complete with hydraulic drive with gear reduction unit (if necessary) and hydraulic chain tensioning arrangement of suitable design, as specified and as required. Standby scrapper conveyor units shall be installed adjacent to the working scrapper conveyor units. The standby scrapper conveyor units shall not be connected to boiler and the same shall be brought under the boiler bottom whenever the working scrapper conveyor unit is to be taken out for maintenance. The Scrapper units shall be provided with rail, wheels and suitable motorized self-propulsion arrangement to facilitate their removal from under the boiler furnace and its replacement with the standby scrapper conveyor unit. (iii) Four (4) nos. clinker grinders complete with drive motors, fluid couplings, gear reducers and accessories as specified and as required. (iv) All jetting nozzles for the trenches and agitating nozzles for slurry sump as specified and as required. (v) Rails for grinder and water filled trough assembly. (vi) All make-up, overflow and drain piping with necessary valves and accessories including hangers and supports as required and as necessary to complete the bottom ash handling system. (C) Common System for Jet Pump/ Scrapper Conveyor system Bottom ash slurry disposal sump shall be provided. Bottom ash slurry disposal pumping system starting from the bottom ash slurry disposal sump to ash dyke/Dewatering Bins D) Economizer/Economizer outlet duct (If applicable) / APH and Duct Hopper (If applicable) Ash Handling Systems (i) One (1) number flushing equipment below each economizer/eco duct hopper complete with flushing nozzles, expansion joints, vertical pipe connections gaskets, slurry discharge and overflow pipes and necessary fixing clamps and structural steel supports as specified and as required. (ii) One (1) number manual hopper isolation valve assembly & One (1) number motorized hopper isolation valve assembly below each economizer/eco duct hopper as specified complete with hopper connecting flanges, gaskets, nuts, bolts etc. (iii) Two (2) numbers (1 working + 1 standby) economizer ash water pumps along with valves, pipes & fittings for both the units. These pumps shall be located in the ash water pump house. (iv) MS disposal pipes for transfer of economizer/eco duct hoppers ash slurry from flushing apparatus to BA hopper (In case of jet pump system) or to BA Ash slurry transportation trench (In case of SCC System) complete with pipe bends, fixtures, elbows, gasket, supporting steel structure etc.			
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	(v) One (1) number Feeder ejector or Flushing equipment below each air preheater hopper and duct hopper complete with flushing nozzles, expansion joints, vertical pipe connections, cylinder operated valve, slurry discharge piping, and necessary fixing clamps, and structural steel supports as specified and as required in case of intermittent type bottom ash handling system employing triple (V) water impounded hoppers. OR One (1) number flushing equipment below each air preheater hopper and duct hopper complete with flushing nozzles, expansion joints, vertical pipe connections, cylinder operated valve, slurry discharge piping, and necessary fixing clamps, and structural steel supports as specified and as required in case of continuous type bottom ash handling system employing dry type hopper with sub-merged scrapper chain conveyor. (vi) MS disposal pipes for transfer of air preheater hoppers and duct hoppers ash slurry from feeder ejector/flushing equipment to MS intermediate ash slurry tanks located near air preheaters (in case of intermittent type BA handling system) or BA Ash slurry transportation trench / sump (in case of continuous type BA handling system) complete with pipe bends, fixtures, elbows, gasket, supporting steel structure etc. (vii) In case of intermittent type bottom ash handling system, two (02) nos. of MS Intermediate Ash slurry tanks for each unit along with two (02) nos. horizontal coarse ash slurry transportation pumps (1W + 1S) for each tank, complete with drive arrangement, base plates, foundations bolts, inserts, embedments and accessories, for each unit complete with supports, all slurry and water connections, etc. for receiving air preheater ash slurry and duct hopper ash slurry ash slurry and further disposal to Slurry Disposal Sump. (viii) In case of intermittent type bottom ash handling system, two lengths of APH and duct hopper ash slurry transportation MS pipelines with basalt lining (One no. independent pipeline for each intermediate ash slurry tank) complete with basalt lined pipe bends, fixtures, elbows, gaskets, nuts, bolts, structural steel supports and other accessories as specified and as required, from the outlet of Coarse ash slurry transportation pumps to the Ash Slurry Sump. Necessary fittings, valves etc. shall be provided as specified and as required. (ix) Two (2) nos. solenoid operated pneumatically actuated knife edge gate valve, (01 no.) at the suction and (01 no.) at discharge of each Coarse ash slurry transportation pumps. (x) All instrument air piping to the various valves and instruments complete with fittings, valves, pressure reducing station, filters, flanges, gaskets, nuts and bolts, hangers, supports, etc, as specified as required. (E) Bottom ash slurry disposal pumping system: i. Three (03) streams of horizontal Bottom ash slurry disposal pumps complete with drive motors, variable speed hydraulic coupling for first stage pumps and fixed belt drive arrangement for subsequent stages, base plate, foundation bolts, inserts, embedment and accessories as specified and as required, out of which one stream will be working, one stream will be normal standby and other stream will act as			
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	maintenance standby. Provisions shall be there for locating another additional Pump in series within the Pump House, for future use. ii. Three (03) lengths of Bottom ash slurry disposal MS pipelines from bottom ash slurry disposal pumps up to ash dyke including garlanding/dewatering bins complete with basalt lined pipe bends, fixtures, elbows, gaskets, nuts, bolts, structural steel supports and other accessories as specified and as required. Cast Basalt pipelines along the ash slurry corridor shall be provided at Road/Rail crossing (Culverts, trenches & bridges, if any) Bottom ash shall be transported to Dewatering bins normally. However, in case of non-utilization, Bottom ash shall be disposed at bottom ash dyke. The length of BA disposal pipelines shall be 15000m (excluding fittings and including branch pipes for garlanding of ash dyke). (iii) Eighteen (18) nos. of manually operated plate valves at the bottom ash slurry disposal pipeline outlets in the dyke area as specified and as required. (iv) Alloy Cast Iron liners for lining conical portion of the Bottom ash slurry sumps. (v) Flushing provision for ash slurry pipelines vi. Complete ash slurry piping along with bends, supports, bolts, nuts, clamps etc. inside the ash slurry pump shed. All the piping inside the pump house shall be basalt lined. vii. Three (03) nos. slurry sump compartment isolation valves. viii. Alloy Cast Iron liners for lining the bottom ash slurry sumps. ix. Two (2) nos. vertical sump drainage pumps for ash slurry disposal pump shed, with drive motors complete with piping, valves, fittings, supports, inserts, sleeves etc. x. One (1) no. pendent controlled electrically operated overhead traveling crane for ash slurry disposal pump shed as specified complete with runway rails, necessary rail clamps, bolts, splice bars and stops for each of the runway. xi. All agitating nozzles for slurry sump as specified and as required. xii. Six (6) nos. solenoid operated pneumatically actuated knife gate valves at the suction [Three (3) nos.] and discharge [Three (3) nos.] of bottom ash slurry disposal pumps. (E) Dewatering Bin system: Dewatering Bins shall be provided in either type of Bottom ash/Eco ash/APH ash system offered:			
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	(iv) Five (5) nos. conveying air compressors (CAC) along with drive motors and accessories for each unit. Out of five (5) nos., three (3) nos. shall be working, and two (2) nos. shall be standby. Each compressor shall be provided with a dedicated refrigerant type of air dryer and air receiver. (v) One (1) no. pendent controlled electrically operated overhead travelling crane for conveying air compressor house as specified complete with runway rails, necessary rail clamps, bolts, splice bars and stops for each of the runway. OR (C) For Vacuum Conveying System (Conveying system for ESP Hoppers to Buffer Hoppers) In case ESP hopper ash is conveyed by vacuum conveying system–the scope of the same is defined below. (i) One (1) no. material handling valve/feed valve at the outlet of each ESP hopper. One (1) no. chute isolation valve at the outlet of each ESP hopper and expansion joints below ESP hopper shall also be provided. (ii) Twelve (12) nos. Mechanical vacuum pumps along with drive motors and accessories. Out of twelve (12) nos., six (6) nos. shall be working & six (6) nos. shall be dedicated standby. Seal water from the vacuum pumps shall be collected in the ESP area pit/sump. (iii) Dry fly ash conveying cast iron pipes from ESP hopper outlet onwards up to buffer hoppers/collector tanks complete with valves, specialties, bends, pneumatic actuators, structural steel supports, platforms, etc. (iv) Twelve (12) nos. (6 working + 6 Standby) fly ash surge-cum-collection buffer hoppers each complete with supporting steel structures, platforms, stairs, aeration system, primary collector, secondary collector along with bag filter etc. or target box along with bag filter etc. (v) Two (2) nos. aeration blowers along with drive motor for each unit, one (1) working and one (1) standby, for aeration of buffer hoppers, each complete with dedicated heaters, valves, insulated pipelines with sliding supports, supporting steel structure, aeration pads, silencer, filters and all other accessories as specified and as required. (vi) Monorails and hoists for vacuum pumps and Buffer hopper aeration blowers and its drives located near first row of ESP. (vii) Two numbers drain pumps (1W + 1SB) for vacuum pump seal water to settling tank. (D) Common for Fly Ash Conveying System (Both Pressure & Vacuum) (i) All interconnecting compressed air/exhaust pipelines complete with valves and fittings and supporting steel structure. (ii) All nuts, bolts and jointing materials at flanged termination points. (iii) To meet the complete requirement of ash handling system such as actuation of material handling, segregation valves; various water and airline valves, slurry valves; bag filter cleaning etc.			
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES						
1.01.07	(iv)	Pipe support structures for all Ash conveying lines to be provided. Pipe lifting and shifting arrangement in pipe rack must be provided. Hooks (suitable for hanging 2 T capacity Chain pulley block) to be provided (with proper access/approach) at every 10 m intervals of Pipe rack for handling of Pipes of each Tier.					
	(v)	Two (2) nos. aeration blowers along with drive motor, one (1) working and one (1) standby, for aeration of buffer hoppers, each complete with dedicated heaters, valves, insulated pipelines with sliding supports, supporting steel structure, aeration pads, silencer, filters and all other accessories as specified and as required.					
	(vi)	Suitable no. of instrument air receiver near ESP along with safety relief valve, automatic drain trap and other accessories complete with supporting steel structures to meet the complete requirement of buffer hoppers and ESPs such as actuation of valves, bag filter cleaning etc.					
	Dry Fly Ash Transportation System						
	Scope under this specification for dry fly ash transportation and storage system starts from the outlet of buffer hoppers up to the Intermediate Silos/HCS D storage silo and from Intermediate Silos to Main Fly Ash Storage Silos and consists of the following: -						
	(A) Fly Ash Transportation from Buffer Hoppers to Intermediate Silos/HCS D Silos						
	(i)	Twenty-four (24) nos. of pump tanks/air locks, (two (2) nos., 1W+1S, each at the outlet of each ESP buffer hoppers) for transportation of dry fly ash to Intermediate Silos					
	(ii)	Five (5) numbers (3 working + 2 stand by) screw type transport air compressors along with silencer, filter, after cooler along with all other accessories and supporting structures, platforms etc. as specified and as required.					
	(iii)	Five (5) numbers (3 working + 2 stand by) refrigerant type air dryer along with accessories as specified and as required.					
	(iv)	Five (5) numbers of air receivers along with safety relief valve, automatic drain trap and other accessories as specified and required.					
(v)	Six (6) lengths of cast iron/MS pipes(3W+3S) for fly ash conveying from ESP buffer hoppers to HCS D Silos/Intermediate Silos.						
(vi)	Three (3) nos. dry ash surge cum collection intermediate storage structural steel silos each of 125 MT effective capacity and complete with an aeration system, dust separators and all other accessories as required and as specified. The silos shall be complete with all fittings, accessories and supporting steel structures, access staircases, platforms, as required for safe and reliable operation and maintenance of dry fly ash storage system.						
(B) Fly Ash Transportation from Intermediate Silos to Main Fly Ash Storage Silos							
(i)	Two (2) nos. of pump tanks/air locks for each at outlet of each intermediate silo, (one (1) nos. working + one (1) nos. standby) for transportation of dry fly ash from intermediate silo to storage silos meant for Road/Rail loading						
(ii)	Five (5) numbers (3 working + 2 stand by) screw type transport air compressors along with drive, silencer, filter, after cooler along with all other accessories and						
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 		
1.01.08	supporting structures, platforms etc. as specified and as required for transportation of dry fly ash from intermediate silos to storage silos meant for Road/Rail loading (iii) Five (5) numbers (3 working + 2 stand by) refrigerant type air dryer along with accessories as specified and as required. (iv) Five (5) numbers (3 working + 2 stand by) air receivers along with safety relief valve, automatic drain trap and other accessories as specified and required. (v) Four (4) nos. aeration blowers (one common for each three-intermediate silo + one common standby for all intermediate silos) each complete with dedicated heaters, valves, fluidizing pads and pipelines including supporting steel structures, insulation, silencer, filter and all other accessories for aeration of silos. (vi) Aeration plant consisting of silo aeration blowers (one for each silo + one common standby) each complete with dedicated heaters, valves, fluidizing pads and pipelines including supporting steel structures, insulation, silencer, filter and all other accessories for aeration of silos. (vii) Two (2) no. instrument air receiver along with safety relief valve, automatic drain trap and other accessories complete with supporting steel structures to meet the complete requirement for intermediate ash storage silos such as actuation of silo ash inlet valves, segregation valves; various water and airline valves, slurry valves ; bag filter cleaning etc. (viii) Target box and vent filter assembly along with pulse jetting arrangement, fan units etc. and other accessories for each intermediate silo. (ix) Required numbers of segregation valves for isolation of fly ash transportation lines and required numbers of silo inlet valves of specified type as specified in Tech. Specs and tender drawings. (x) All necessary hydraulic or pneumatic actuators. (xi) All interconnecting compressed air pipelines complete with valves, fittings, pipe rack and supporting steel structure. (xii) One (1) number pendent controlled overhead travelling crane each in transport air compressor house and intermediate silo area utility building to handle the equipment in the transport air compressor house and silo utility building as specified complete with runway rails, necessary rail clamps, bolts, splice bars and end stops for each of the runway. (xiii) All nuts, bolts and jointing materials at flanged termination points. Dry Fly Ash Storage System Scope under this specification for dry fly ash transportation and storage system starts from the outlet of buffer hoppers/intermediate Silos and consists of:-		
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
1.01.08.01	Main Fly Ash Storage System (a) Two (2) nos. of Main fly ash storage silos (RCC Silo) of 1500 MT effective storage capacity each for road and rail loading of dry fly ash and complete with an aeration system, dust separators, electric hoist over silo top for handling and all other accessories as required and as specified. The silos shall be complete with all fittings, accessories and supporting steel structures, access staircases, platforms, as required for safe and reliable operation and maintenance of dry fly ash storage system. Each fly ash storage silo shall have six (6) outlets, four (4) outlets for unloading ash to rail/closed truck through rotary feeders, one (1) for unloading ash to open truck with rotary feeders and ash conditioners and one (1) blanked outlet for future use. (b) Two (2) nos. (one at entry and another at exit) Pit-less type Weigh Bridge shall be provided at dry fly ash silo area for Truck/Bulker loading complete with all electrical, controls, civil and structural works for weighment of trucks/bulkers before and after filling. Mass flow meter/Solid flow meter (Two numbers below each silo) complete with all electrical, controls etc. to be provided for measurement of ash quantity (total or part, as required) during filling of ash to the road tanker/Rail Wagons. (c) Pit-less type Weigh Bridge for rail loading below dry fly ash silos (minimum three numbers) complete with all electrical, controls, civil and structural works for weighment of rail Wagons during filling. (d) Aeration plant consisting of silo aeration blowers (one for each silo + one common standby) each complete with dedicated heaters, valves, fluidizing pads and pipelines including supporting steel structures, insulation, silencer, filter and all other accessories for aeration of silos. (e) Two (2) nos. instrument air receiver along with safety relief valve, automatic drain trap and other accessories complete with supporting steel structures to meet the complete requirement of ash storage silos such as actuation of silo ash inlet valves, segregation valves; various water and airline valves, slurry valves; bag filter cleaning etc. (f) Target box and bag filter assembly along with pulse jetting arrangement, fan units etc. and other accessories for each silo. (g) Six (6) nos. Slide plate type isolation valves below each fly ash storage silos. (h) Required numbers of segregation valves for isolation of fly ash transportation lines and required numbers of silo inlet valves of specified type as specified in Tech. Specs and tender drawings. (i) Two (2) numbers of twin shaft paddle type/rotary drum type hydro-mix conditioner units along with drive motor, rotary feeder, one number for each silo, along with associated water piping and valves, for unloading the conditioned fly ash into trucks. (j) Two (2) nos. ash conditioning water pumps (1 working + 1 standby), for conditioned ash unloaders along with drives and controls as required and specified. (k) Two (2) numbers of Dry fly ash unloaders from each dry fly ash storage silo along with rotary feeders, telescopic chutes and other accessories as specified and as required.			
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
1.01.08.02	(l) The pitching of ash silo and overall arrangement of hydro-mix conditioner units, telescopic chutes, air slides etc. shall facilitate simultaneous loading of five wagons (BOXN/BCFC/BCCW/BTAP) from three number of RCC Silos. Suitable arrangement for Control of movement of Telescopic spout shall have to be provided in all three X-Y-Z directions to facilitate loading of ash into Wagons. While loading ash in wagons, top lids of wagons need to be accessed. For ensuring safety while accessing the top of wagon, a suitable platform at approx. height of 4.5 Mtrs above railway track all along the length of track in silo area shall be provided. (m) All necessary hydraulic or pneumatic actuators. (n) All interconnecting compressed air pipelines complete with valves, fittings, pipe rack and supporting steel structure. (o) 2 x 100% capacity wash water pumps along with drive motor and accessories for fly ash storage silo area along with dedicated hose pipe. (p) Two (2) nos. (one working + one standby) vertical sump drainage pumps along with drive motor and accessories for fly ash storage silo area to pump the accumulated ash water to the ash slurry sump of bottom ash slurry disposal pump house or to dyke including piping along with necessary valves, fittings, supports, etc. as specified and as required. (q) One (1) number pendent controlled overhead travelling crane in silo area utility building to handle the equipment in the silo utility building as specified complete with runway rails, necessary rail clamps, bolts, splice bars and end stops for each of the runway. (r) All nuts, bolts and jointing materials at flanged termination points. (s) One (1) number conventional enclosure type passenger cum goods elevator having capacity of 16 persons (1088 kg) complying to IS:14665 (latest edition) with drives, all electrical, mechanical, civil, structural & associated foundation works, accessories and to serve various floors of Main Fly ash Silo complex. Staircase access for machine room shall also be provided by the bidder. (t) Suitable arrangement for Bulker washing shall be provided.			
	HCSO Storage System (a) Two (2) nos. of HCSO Silos (RCC Silo) of 500 MT effective storage capacity each for road loading of dry fly ash and complete with an aeration system, dust separators, electric hoist over silo top for handling and all other accessories as required and as specified. The silos shall be complete with all fittings, accessories and supporting steel structures, access staircases, platforms, as required for safe and reliable operation and maintenance of dry fly ash storage system. Each HCSO fly ash storage silo shall have four (4) outlets, two (2) outlets for discharging ash to mixing tanks/ retention tanks through rotary feeders and ash conditioners, one (1) outlet for unloading ash to closed truck through rotary feeders, one (1) for unloading ash to open truck with rotary feeders and ash conditioners. Both the silos shall have the provision to store fly ash coming from the unit.			
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	(b) Two (2) nos. (one at entry and another at exit) Pit-less type Weigh Bridge shall be provided at dry fly ash silo area for Truck/Bulker loading complete with all electrical, controls, civil and structural works for weighment of trucks/bulkers before and after filling. Mass flow meter/Solid flow meter (Two numbers below each silo) complete with all electrical, controls etc. to be provided for measurement of ash quantity (total or part, as required) during filling of ash to the road tanker (c) Aeration plant consisting of silo aeration blowers (one for each silo + one common standby) each complete with dedicated heaters, valves, fluidizing pads and pipelines including supporting steel structures, insulation, silencer, filter and all other accessories for aeration of silos. (d) Two (2) nos. instrument air receiver along with safety relief valve, automatic drain trap and other accessories complete with supporting steel structures to meet the complete requirement of HCSD silos such as actuation of silo ash inlet valves, segregation valves; various water and airline valves, slurry valves; bag filter cleaning etc. (e) Target box and bag filter assembly along with pulse jetting arrangement, fan units etc. and other accessories for each silo. (f) Four (4) nos. Slide plate type isolation valves below each fly ash storage silos. (g) Required numbers of segregation valves for isolation of fly ash transportation lines and required numbers of silo inlet valves of specified type as specified in Tech. Specs and tender drawings. (h) Six (6) numbers of twin shaft paddle type/rotary drum type hydro-mix conditioner units along with drive motor & rotary feeder, three (3) number for each silo, along with associated water piping and valves, for discharging ash to mixing tanks/ retention tanks & unloading the conditioned fly ash into trucks. (i) Two (2) nos. ash conditioning water pumps (1 working + 1 standby), for conditioned ash unloaders along with drives and controls as required and specified. (j) One (1) number of Dry fly ash unloader from each HCSD silo along with rotary feeders, telescopic chutes and other accessories as specified and as required. (k) All necessary hydraulic or pneumatic actuators. (l) All interconnecting compressed air pipelines complete with valves, fittings, pipe rack and supporting steel structure. (m) 2 x 100% capacity wash water pumps along with drive motor and accessories for fly ash storage silo area along with dedicated hose pipe. (n) Two (2) nos. (one working + one standby) vertical sump drainage pumps along with drive motor and accessories for fly ash storage silo area to pump the accumulated ash water to the ash slurry sump of bottom ash slurry disposal pump house or to dyke including piping along with necessary valves, fittings, supports, etc. as specified and as required. (o) One (1) number pendent controlled overhead travelling crane in silo area utility building to handle the equipment in the silo utility building as specified complete with runway rails, necessary rail clamps, bolts, splice bars and end stops for each of the runway. (p) All nuts, bolts and jointing materials at flanged termination points.			
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	b) Seal/cooling/other water pumps and motors complete with all the accessories of drive and mounting as specified and as required. Bottom ash seal water pumps (one working + one standby) for meeting the seal water requirement of clinker grinder, BAOF pump sealing, BA slurry transportation pumps, drain water pump of BA slurry pump house, etc. These Pumps shall be located in the Boiler area. c) HP and LP Seal water pumps (one working + one standby each) for meeting the seal water requirement of Bottom Ash slurry disposal pumps and drain water pump of Bottom Ash slurry pump house, etc. These pumps shall be located in the Bottom ash slurry disposal pump house. d) Bottom ash overflow water system (i) One (1) number Bottom ash overflow water storage tank including its structural steel supports and all accessories (ii) One (1) number settling tank and one (1) number surge tank including its structural steel supports and all accessories. (iii) Two (2) number bottom ash overflow water pumps (one (1) working and one (1) standby) complete with drive motors, variable speed hydraulic coupling and other accessories as specified and required for pumping BA hopper/SSC upper trough cooling water overflow from Bottom ash overflow water storage tank/sump to settling tank. (iv) Bottom ash overflow water pipes from BA hopper/SSC to BA overflow water storage tank; from BA overflow water tank to suction of BA overflow water pumps; from discharge of BA overflow water pump to settling and surge tanks complete with valves, fittings, structural steel supports etc. Overflow transfer pipes to transfer clear water from surge tank to over ground water sump of ash water pump house, by gravity flow. (v) Two (2) nos. (One working + one standby) sludge pumps, to remove sludge from settling & surge tank and to pump the sludge to ash slurry sump of combined ash slurry pump house. (vi) Any treatment facility required to ensure that the total suspended solids in Economiser ash and bottom ash overflow water is restricted to 100 ppm. e) All ash water and seal water piping and all the equipment's and sumps complete with fittings, valves, strainers, flanges, gaskets, nuts, bolts, hangers, supports, flushing nozzles, agitating nozzles, etc. as specified and as required. f) All overflow and drain piping from various equipment to waste service water sump or HCSD mixing tank / ash slurry sump / Settling Tank as required g) One (1) number pendent controlled overhead travelling crane in Ash water pump house to handle the equipment in the ash water pump house as specified complete with runway rails, necessary rail clamps, bolts, splice bars and end stops for each of the runway.			
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
1.02.00	Water Facilities			
1.02.01	It is proposed to operate the ash water system in a closed circuit. The ash water from the ash dyke (whatever available) shall be re-used. During recirculation mode the make up to ash water system shall be supplied from the CW system blow down water and raw water makeup.			
1.02.02	For the purpose of water supply to the ash handling system, water pumps taking suction from over-ground RCC sump shall be installed in the ash water pump house. Water supply to ash water pump house shall be tapped from following sources: (a) CW System Blow down: This water shall be used for the purpose of supplying make up to the normal water supply, i.e. when the ash handling system is operating on recirculation mode. (b) Raw Water make up: The raw water shall be used for initial period or during emergency period. (c) The location of ash water pump house and over ground sump shall be decided by the bidder. (d) The water requirement for disposal of fly ash in HCSD form shall be met by one (1) number working and one (1) number standby ash water pumps. (e) The bottom ash hopper overflow water shall be led to an overflow tank. Bottom ash over flow water pumps shall take suction from over flow tank and pump the water to the required treatment facilities where the water shall be treated so that outlet water quality shall have TSS < 100 ppm. This treated water shall be led to over-ground sump of ash water pump house, through gravity flow. (f) Sealing Water:- Sealing water for combined ash slurry pumps, vacuum pumps, clinker grinder etc. shall be met by plant service water system. Seal water discharged from vacuum pumps shall be taken to nearest pit in the ESP area/other nearby area. (g) Cooling Water:- Demineralized ECW shall be provided to meet cooling water requirements of various heat exchangers, air compressors intercoolers, after coolers etc. The cooling water system shall be operated in a close cycle (h) Decanted water shall be pumped from pumping system located at AWRS pump house near ash dyke. Decanted water from ash pond shall be reused in Ash handling System.			
1.03.00	ASH WATER RECIRCULATION SYSTEM (i) One (1) No. Horizontal centrifugal type Ash Water Recirculation pump of capacity 700m³/hr located in the dyke end existing AWRS pump house, complete with drive motors, base plate, foundation plates and accessories as specified and as required. (ii) One (1) No. Electric operated Hoist for handling of above pumps, motors etc. for the above pump house complete with runway rails, with necessary clamps, bolts, slice bars and end tops for each of the runway. (iii) Complete mechanical ventilation system for all areas namely pump house, MCC room, Battery rooms, toilets, air conditioning of AWRS control room. (iv) Following pipelines complete with bends, fixtures, couplings, fittings, gaskets, nuts, bolts, clamps, structural steel supports and other accessories as specified and as required. a. Inlet pipelines from overflow lagoon to decanted ash water recirculation pump house. b. One pipeline (MS pipe of thickness 8mm) from decanted ash water recirculation pump house to ash water sump inside the plant c. All the interconnecting pipes from sumps to pumps and pump discharge to common			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIA-13 ASH HANDLING SYSTEM	PAGE 15 OF 19

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	header. d. Recirculation line to suction sump. e. All the necessary clamping arrangements along with guides, bolts, nuts etc. In addition to major pipelines brought out above, all the pipelines required to complete the Ash Water Recirculation System are included in the scope of the Bidder. (v) All necessary valves, fittings, specialties etc. for various equipments, pumps piping etc. Necessary piping, valves, specialties etc. for inter-connection of associated equipment. Size of valves shall be same as respective pipelines size. (vi) All necessary instrumentation for safe and reliable operation of the whole system as required and as specified. (viii) All air intake valve, drain valves, auto vent valves in pipelines along with isolation valves as per system requirement. (ix) Thermal stress and transient analysis for the pipeline from dyke end pumphouse to ash water sump in the plant. Automatic air release valves (ARV) required for the complete piping system along with gate valves shall be provided as per recommendation of transient analysis study. Further based on thermal analysis, anchoring arrangement for the ash water recirculation pipe shall be provided wherever required. In addition to above compliance of all other recommendations of Thermal stress and transient analysis study shall be implemented by bidder. (x) Any modification related to accommodating the extra pump should be in vendor scope including civil works			
1.04.00	Lifting lugs, eye bolts, etc. Each equipment shall be provided with suitable lifting attachments, supports, lifting lugs, eye bolts, etc. to facilitate maintenance.			
1.05.00	The Contractor's supply shall also include all miscellaneous items, e.g. first fill of lubricants, special tools and tackles etc. that are necessary to ensure safe and reliable operation of the plant during start up, continuous running, shut down and emergency conditions, even if these are not explicitly mentioned in this specification.			
1.06.00	The contractor shall be responsible for making all connections at terminal points and for supplying any necessary jointing material, connectors, nuts, bolts, etc.			
1.07.00	The contractor shall be responsible for making all connections at terminal points and for supplying any necessary jointing material, connectors, nuts, bolts, etc.			
1.08.00	Hoists/Cranes Hoists/cranes shall be provided for erection & servicing of all major equipment. The equipment to be covered shall include (but not limit to) all drive including motor, pumps, gearbox, fluid coupling unit., compressors, after coolers, air dryer , etc.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-IIA-13 ASH HANDLING SYSTEM
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
2.00.00	GENERAL			
2.01.00	Design and Engineering			
2.01.01	While various parameters for the system have been specified in these specifications for the guidance of the Bidder, the Bidder will be responsible for design and engineering of complete system and integrate with other systems to achieve safe, efficient and trouble free operation of the system.			
2.01.02	The Contractor/design agency/ consultancy organization shall establish slurry rheology analysis, designing slurry preparation & pumping processes, establishing equipment parameters, recommendation for designing disposal area, planning disposal area operation procedure, designing control system etc. for high concentration slurry disposal (HCSD) system.			
2.01.03	Bidder shall furnish pressure drop calculation for HCSD system.			
2.01.04	The contractor will furnish various Design and Engineering documents for the approval of Owner as per the mutually agreed list and schedule at the time of award of the contract. The consultant for structural analysis, design drawings and detail fabrication drawings shall be subject to prior approval of Owner. The following is a brief list of major data/drawings required to be furnished by the contractor while executing the contract. (i) Detailed piping and Instrument flow diagrams for various systems/sub-systems showing all the equipment, piping, valves, instruments, etc. These diagrams shall also indicate pipe ODxThk, material, pipe class, pipe /valve / equipment tag number, operating parameters, etc. (ii) Detailed system design and equipment sizing/selection, pressure drop calculations, water balance diagrams, equipment data sheets etc. (iii) General arrangement and cross-sectional views of plant and equipment, equipment and piping layouts, details of ash disposal pipe line layout indicating details of road, rail, nallah crossings etc. details of equipment/pipe supports, etc. (iv) Analysis and design, design drawings, layout drawings, underground facilities, etc. for all structural works including buffer hopper, Bottom ash hopper, water tanks, Silos etc. (v) Layout and size of trenches including arrangements for trench sections, lining, jetting, details etc. (vi) Detailed system operation and control write-ups, logic diagrams, electrical schematic and wiring diagrams, programming information/settings for electronic hardware/electronic assemblies control system hardware details, etc. (vii) Detailed Instrumentation schedules data sheets and Installation drawings, etc. (viii) Cable routing/layout drawings and cable schedules. (ix) GA of switchgear and control panels, Junction Boxes, (x) Performance and Guarantee test procedures (xi) O&M manual (Content of O&M manual shall be as per GTR). (xii) System commissioning procedure			
2.02.00	In addition to what has been described above Bidder's scope of services shall include Submission, Review, Finalisation and getting approval from Employer of: -			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIA-13 ASH HANDLING SYSTEM	PAGE 17 OF 19

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
2.02.01	Detailed piping and instrument or engineering flow diagram for process and utility, showing all equipment, machinery, piping etc. All pipes should be indicated with diameter, pipe class, pipe number, fluid flowing through it as per the Employer's legend to be furnished later.			
2.02.02	Detailed Data Sheets, General Arrangements and Cross-sectional/ assembly drgs., along with the manufacturer's Catalogue for all the items/equipment supplied by the Bidder.			
2.02.03	Detailed installation drawings for all instruments and instrumentation schedule.			
2.02.04	Design Calculation - Design calculation of process and mechanical equipment and systems. The Bidder shall show, explain and prove the validity of the basis/procedures and methods used in these calculations.			
2.02.05	Various drawings, data, test reports, test certificates, manuals for erection, operation and maintenance, etc. as required.			
2.02.06	All design data, drawings and information regarding the structures, services, terminal point details for piping etc. which are to be arranged by others shall be furnished by the bidder in a timely manner matching with the overall project schedule.			
2.02.07	G.A. and Equipment layout drawings for the complete Plant. (a) Detailed piping layout drawings pipe support drawings, complete bill of materials of the piping, valve schedule etc. (b) Reviewing of all the engineering documents furnished by the Bidder, with the Employer. (c) Reviewing of all the drawings prepared by the Bidder in connection with this work etc. (d) Submission of detailed procedure for various performance tests and getting the Employer's approval for the same. (e) Submission of O & M manuals. (f) System commissioning procedure. (g) Detailed instrument schedule, datasheets and installation drawings. (h) Detailed system operation and control writeup, logic diagram etc.			
2.02.08	Lifting lugs, eye bolts, etc. Each equipment shall be provided with suitable lifting attachments, supports, lifting lugs, eye bolts, etc. to facilitate maintenance.			
2.02.09	The Contractor's supply shall also include all miscellaneous items eg. first fill of lubricants, special tools and tackles etc. that are necessary to ensure safe and reliable operation of the plant during start up, continuous running, shut down and emergency conditions, even if these are not explicitly mentioned in this specification.			
2.02.10	The contractor shall be responsible for making all connections at terminal points and for supplying any necessary jointing material, connectors, nuts, bolts, etc.			
2.02.11	Mandatory spares shall be supplied as per the list enclosed in Mandatory Spares Section.			
3.00.00	CONTROL AND INSTRUMENTATION SYSTEM Ash handling system shall be controlled through microprocessor based Distributed Digital Control Monitoring and Information System (DDCMIS) as specified under sub section-II C (Control & Instrumentation)			
3.02.00	Local panels containing miniature push buttons, selection switches, mimic and annunciation window, etc. shall be provided at Bottom ash area/system operation and silo unloading system operation. Signals to/from these local panels shall be hooked up in DDCMIS for control implementation in DDCMIS.			
3.03.00	In case any equipment being supplied by the Contractor for ash handling system, has control requirements better than those specified above, control of such equipment can be through			
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	microprocessor/PLC based system to be supplied by the equipment supplier as per their standard & proven practice, subject to Employer's approval during detailed engineering. Suitable interface to AHP DDCMIS, preferably OPC compliant (through Ethernet port) to be provided in such cases. Bidder shall clearly bring out in his offer any such equipment, along with reasons and details of control system offered.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIA-13 ASH HANDLING SYSTEM	PAGE 19 OF 19



SUB-SECTION–IIA-14

MILL REJECT HANDLING SYSTEM

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 		
	MILL REJECT SYSTEM 1.00.00 To handle the Mill Rejects on a continuous basis, the Bidder shall provide a Mill Reject Handling System. The Mill Reject Handling System shall comprise Mechanical Conveying system. The Rejects shall be stored in storage silo. From the storage silo, the Mill Rejects shall be disposed off in trucks. 1.01.00 The scope of supply for mill reject handling system shall include but not limited to the following: 1.01.01 Mechanical conveying system: (a) One (01) no. pyrite hopper with discharge chute, emergency chute work etc. for each mill as required. (b) One (01) no. pneumatically operated isolation gate for inlet and one (1) no. pneumatically operated isolation gate for outlet of pyrite hoppers complete with compressed air pipe work, solenoid valves & supporting arrangement for each pyrite hopper. (c) Mechanical feeder including Vibrating Feeder (<u>if applicable</u>) for mill rejects below each pyrite hopper for feeding at consistent rate to the mill reject conveyor. (d) Metallic Belt conveyor/Chain Flight Conveyor along with drives, accessories, supports etc for conveying the mill rejects from the mills for each row of mills in each unit. The conveyor shall be fully enclosed. (e) Bucket elevator along with drives, accessories and supporting structures to raise the mill rejects discharge by the metallic belt conveyor for discharging into storage silo. (f) Mill reject storage silos, one (1) no for each row of mills in steel construction each having an effective storage capacity of sixteen (16) hours considering all the working mills of the respective Mill bay in operation and rejecting @ of 1 % of mill capacity for the worst coal conditions. Necessary supporting steel structure, platform, staircase, manual operated unloading Gate, 3 mm thick SS plate liners covering straight length portion and conical portion of mill reject system hoppers (bunkers), level switches, air relief devices, etc. shall also be provided. The storage Silos shall be designed to provide a clear access of 4.5 m for a Road Tanker/Truck to be placed under the silo & receive the rejects using suitable chute work. (g) Suitable spray quenching system, to cool the mill reject in pyrite hoppers. (h) Complete control & instrumentation as specified in C&I section. (i) Necessary electrical equipment as specified. (j) Civil structural works associated with Mill reject handling system including foundation bolts, pockets, grouting and underpinning etc. (k) One (1) no. fixed type sump pump of 10 m³/hr capacity for each underground pit for Bucket elevator area, if applicable.		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIA-14 MILL REJECT HANDLING SYSTEM	PAGE 1 OF 1



SUB-SECTION–IIA-15

LP DOSING AND OXYGENATED TREATMENT SYSTEM

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
1.00.00	LP DOSING & OXYGENATED TREATMENT GENERAL Complete Boiler Feed water chemical dosing (both AVT & Oxygenated treatment) system complete with dosing pumps, tanks, associated pipings, supports, fittings, valves, instrumentation and controls etc. as specified elsewhere in the specification.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIA-15 LP Dosing & Oxygenated Treatment System	PAGE 1 OF 1



SUB-SECTION–IIA-16

ELEVATORS, CRANES AND HOISTS

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 			
	ELEVATORS, CRANES AND HOISTS 1.00.00 ELEVATOR 1.01.00 Passenger Elevators for TG Building, The Passenger elevators for TG Building shall be as under. One (1) no. conventional type elevator having capacity of 13 persons for TG Building. 1.01.01 The scope shall include all items / accessories, service along with all electrical equipment etc. required to meet all design, installation, operation, safety, protection and other requirements of IS: 14665 (latest edition) (all parts), 'Lift' and service lifts'. This scope shall include all items / devices needed to comply with the requirements indicated elsewhere in the specification. The scope shall include but not limited to the following: (a) 1 No. fireman's switch for each elevator. (b) Machinery supporting Beam. 1.01.02 The location of Elevators shall be as per tender drawings enclosed with the specification. 1.01.03 Complete erection, testing and commissioning including all testing and commissioning materials, consumables and other tools and tackles required for erection. 1.01.04 To obtain necessary local administration permits / approvals and make arrangements for inspection and tests required thereby. 2.00.00 CRANE & HOIST 2.01.00 Suitable EOT Crane/HOT crane/monorail beams with hoists/chain pulley blocks of adequate capacity, to meet the erection and maintenance requirements are to be provided by the vendors for the various equipment/areas. Some of the areas/equipment not covered by TG hall EOT crane are indicated below. For balance areas/equipment, not listed herein, the requirements of Technical Specification shall be followed. (a) Feed water heaters & deaerator (Applicable Hoists/Chain pully block for maintenance purpose shall be provided) (b) Various pumps & Heat Exchangers.			
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			एन टी पी सी NTPC
	(c) Fans, motors, gear boxes etc., of Main Condenser, vacuum pumps, control fluid room etc. (d) Auxiliary cooling water pumps and DM cooling water pumps of ECW systems and Plate heat exchangers. (e) Central lube oil system room. (f) Any other equipment. The above requirement is indicative only; the requirement given in the respective chapter is to be adhered to.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION-VI, Part-A	SUB SECTION- IIA-19 ELEVATORS, CRANES AND HOIST	PAGE 2 OF 2



SUB-SECTION–IIA-17

CONDENSATE POLISHING UNIT

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	CONDENSATE POLISHING UNITS			
1.00.00	SCOPE			
1.00.00	The scope of work for the equipment and accessories to be furnished in accordance with this specification shall include design, engineering, manufacture, inspection and testing at suppliers work(s), packing, forwarding to site, unloading, erection, supervision, pre-commissioning, testing and commissioning and performance testing of the equipment/system and works indicated in this Sub-Section of the technical specification. Any item or works though not specifically mentioned in this specification but needed to complete the equipment & systems to meet the intent of the specification shall also be furnished.			
2.00.00	The scope of Condensate Polishing Plant (CPP) shall include but not be limited to the following:			
2.01.00	The Condensate Polishing Plant (CPP) shall treat the condensate of the Turbine-Generator (TG) Unit of the power station. One (1) number of Condensate Polishing Plant (CPP) for TG (Turbine-Generator) unit, along with complete external regeneration system for the Condensate polishing plant shall be provided as detailed out in relevant sub-section of Part-B of Technical Specification.			
2.02.00	The Condensate Polishing unit shall consist of either four (4) service vessels (4 x 33.33% capacity) or three (3) service vessels (3 x 50% capacity) for the TG Unit along with emergency bypass system, resins, blowers, valves, piping etc. Two (2) x 50% capacity backwashable type cartridge pre-filters shall be provided for the commissioning period, start-up period as first cleaning step as well as normal continuous operation, complete with automatically operated by-pass, associated piping, pumps (with at least one stand-by), pneumatically operated valves etc.			
2.03.00	Inclusion of adequate resins for all the condensate polisher service vessels, resin storage vessel (1 no) in regeneration area and one (1) additional charge for use during commissioning stage of unit. Therefore, total number of charges supplied by bidder shall be either six (06) or five (05) corresponding to offered configuration (4 x 33.33 % or 3 x 50%) of service vessels.			
2.04.00	For regeneration, resin from the exhausted exchanger vessel will be transferred hydraulically/hydro pneumatically through resin transfer pipeline to the regeneration system. The exhausted resin charge will be cleaned, separated, regenerated, mixed and rinsed before being stored for the next use. CPU Regeneration facilities shall consist of but not limited to the following systems and equipments: a) Resin transfer & DM water pipelines & valves, fittings etc.			
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 		
2.05.00	b) One (1) set of regeneration facilities consisting of Resin separation vessel, Cation, Anion regeneration vessel(s), Resin make-up hopper, Mixed resin storage vessels (1 no) etc. c) Air blowers & drives etc. d) One (1) set of alkali solution preparation & dosing skid. e) One (1) set of acid solution preparation & dosing skid. f) Two (2x100%) DM water Pumps for chemical preparation & dilution. g) Two (2x100%) DM Water Pumps for resin transfer operation. h) Complete Effluent transfer system up to Ash handling system along with N-pit, Effluent re-circulation/disposal pumps, piping, valves, fittings etc. i) Wastewater generated during resin transfer operation shall be collected in a collection pit located in the regeneration area. Complete Wastewater collection pit and its disposal system up to CW channel along with piping, valves, fittings, Resin transfer wastewater disposal pumps (2x100%) etc. j) Two (02) numbers of DM water Storage tank for CPU regeneration system. k) Bulk acid and alkali storage tanks and acid & alkali unloading facilities for CPU regeneration system. l) Adequate number of safety shower units and Eye-fountains to protect against any chemical hazard. m) Dosing of acid and lime to neutralize effluents in N. Pit before disposal including lime solution preparation facilities for neutralization etc. n) Complete piping, valves, fittings etc. as required. o) Any other equipments, systems to meet the system and specification requirements as specified in Part-B of Technical Specification. Platform(s), cage ladder(s) with steps to facilitate approach to various vessels, tanks, manholes/hand-holes, sight glass, operation & maintenance of valves, instruments etc. shall be provided.		
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SUB-SECTION–IIA-18

SEPARATION OF PLANT DRAINS FROM STORM WATER DRAINS

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	SCOPE SUPPLY & SERVICES		
1.00.0	SEPARATION OF PLANT DRAINS FROM STORM WATER DRAINS General The minimum technical requirements and equipment shall include, but not be limited to the following: Arrangements shall be made that effluents (plant water) and storm water do not get mixed. It is not the intent to specify here the complete details of the separation and treatment system. The contractor shall provide the various other systems, equipment etc. as required to meet the system requirements & intent of specification. In general, the following philosophy shall be adopted for separation of plant drain from the storm water drain. a) Area wash water, Oil/Coal/Ash/Chemical contaminated water are considered as Plant Water. Plant water must be completely isolated from the Storm/Rainwater and only Plant water needs to be collected, treated & recycled/reused for various plant use. Storm water drains will be separated out for free discharge. Rainwater shall be routed to storm water drain. The rainwater down comers for collections of rainwater to be routed directly into storm water drain. b) Required no of Area Pit(s)/Sump(s) shall be created broadly in the following areas to facilitate the collection of plant water (as applicable): 1) TG area (In TG ground floor) 2) Condenser pits & CW Valve pits area 3) Boiler area (Below the APH area in boiler ground floor) 4) CHP transfer point in the main plant area (One RCC pit/ sump for each TP) 5) CHP area 6) Limestone and Gypsum handling area 7) Vacuum pump sealing water area 8) Mill & Bunker area (At the end of MRS Trench) 9) ESP area (On rear side of ESP) 10) FOH area 11) Chemical storage area 12) Ammonia Unloading & Storage area 13) FGD area 14) Transformer area (s) 12) Other Clusters in the plant area etc. 13) Any other areas envisaged by the contractor to meet the drain separation philosophy for the complete plant c) Under drainage philosophy, broadly two categories of drains/water are required to be managed viz. Clear water and Contaminated water having trace of chemical, Oil, coal & ash. Clear water will be routed to CW channel and contaminated water will be diverted to Area Pit (s) / Sump(s). After oil skimming, contaminated wastewater of this sump(s) will be sent to Waste Service Water Sump (WSWS). Coal laden water shall		
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CLAUSE NO.	 SCOPE SUPPLY & SERVICES		
1.01.00	be sent to Coal Slurry Settling Ponds (CSSP). Ash laden water shall be sent to Ash slurry sump/tank. d) To meet that above requirement, RCC Area pit(s) / sump(s) and associated submersible pumps / Centrifugal pumps (Horizontal or vertical), piping, fitting, valves etc., as per requirements given below, to discharge the effluent/ wash water/ blow downs etc. from RCC pit/ sump to Liquid Effluent Treatment Plant (LETP)/ WWS/CSSP/ Ash Slurry Sump or tank (as the case may be) are to be provided, supplied and installed by the bidder. e) Bidder shall ensure that all materials and valves, submersible pumps, piping, fittings etc. shall be compatible with water quality for this project and the respective fluids therein mentioned in this chapter. f) Auto coupling arrangement type submersible pump of capacity 2X100% for each pit/ sump should be selected such that it shall generally evacuate the RCC pit/ sump within 20 minutes. The operation of the pumps shall be interlocked through level measurement devices to be installed in the RCC pit/sump so that the pumps shall start automatically and empty the RCC pit. Further, the discharge pressure of the pump should be enough to discharge the fluid handled to LETP (WWS)/CSSP/Ash Slurry Sump or tank/CW channel as the case may be, as per clauses mentioned below. g) For wash water from CHP transfer points area & Mill & Bunker Building Area, separate downcomers other than rainwater downcomers shall be provided by the bidder which shall carry the wash water to the RCC pit/ sump. TG Ground Floor Area a) The effluent from the TG Area pit(s) /sump(s) shall be pumped to Waste Service Water Sump (WWS) located in WTP area. b) A drain header with the funnels shall be provided along the columns in TG Building at various floor areas to which various vents, drains, other sources of water etc. shall be connected which shall finally be led to TG area pit(s)/sump(s). c) Condenser pits and CW valve pits shall be provided with raised dyke walls to avoid any oil spillage/ wash water into the condenser pit for ensuring oil free water. Submersible pumps shall be provided to pump the water collected in condenser pit to CW channel. d) All oil drainage shall be routed individually to a common collection tank for collecting oil or any such obnoxious material. Reusable part of oil from this tank shall be transferred to dirty oil tank or drum for further processing. e) ACW self-cleaning strainer/Debris filter flushing water shall be diverted to TG area pit/sump(s). Hot water drains of equipment shall be led to TG area pit/sump(s) after cooling suitably. f) Atmospheric/Unit flash tank drain sump and pumps shall be sized for initial clean-up flow during cold/warm/hot start-up including the spray flow of service water to flash tank to bring down the flash tank drain water temperature below 60 deg.C. g) Submersible pumps shall be permanently fixed in the pits/sumps. h) Further, refer tender drawing for scheme for plant effluent separation in TG area.		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIA-18 SEPARATION OF PLANT DRAINS FROM STORM WATER DRAINS	PAGE 2 OF 3

CLAUSE NO.	SCOPE SUPPLY & SERVICES		
1.02.00	Boiler Ground Floor Area The water shall be preferably be pumped from the proposed sump to Ash Slurry sump or Waste service water sump (WSWS), located at Liquid Effluent Treatment (LETP) plant depending on layout/quality of effluent. All hot water blow downs from boiler shall be led to the RCC pit / sump (s) in the boiler area.		
1.03.00	CHP transfer points area-The wash water from transfer points in plant area laden with coal particles shall be treated in coal slurry settling pond (CSSP).		
1.04.0	Mill & Bunker Building Area The wash water from mill floor area shall be collected in the mill floor area RCC pit/ sump(s). Separate RCC pit/sump(s) for the mill bays shall be provided. The wash water from various floor such as tripper floor, feeder floor, Mill base etc. shall be led through down-comer pipes to the RCC pit/ sump(s). This water collected in the RCC pit/ sump shall be led to Coal slurry settling pond (CSSP) by pumping.		
1.05.00	ESP Area The trench in/ around ESP area shall be suitably blocked to isolate it from storm water drain. The ash laden wash water from ESP area shall be collected in ESP area RCC pit/ sump(s). This water shall be led to ash slurry sump/ tank by pumping .Seal water from vacuum pumps shall also be led to the RCC pit/ sump (s).		
1.10.00	Ammonia Unloading & Storage Area Wash water/ rainwater of ammonia unloading, storage and handling area should be separated out from surrounding storm water drain. Further, Wash water/ rainwater of ammonia unloading, storage and handling area drain shall be collected (by making appropriate slope) in Waste ammonia/Water retaining Basin. The treated water from Waste ammonia/Water retaining Basin in ammonia unloading and storage area shall preferably be pumped from the basin to Ash slurry sump/tank.		
1.11.00	Fuel oil handling Area The wash water from the FOPH area containing traces of oil shall be pumped to oil water separator RCC pit in the fuel oil unloading area. The decanted water shall be reused/recycled for the washing of fuel oil handling areas. Parallely, decanted water shall be collected in FOH area RCC pit/ sump(s) and pumped to Employer's waste service water sump (WSWS) located in LET plant.		
1.12.00	Other Clusters in the plant Area Service water effluents from various other plant areas excluding WTP area shall be separately collected in Area pit(s)/sump(s) and pumped to WSWS located in LET plant.		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIA-18 SEPARATION OF PLANT DRAINS FROM STORM WATER DRAINS	PAGE 3 OF 3



SUB-SECTION–IIA-19

WORKSHOP, LAB M&C EQUIPMENT

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	WORK SHOP, LAB, M&C EQUIPMENT		
SI. No.	EQUIPMENT DESCRIPTION	QUANTITY	
H	ELECTRICAL TESTING EQUIPMENT		
	COMMON TEST EQUIPMENT		
1.	Precision grade Multimeter (Digital)	2 Nos	
2.	Fully Automatic digital Megger (0-15 KV) Motorised, 0-1KV hand operated	2 each	
3.	Tong tester-AC & DC (400 AMP)	2 nos	
4.	Portable earth resistance measurement kit based on three spike method(Earth tester)	1 no	
5.	Fully Automatic portable cable Fault Locator (cable test kit)	1 no	
6.	Grounding device/Earthing Device	2 nos	
7.	Pressure gauge (accuracy class 0.25%, Range-up to 100 Kg/cm2, LC-1 kg/cm2 Min)	2 nos	
8.	Digital Wattmeter, Ammeter, Voltmeter	1 each	
9.	Resistance Bridge: Kelvin Bridge	1 no	
10.	Fully automatic three phase dynamic relay test kit with necessary software for control and data storage. At least 4 nos. separate current and voltage channels,2 nos. DC channels, sufficient nos. of Binary Input and Output modules.	1 set	
11.	Vibration meter	1 no	
12.	Test kit for Transformer winding/ Winding resistance kit	1 set	
13.	Variable AC/DC source	2 nos	
14.	Dead Weight test (accuracy class min 0.05%)	1 no	
15.	Electro Pneumatic calibrator (accuracy 0.1% of full scale)	1 no	
16.	Fluidised Temp Bath (100-600 deg C, stability +/-0.2 % deg C)	1 no	
17.	Portable V-meter Calibrator	1 no	
18.	Resistance thermometer (bridge 0-2000, resolution 0-001, accuracy +/-0-005, sensitivity 0.001%, Amb Temp 50 deg C +/- 0.005% of span per 1 deg C	1 no	
19.	Decade resistance Box	1 no	
20.	Rheostat	2 nos	
21.	Test (reference) RTD	2 nos	
22.	Electromagnetic Core Imperfection Detector(EICID)	1 no	
23.	Recurrent Surge Oscilloscope for Gen. Rotor(RSO)	1 no	
24.	Portable PD Test set	1 no	
25.	Analog Phase sequence indicator	2 nos	
26.	Precision grade Digital Phase angle meter	2 nos	
27.	Precision grade clamp on current measurement kit suitable for measuring spill current in mA accurately. (Current range:0- 100 mA)	2 nos	
28.	Portable panel cutting machine.	2 nos	
29.	Complete set of screw drivers and nut drivers suitable for working in relay panels	3 nos	
30.	Maintenance toolbox and accessories for maintenance of LT MCC	2 nos	
31.	Maintenance toolbox and accessories for maintenance of HT MCC	2 nos	
32.	Hydraulic Crimping tools with dies suitable for sizes: 16 sq.mm to 630 sq. mm)	1set	
33.	Hydraulic Crimping tools with dies suitable for sizes: 300sq.mm to 1000 sq. mm)	1set	
34.	One complete set of torque wrenches of different sizes up to 200 N-m	2 set	
35.	Portable earth resistance measurement kit based on Stake less method (clamp on type)	1no	
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIA-19 WORKSHOP, LAB, M&C EQUIPMENTS
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CLAUSE NO.	WORK SHOP, LAB, M&C EQUIPMENT		
Sl. No.	EQUIPMENT DESCRIPTION	QUANTITY	
36	Non-contact tachometer	1no	
	FOR TRANSFORMER OIL ANALYSIS LAB		
1	Oil moisture analyser	1no	
	FOR GENERATOR & IP BUSDUCT		
1.	Fully automatic DC High Voltage Test Kit (H.V. Tester) (0-70 KV) /1A	1no	
2.	Fully automatic AC high voltage test kit, up to 50 kV/ 5A suitable for testing Generator and associated busduct etc.	1no	
3.	Fully automatic insulation analyzer (power factor & capacitance measurement) with resonating inductor (suitable for Generators up to 800 MW) test kit with necessary software for data storage and analysis. Voltage range: up to 12 kV. The analyser provided with interference suppression circuit and suitable for measurement up to live 765 kV Switchyard.	1no	
4.	Portable AC high voltage test kit, up to 50 kV/ 100 mA.	1no	
5.	Fully automatic portable micro-ohmmeter, winding resistance measurement kit for generator.	3 nos	
	FOR EXCITATION SYSTEM		
1	Four channel digital storage oscilloscope with Fast Fourier Transform analysis	2 nos	
2	Precision grade fully automatic 6 channel Digital recorder.	2 nos	
3	H2 leak detector	1no	
	FOR MOTORS		
1	Fully automatic Power quality analyzer kit with suitable attachments for energy survey of various feeders with necessary software for data storage & analysis	1no	
2	Fully automatic motor current signature analyzer for motors up to 11 kV, HT & LT motors with necessary software for data storage and analysis,	1no	
3	Motor surge tester (suitable for the largest HT motor)	1no	
4	Motor bearing puller based on induction heating method. (suitable for the largest HT motor)	1no	
5	Motor greasing device based on ultrasound detection principle	1no	
6	Hand operated grease gun	2no	
7	Motor checker, EMC-22	2no	
	FOR BATTERIES		
1	Fully automatic Battery impedance measurement test kit capable of measuring specific gravity of acid, temperature of cell etc. with data storage facility.	1no	
2	Fully automatic battery discharge unit up to 1000 AH DC system, with selectable current discharge current facility, Voltage & current monitoring facility and short circuit protection.	1no	
3	High sensitivity (able to detect high resistive faults), Precision grade Fully automatic DC earth fault locator in live DC circuit.	1no	
	FOR PANELS & ELECTRICAL EQUIPMENT (THERMOGRAPHY)		
1	Fully automatic infrared thermovision scanning system suitable for thermal scanning of switchyard equipment, panels etc and having facility of data storage on separate card with necessary software for analysis	1no	
	FOR CURRENT TRANSFORMERS		
1	Fully automatic Instrument transformer test set capable of measuring ratio, polarity and knee point voltage by secondary injection method, suitable for up to 765 kV equipment	1no	
2	Fully automatic precision grade primary injection kit suitable for testing 0.2 class EHV Current transformers (Current range: 0-2000 amp.)	1no	
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIA-19 WORKSHOP, LAB, M&C EQUIPMENTS
			PAGE 2 OF 5

CLAUSE NO.	WORK SHOP, LAB, M&C EQUIPMENT		
SI. No.	EQUIPMENT DESCRIPTION	QUANTITY	
3	Precision grade digital AC clamp on meter (0 – 2000 Amp)	1no	
4	Oil sample container 1L	12 nos	
	FOR PLCC SYSTEM		
1	Fully automatic digital Level oscillator & level measurement meter for PLCC system.	1no	
	<u>ELECTRICAL WORKSHOP EQUIPMENTS</u>		
S.No	Item description	Quantity	
1	EOT crane facility (suitable for handling the largest HT motor)	Lot	
2	Oven for drying of HT & LT motors insulation		
a	HT Oven (suitable for drying highest rating HT motor)	1 no.	
b	LT Oven (suitable for drying highest rating LT motor).	1 no.	
3.	Workshop T&Ps		
a.	High voltage AC test kit 25kV – 1A	1 no.	
b.	High voltage DC test kit 30kV – 200 mA	1 no.	
4.	Battery operated trolleys for handling of motors	2 nos.	
5.	Hydraulic Bearing & coupling half pullers and hydraulic jacks	1 Set	
6.	Set of box, D-shape, ring spanners	2 sets. of each	
7.	Induction heating machine suitable for highest rating motor bearing/coupling half.	1 no.	
8.	Gas cutting and heating equipment.	Lot	
9.	Electrical test bed for HT & LT drives.	1 no.	
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001 SUB-SECTION-IIA-19 WORKSHOP, LAB, M&C EQUIPMENTS PAGE 3 OF 5			

SINO	C&I Lab items		
1	Electronic test bench	No.	1
2	Pneumatic Test Bench	No.	1
3	Vacuum Tester	No.	1
4	Hydraulic Pressure gauge tester	No.	2
5	Vacuum Pump	No.	1
6	Tested /Calibrated High precision PG	No	1
7	Portable Electro-pneumatic Calibrator	No.	2
8	Thermocouple test furnace	No.	2
9	Mercury Thermometer	No of each range	12
10	Stop watches	No.	4
11	Standard Tool Box		2
12	Trimmer & Alignment tool kit	No.	1
13	Digital thermometer/Hygrometer	No.	2
14	Portable dry block type temp.calibrator	No.	3
15	Low temp Portable dry block type calibrator	No.	3
16	High temp portable dry block type calibrator	No.	1
17	Soldering/ De-Soldering stn	No	2
18	Portable digital tachometer	No	2
19	Digital multimeters		
20	Digital Multimeter – 4 ½ digits	No	2
21	Digital Multimeter – 5 ½ digits	No	1
22	Digital Multimeter – 6 ½ digits	No	1
23	Portable Digital Multimeter – 4 ½ digits	No	2
24	Portable Digital Multimeter – 3 ½ digits	No	2
25	Portable current/mV calibrator	No.	2
26	Variac	No.	2
27	Potentiometer/Rheostat		5
	a. 12A-3W	No	2
	b. 5A-18W	No	2
	c.2A - 47W	NO	2
	d.2A-100W	NO	2
	e.1A-470W	NO	2
28	Clip on A.C power meter & DC Chip on meter	No.	1

CLAUSE NO.	WORK SHOP, LAB, M&C EQUIPMENT				
	29	Portable flue gas analyzer	No.	1	In addition to this the testing equipments mentioned in CI 3.00 of B-04, 2.13.00 of B-17, 1.05.03 of II-B (Electrical system/equipments) shall also be supplied by the vendor.
	30	Optical fibre cable fault detector	No	2	
	31	Optical fibre cable splicing and joining equipment	No	1	
	32	External hard disks for mandatory backup purpose - 4 TB	No	10	
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-IIA-19 WORKSHOP, LAB, M&C EQUIPMENTS	
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SUB-SECTION-IIB

ELECTRICAL SYSTEM / EQUIPMENTS

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES 		
1.00.00	SCOPE The Bidder scope shall include design, engineering, manufacture, type testing, inspection & shop testing at supplier's works, packing, forwarding to site including customs clearance/ port clearance (if required), receipt and unloading, in plant transportation, handling and storage (preservation & conservation of equipment) at site, erection including associated civil and structural works, testing and commissioning of the Electrical equipment/ system and works as indicated in this chapter. The Electrical scope shall be as described briefly in the following clauses but not limited to it. Electrical system design, equipment selection and sizing: The Bidder's scope includes complete electrical system of EPC package including but not limited to the following. i) System design including Key SLD. ii) Equipment sizing criteria and design calculation iii) Cable route layout and interference design iv) Preparation of power and control cable listings and interconnection schedule v) Design of lighting, earthing & lightning protection systems vi) Design of 400kV switchyard (AIS) including protection and control vii) Design for switchgear buildings, control buildings and others. viii) Design for solar PV and interconnection with switchgears. ix) Design and sizing for complete DC system. The Design calculations shall include Steady state, transient study and protection coordination of the entire offered system. 1.01.00 Generator and Auxiliary System 1.01.01 Generator complete in all respects including stator, rotor, bearings, couplings, terminal pads with palms and all its associated supervisory and instrumentation system. 1.01.02 Complete hydrogen cooling, carbon dioxide and nitrogen gas systems as applicable including the necessary piping and pipe supports, valves, measuring system along with the control panel and gas cylinders.		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIB ELECTRICAL SYSTEM / EQUIPMENTS	PAGE 1 OF 28

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES 																						
1.01.03	Complete seal oil system including the necessary tanks, pumps, motors, coolers, strainers, piping and pipe supports, valves, measuring system along with control panel.																						
1.01.04	Complete water-cooling systems where applicable including the necessary tanks, pumps, motors, heat exchangers, strainers, piping and pipe supports, valves, measuring system along with control panel.																						
1.01.05	Complete excitation system (brushless or static type) with main exciter, excitation transformer, thyristors, pilot exciter, rectifiers and filters, field flashing and field forcing equipment, rotating diodes etc. as applicable along with the DAVR, de-excitation equipment, cables/bus duct and all necessary control, annunciation and monitoring equipment mounted on suitable panels. In case static excitation system is offered, suitable switching arrangement for isolation of excitation transformer from Generator bus duct and charging of excitation transformer from 11kV/3.3 KV electrical system (as alternative source for excitation system) for testing of excitation system shall also be provided. Necessary switchgear and cables for this purpose shall be provided by the contractor.																						
1.02.00	Generator Busduct and MV Busduct a) Generator Busduct and Auxiliary equipment b) Medium Voltage Busduct The standard equipment ratings have been specified in the relevant chapters																						
1.03.00	Generator Circuit Breaker - Not Applicable																						
1.04.00	Transformers: <table border="1"> <thead> <tr> <th>S.No</th><th>Equipment Name</th><th>Rating/Parameters</th><th>Quantity</th></tr> </thead> <tbody> <tr> <td>1.</td><td colspan="3">POWER TRANSFORMERS / REACTORS / AUXILIARY OIL FILLED TRANSFORMERS</td></tr> <tr> <td>i)</td><td>Generator Transformer</td><td>as per SLD & System Requirement</td><td>4 (3+1 Spare) Nos.</td></tr> <tr> <td>ii)</td><td>Shunt Reactor(s)</td><td colspan="2">as per SLD & System Requirement</td></tr> <tr> <td>iii)</td><td>Station Transformer (ST)</td><td colspan="2">as per SLD & System Requirement</td></tr> </tbody> </table>			S.No	Equipment Name	Rating/Parameters	Quantity	1.	POWER TRANSFORMERS / REACTORS / AUXILIARY OIL FILLED TRANSFORMERS			i)	Generator Transformer	as per SLD & System Requirement	4 (3+1 Spare) Nos.	ii)	Shunt Reactor(s)	as per SLD & System Requirement		iii)	Station Transformer (ST)	as per SLD & System Requirement	
S.No	Equipment Name	Rating/Parameters	Quantity																				
1.	POWER TRANSFORMERS / REACTORS / AUXILIARY OIL FILLED TRANSFORMERS																						
i)	Generator Transformer	as per SLD & System Requirement	4 (3+1 Spare) Nos.																				
ii)	Shunt Reactor(s)	as per SLD & System Requirement																					
iii)	Station Transformer (ST)	as per SLD & System Requirement																					
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIB ELECTRICAL SYSTEM / EQUIPMENTS PAGE 2 OF 28																				

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES 			
1.05.00 1.05.01	S.No	Equipment Name	Rating/Parameters	Quantity
	iv)	Unit Transformer (UT)	as per SLD & System Requirement	
	v)	Auxiliary Transformers (including LT Outdoor)	as per SLD & System Requirement	
	vi)	INDOOR Transformers (Epoxy cast resin)	as per SLD & System Requirement	
	vii)	Neutral Grounding Reactor & Surge Arrester for Shunt Reactor	as per SLD & System Requirement	
	2.	TRANSFORMER MAINTENANCE TESTING & MONITORING EQUIPMENTS	Refer Sub-Section B-04, Part-B of Technical Specifications	
	3.	NGR	as per SLD & system requirement	
	4.	SPARE OIL	Refer Transformer Sub-Section, Part-B of Technical Specifications	5% of total Volume for all Transformers & Reactor
	The preferred standard Transformers ratings shall be as indicated in a typical key single line diagrams Drgs. No XXXX-999-POE-J-001 enclosed in Tender drawings. Note: Generator Transformer (GT) nominal tap position design may be ensured.			
	SWITCHGEAR 11kV and 3.3kV SWITCHGEAR (MV SWITCHGEARS) The scope shall include 11 kV & 3.3 kV Switchgear boards as required (a typical key single line diagram for Aux Power Supply Drawing No XXXX-			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-IIB ELECTRICAL SYSTEM / EQUIPMENTS PAGE 3 OF 28

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES			
1.05.02	999-POE-J-001 enclosed). The design and sizing criteria of the Switchboards shall be as detailed at chapter B-0/B-05(A). All the Switchboards shall have minimum two (2) no of modules(2 no's motor feeder/2 no's of transformer feeder/1 motor and 1 transformer feeder) as spares in each section. Highest rating of each motor and transformer feeder must be included in the spare. . If only motors are there on a particular board/ section, minimum 2 no. of motor feeders shall be supplied by the bidder. It is preferable to supply MV Switchgear from a single manufacturer. Contractor's scope also includes the supply and laying of Insulating mat in front of 11/3.3kV Switchgears in switchgear rooms.			
	LV SWITCHGEARS AND LV BUSDUCTS The scope of work includes the following for feeding all the LV Loads of the power plant as required (a typical key single line diagram for Aux Power Supply Drawing No. XXXX-999-POE-J-001 enclosed). The LV switchgears is of Intelligent type for Motor controller. The design and sizing criteria of the Switchboards shall be as detailed at Chapter B-0/B-06. The major LT Switchgear shall include the following: 415 Volt Switchgears 415 Volt Motor Control Centers 415 Volt AC Distribution Boards 220 V DC/110 V DC Distribution Boards 415 Volt AC MCCB Boxes 220/110/ Volt DC MCCB Boxes andLocal Motor Starters -for ventilation fans (up to 5.5 KW) Local Emergency Push Buttons(EPB) -for all motors except ventilation fans Telescopic Trolley for Breaker Handling MLDB/WLDB with Lighting/Welding Transformers (2 no's of MCCB both at Primary and Secondary End of Transformer shall be provided) Intelligent Motor control device Wall mounted Power Distribution Board. LV Bus ducts & Associated Support Structure			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIB ELECTRICAL SYSTEM / EQUIPMENTS	PAGE 4 OF 28

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES			
1.05.03	Sandwich Busduct and Support Structure			
	Spares (MCCB Modules less than 100 A and MPCB Modules): All Switchgears, Motor Control Centres (MCCs) & AC/DC distribution boards, etc. shall have at least twenty per cent (20%) or minimum two (whichever is higher) fully equipped MCCB/MPCB modules of each rating as spares which shall be uniformly distributed over different vertical sections.			
	Spares (MCCB modules—100A and higher/Starter/DAE-OG/DM Modules): In addition, all Switchgears, MCCs and AC distribution boards shall have as spares at least twenty per cent (20%) of starter modules/MCCB/DAE-OG/DM modules or at least one module (whichever is higher) of each rating range of the selection table, equipped for the rating of the largest auxiliary fed from that range.			
	It is preferable to supply LT Switchgears and LT Bus ducts from one/ two manufacturers.			
	In addition to above, LV Switchgears/MCCs/feeders, as indicated under Clause 1.19.00, required for Employer’s requirement shall also be in Contractor scope.			
	Contractor’s scope also include supply and laying of the Insulating mat in front of LT Switchgears in switchgear rooms.			
	Switchgear /Numerical Relay Networking			
	The Contractor’s scope of work shall include the following for all the 11KV/ 3.3KV and LV Switchgears under this package. The communication architecture and design criteria have been explained in chapter B-05(B) of the specification.			
	The Contractor’s scope of work shall include complete design, engineering, supply, installation, testing and commissioning and AMC (Three Years) of the following.			
	a) Communicable Numerical Relays (with IEC 61850) in all MV Switchgears & LV Switchgears.			
	b) IEC 61850 Ethernet switches in Switchgear panels – Sufficient quantity of Ethernet switches as per requirement for all boards. At least 2 ports per switch shall be kept as spare ports.			
	c) Cat5e Ethernet cable / FO cable for connection of Numerical Relays to Ethernet switches in all Switchgears.			
	d) Optical Fibre Cable with fire-retardant outer sheath as required for the			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-IIB ELECTRICAL SYSTEM / EQUIPMENTS
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES			
1.06.00	complete numerical relay network. e) Optical Fibre Cable termination equipment such as LIU, patch cord, etc. for the complete network. f) HMI stations (Engineering & Operator Workstations and printers) & suitable arrangement for integration of HMI to DCS in Control Room. g) GPS, Time synchronizing equipment & Digital Clocks. h) Laptops – 5 Nos & Interface cables for connection of Numerical relay front port to the laptop – One No. cable of length at least 5m per switchboard Shall be provided. i) All other equipment required to meet the intended specification. j) The scope shall include the AMC Contract for the above specified system for a period of three years from the date of takeover by the Employer. k) Relay Test Equipment. 2 Nos. The typical configuration of such a proposed system is as enclosed in Drawings 0000-205-POE-A-001. The numerical relay network shall include relays on all MV & LV switchgears being supplied under this package including Employer’s requirement indicated at 1.19.00.			
	DC System: Battery and Battery Charger Lead acid plante type/ Nickel Cadmium batteries and Float cum boost chargers for main plant, switchyard and all other areas in the scope of the contractor, as per system requirement. Following DC systems (Battery and Charger) shall be supplied to cater to various DC loads in the plant. The design and sizing criteria shall be as detailed out in the chapter B-0, Part-B of Technical specifications. 220V DC System for Main Plant and FGD 220V or 110V DC System for AHP/Ash silos/Raw water Pump house 220V DC System for CHP/LHP 220V DC System for Switchyard 220V or 110V DCSystem for WTP/CT/CW Area			
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES	
	(l.) The Contractor shall provide complete detailed cable tray layout drawings for contractor scope of area. The detail cable tray layout includes tray layout of different platforms, floors, cable shafts, inter connection of buildings/interplant cable tray layout for feeding all the electrical loads viz HT motors, LT motors, DC motors, panels, instruments, JB's etc. The cable tray layout comprises of sufficient/exact number of cable trays, size, elevation, distances, clear view, sectional detail, cable tray numbering etc. as per the contractor equipment of Electrical/C&I loads etc. (m.) The cable tray layout drawing shall indicate cable routes in contractor scope of area. The contractor shall supply and install these cable routes for contractor's cable covered in Electrical and C&I sections. (n.) The Contractor shall also prepare and submit 3D model of cable tray layouts clearing floor beams/equipment's etc. The cable tray Routes shall be supported at an interval of 2Mtr from floor beams/structures and shall be routed with minimum bends along with shortest route. (o.) Complete cable erection includes supply and erection of all the accessories such as rigid/ flexible conduits, fittings, junction boxes, tying materials, cable tags, and markers, support structures, cable trays, cable termination, junction boxes etc. shall be under the scope of contractor. (p.) Contractor shall provide Auto cad drawings, for all buildings under his scope along with equipment layout/sections. Architectural drawings shall also be provided. (q.) The contractor shall furnish the complete and consolidated feeder list for DC system, LT system and HT system for all loads and drives under the scope of supply of contractor to Employer. Contractor shall indicate the location of his equipment in feeder load list in mutual agreed format. (r.) Contractor shall furnish the cable schedule as per mutually agreed format for all the cables under his scope of supply under Electrical and C&I section. (s.) Control interconnection charts/ diagram/equipment layout/layout for cables between Contractor's equipment's shall also be prepared by bidder. (t) The contractor shall provide trestle as identified in the Pipe & Cable trestle layout Drg no XXXX-999-POM-F-006A. Typical section of cable	
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES 		
1.09.00 1.09.01 1.09.02 1.10.00 1.11.00	tray arrangement is indicated in Drg. NoXXXX-999-POE-J-004 "Typical section of cable tray arrangement in trestle". In addition to above, cabling works, as indicated under Clause 1.19.00, if required for Employer's requirement shall also be in bidder scope. CABLES: HT Power Cables HT power cables required to feed the transformer feeders, motor feeders and inter-stage connection and all feeders as indicated in typical key single line diagrams for Aux Power Supply (Drg. No XXXX-999-POE-J-001) along with necessary termination, lugs and glands. It is preferable to supply HT power cable from one/ two manufacturers. LT Power and Control Cables Supply of LT Power and Control cables along with interplant control and protection cabling, necessary termination, lugs & glands as required for all systems covered under this package as per Drg. No XXXX-999-POE-J-001. Earthing and Lightning Protection Below and above ground earthing mat/Grounding and lightning protection for the complete buildings, switchyard and equipment's in the Contractor's scope. Bidder's scope shall also include interconnection of Earth grid with existing grid of stage-I at various locations. All earthing in BOP area shall be treated earth pits as per latest Indian Standard and IEEE guidelines. Contractor shall prepare complete earthing and lightning protection layout drawings of all the areas covered under this contract. Station Lighting Bidder's scope includes the following: Design and Supply of Station lighting system for the plant, buildings and equipment under Bidder's area. Lighting fixtures complete with lamps & accessories, LED lighting fixture complete with driver circuit & accessories, Lighting Panels, Receptacles,		
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES		
1.12.00 1.13.00 1.14.00 1.15.00	Switch boxes, Conduits. Lighting Wires, Ceiling fans or Wall mounted fans with regulators, lighting poles, Lighting masts, Earth wires and rods, Junction boxes, Battery operated automatic self-contained lighting fixture, Maintenance ladders (Minimum 02(two) nos as required shall be provided in each area of Boiler , turbine and 1no in each building. Scope shall also cover all interior and exterior lighting such as area lighting, aviation obstruction lighting, street lighting, security lighting etc. LED type lighting fixtures shall be provided for Lighting Mast. Contractor shall prepare complete lighting layout drawings of all the areas covered under this contract. Mandatory spare parts and maintenance equipment as required. Out of the total requirement of lighting mast envisaged for station lighting, at least Twenty (20) Lighting Masts (30M height) shall be supplied, erected and commissioned at locations identified by Site Engineer prior to construction phase which shall cater to construction lighting and same shall later function as permanent lighting. LED type lighting fixtures shall be provided for Lighting Mast. Minimum 10 number of mobile lighting mast with DG set and fuel shall be provided for construction lighting and are non-returnable. DG SET Two Nos. Diesel Generator sets (One main and one standby) with acoustic enclosure of stationary type suitable for outdoor installation to be provided Additionally, one (1) number separate DG set along with acoustic enclosure of stationary type suitable for outdoor installation shall be provided for meeting emergency load requirement of FGD system. Mandatory spare parts and maintenance equipment as required. NA Control Philosophy for plant Electrical System Control of Electrical System of Main Plant, EHV Breakers of Generator Bay and Balance of Plant (BOP) shall be provided from DCS with suitable ECD (Electrical Control Desk) and/or Soft HMI. The details of the same are specified in relevant sections of Control and Instrumentation. CONSTRUCTION POWER		
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES	
	1. Terminal point of construction power shall be 3.3KV Switchgear which is being fed from 33/3.3KV Transformer. 2. The Bidder's scope includes to extend the 3.3 kV supply by installing new Packaged substation(PSS)/ pole mounted/Pad mounted transformers with proper fencing arrangements and associated switchgears (meeting the safety requirements as per IE Rules) at the required location for meeting the construction power requirements of stage-II. ii. The bidder's scope includes supply, erection, testing and commissioning of overhead lines, ring mains (if required), single pole/double pole/four pole structures with switches, fuse, lightening arrestors, LT transformers, 415Vswitchboards, power and control cables, DC systems etc. as required for further distribution for meeting the construction power requirements. iii. The Bidder's scope also includes the reroute/reinstall/relocate the existing overhead line/substations and at new required location with mutual agreement with Owner for extending the construction power supply from 3.3KV switchgear (If required). All the cost of rerouting/reinstallation line/substations shall be in the Bidder's scope. iv. Bidder's scope also includes maintenance of entire construction power system (for the network constructed by the bidder for stage-II Project Execution) including providing of necessary maintenance spares to maintain the uninterrupted power supply during project construction phase. However, maintenance of the main substation 33/3.3kV is excluded from the scope of the bidder. v. All necessary statutory requirements for charging construction power bidder's network shall be in the bidder's scope. The bidder shall also provide power for meeting the Employer's office/miscellaneous power requirements as indicated in Employer's requirements under Clause 1.19.00. vi. Construction power supply network, within the plant, is a temporary arrangement which shall be used during the project construction phase. To meet this requirement, the equipment's may be arranged by Bidder either by shifting their existing equipment's at other installation or by fresh procurement, which may be taken back after commissioning of the project.	
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES 			
	1. Suitable metering arrangement along with associated Instrument transformers and Metering Cubicles meeting the DISCOM requirements shall be provided by the bidder at supply point of Construction power, for the measurement of actual energy consumed. The charges for the actual energy consumed by the bidder (Energy Charges Only) shall be recovered by the Employer based on prevalent rate of DISCOM and type of connection used. Complete construction power arrangement along with power drawl limits shall comply with respective DISCOM service rules. vii. The Contractor shall maintain a minimum drawl power factor as per DISCOM regulations for their substations, and all such devices for maintaining power factor shall be under the scope of contractor. viii. Even though the Employer shall make all efforts to maintain the main 33/3.3kV Construction power substation a continuous supply of construction power, the same is not guaranteed and Employer shall not be responsible for any loss or delays which the contractor may suffer on this account. Also, the Employer shall not entertain any claim for exemption/ reduction of liquidated damages for delay in execution of the contract due to irregular power supply. Contractor shall arrange/provide necessary backup arrangement on his own for uninterrupted power supply. ix. All temporary cabling/wiring/switching arrangement must comply with local regulations and will be subject to Employer's inspection and approval before connection to supply. 1.16.00 SWITCHYARD The scope of work comprises of Design, supply, erection, testing and commissioning of 400kV extension bays at existing Singareni TPS Switchyard as shown in Single Line diagram(XXXX-999-POE-J-002 associated with Singareni TPP Stage-II (1X800MW). The existing 400kV Switchyard is provided with one and half breaker scheme. The switchyard shall employ switching scheme as indicated in single line diagram. Scope of work shall also include Switchyard control room building along with air-conditioning of control room building, ventilation system for			
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES			
	MCC/Switchgear/Panel/Battery rooms etc. and associated civil & structural works at Singareni TPP Stage-II (1X800MW). The scope of work shall also include overall project management, co-ordination, design, engineering, supply, erection, testing and commissioning of AIS Switchyard and take off Gantry at both (Switchyard & plant) end and associated civil and structure works along with civil works for Bus Reactor, Switchyard Service Transformer. The scope of work shall comprise, but not limited to the design, engineering, manufacture, testing and inspection at manufacturer's works, packing, supply, transportation, transit insurance, delivery to site, unloading, storage and equipment erection including associated civil & structural works. Further the scope shall also include the cabling, lighting, lightning protection, earthing, association of sub vendors in the erection, supervision, site testing, inspection and commissioning.			
1.16.01	400kV AIS Switchyard Bay details: Bay details are as shown in the Single Line diagram associated with Singareni TPP Stage-II (1X800MW).			
1.16.02	Equipment and materials: I. 400kVAIS equipment: Circuit breakers (With /without CSD), Disconnectors/Isolators (With or without Earth switch), Current Transformers, Surge arresters, Bus Post Insulators, Capacitor voltage transformers etc., II.400kVSwitchyard materials: • 4" EHIPS Aluminum tube as required • ACSR 'Moose' Conductor for as required • 10.98mm dia G.S. Earth wire as required • Insulators and hardware as required			
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES	
	• Clamps, connectors and spacers as required • JBs and Bay Marshalling kiosks as required • Galvanized Steel Structure • Complete earthing grid of present scope of bays (inclusive of supply of 40mm dia MS rod and GI flat) for earthing of all switchyard equipment, antiweed, PCC& Gravel filling as required. • Bidder's scope shall also include the complete interconnection of Earth grid with existing Earth grid of Stage-I switchyard. • Removal of gravel in present scope of bays for equipment foundation/erection if required and its relaying with new gravel is in the scope of the bidder. • Contractor shall make earth resistivity measurements at site (based on four electrode method) and design the earthing grid as per IEEE: 80 (Latest edition) and Gravel filling of switchyard. Earthing of all switchyard equipment's and its connection to earthing grid. Also, connection of switchyard earthing grid with main plant earthing grid. Earth pit as per IS 3043 as required. • Complete Direct Stroke Lightning Protection using Lightning Mast and/or shield wire and its connection to earth mat as required 400kV switchyard of present scope of Bays and Transformer yard. • Supply and laying Armoured Power and control cables, Armoured FO Cables, screen cables, cabling (including inter and intra panel), cabling between Contractor supplied equipment and Owner supplied equipment required. Etc. and from present scope of panels to existing panels to complete the system is in the scope of Bidder. Cable trenches, cable support angles, cable trays and accessories as necessary for cable erection such as glands, lugs, clamps for cables, ferrules, cable ties, Hume pipe etc. cable route markers for buried cable trench are also included in the scope.	
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES 		
	• Scope of work shall also include construction of the new cable trenches, Roads, drains, fencing required for present scope of bays and its interconnection to existing cable trenches, sump pit, drains, storm water drain etc., Fencing etc. • Dismantling of existing fencing roads, temporary sheds and building, foundations, re-routing of pipe lines above the ground and below the ground available in present scope of bays is also in the scope of the bidder. ▪ Switchyard Control room Buildings • AC & Ventilation of Control Room Buildings • Indoor, outdoor Lighting and its accessories. Lightning Mast / Lighting mast shall be used for mounting lighting fixtures for outdoor switchyard lighting. Mounting of Lighting fixtures on towers/ gantries is not permitted. 1.16.03 The equipment and materials to be supplied by the Contractor shall form a complete 400kVAIS at Singareni TPP-II. The equipment and services as detailed in all sections of the bidding documents and as shown on the Single Line diagram shall be within the scope of supply of the Contractor. It is in the interest of the contractor to acquaint himself with the site conditions and scope before submission of offer. 1.16.04 The list of items covered under the scope of supplies is as mentioned above. Any items though not specifically mentioned but which are required to make the switchyard complete in all respects for its safe, efficient, reliable and trouble-free operation shall also be deemed to be included and the same shall be supplied and erected by the Contractor, unless they are specifically excluded in the text of exclusions given in relevant section. 1.16.05 Following shall be provided for Control & Protection of EHV system and Generator Relay Panels. a) All Hardware/software components required for Integration of protection relay and IEDs being proposed under this contract with the existing stage-I switchyard SAS system for control and protection shall be in the scope of bidder. Complete Integration of Stage-II relays with		
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	the Existing Stage-I SAS shall also be in the scope of the bidder only. Any items though not specifically mentioned but which are required to make the complete integration of stage-II relays with Existing Stage-I SAS in all respects for its safe, efficient, reliable and trouble-free operation shall also be deemed to be included and the same shall be supplied and commissioned by the Contractor, unless they are specifically excluded in the text of exclusions given in relevant section. Upgradation of present SAS servers at 2X600MW (Stage-I), if required is also in bidder's scope. Protection & Control system shall be provided with Numerical relays. Cyber security guidelines issued by CEA/GOI shall be followed while designing and configuring SAS. b) Switchyard Control Room shall be complete in all respect including auxiliary systems. c) AC & DC power supply system for entire EHV system Bay equipment. d) Panel mounted Bay Protection Units (BPU) & Bay Control Units (BCU) for all 400kV bays along with SAS Panels and Switchyard OWS & EWS shall be located in the switchyard control room as per the SAS Architecture Drawing. e) Bus bar protection integration (Peripheral Unit in the scope of Bidder) in the existing Stage-I bus bar protection for all 400kV bays under present scope shall be in bidder's scope. Necessary Input cards required for CU in the existing BB Protection relay will be supplied by the Employer. Bidder must indicate the number of CT Inputs required for the integration Purpose. Peripheral Unit for integration with existing busbar protection relay shall be provided by the Bidder. f) Control, metering and protections of all 400kV bay systems of stage-II (1X800MW) shall be as per relevant tender SLDs. g) Bidder's scope includes integration and interfacing requirements of SAS system under present scope of 400 kV bays under this contract. h) Bidder's scope also includes above interfacing SAS requirements for the generator bay, reactor bay and 2 station transformer bays in the existing Stage-I SAS System. i) Bidder shall provide necessary trip relays; multiplication relays any other hardware associated cabling etc. as required to achieve the integration	
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	and interfacing requirements. The bidder shall also provide the B/B relay setting calculations and revised relay settings on account of new bays getting added to the switchyard. j) ABT Energy meters k) Networking of the ABT Energy meters supplied under this contract shall be in the scope of the vendor. l) Network Features of ABT Energy metering system shall be at par with SAS and ABT Network shall be separate from the SAS network. m) Time synchronization equipment (TSE) for switchyard and GRP. n) Islanding scheme for 400 KV switchyard bays: Bidder's scope includes integration of bays under present scope with the existing Islanding scheme at Stage-I (2X600MW). Necessary hardware required and any associated cabling is in the scope of the bidder. o) Protection panels for Gen, GT, UT (GRP) along with OWS and EWS to be located in corresponding CER/CCR and to be networked as per the SAS Architecture Drawing. One number generator DR with both slow and fast scan feature to located in each GRP. p) All networking accessories and workstations as per SAS Architecture Drawing. In addition to the above, the following shall also be provided: - 1. All interconnecting facilities between substation automation system and Generating plant control system (Main Plant DDC). 2. All third-party interfaces with TSTRANSCO as per tender drawing for SAS Architecture. 3. All control cables/FO Cables within switchyard, main plant and also for interface between main plant, various transformers and switchyard for the realization of control and protection scheme. 4. Recommended relay setting & SCD/ICD files for owner's review and approval for switchyard bays under present scope. 5. Required SCD/ICD/IID/CID Files of the base under this contract for integration of the relays/ BCU supplied under this contract with the existing Stage-I SAS system.	
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	6. A hardware-based firewall shall be provided with a minimum of 5GB Ethernet Ports having License for at least 5 years for sharing the necessary data from SCADA to SLDC/Transco etc. 7. 3 phases dedicated CT and CVT for metering as per TSERC proceedings No. TSERC/SECY/13 /2015, dated 02.02.2015 and CEA metering regulations (main & check meters & separate CT & CVTs for standby meter) shall be provided for Stage-II ST bays, GT bay and reactor bay – to comply with the latest order received from TSTRANSCO on grid connectivity approval. 8. All energy meters are compatible to ABT and EBC data base. Specification of energy meters shall be as per TSTRANSCO guidelines. 9. The CTs, CVTs and ABT energy meters (0.2s) are to be provided as per TSDISCOM/TSTRANSCO specifications and shall be got tested at NABL accredited laboratory in the presence of TSTRANSCO/ DISCOM officials. 10. The detailed plant metering scheme for generation has to be submitted to the Chief General Manger IPC&RAC, TSNPDCL, Warangal for approval before Installation and commissioning. 11. Bidders shall liaison or coordinate with TSTRANSCO / TSNPDCL official in getting synchronization approval as per letter. 12. Layout and installation of protection scheme for lines, bays and all equipments as per norms and shall got approved by competent authority.	
1.17.00	ELECTROSTATIC PRECIPITATOR (ESP) 1) High voltage transformer-rectifier sets complete with bus sections, grounding switches, controls, leveling wheels, etc. 2) Insulators along with heating system or ventilation system complete with fans, heaters and necessary control etc. to avoid moisture condensation for insulator compartments.	
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	3) ESP MCC's for power supply to all ESP loads viz.TR Set Controllers, rapper motors/ Plungers, Hopper heaters, Wrap-around heaters, Insulator heaters, Ash Level Indicators, Opacity Monitors, control panels and hoists etc. One MCC, fed from a dedicated ESP service transformer, shall be provided for each pass of ESP. Standby ESP transformers shall also be provided. 4) Single phase or Three phase High voltage transformer-rectifier (HVTR) set or Switch Mode High/ Medium Frequency Transformer Rectifier set or in combination of both. 5) The contractor shall furnish the complete and consolidated feeder list for DC system, LT system and HT system for all loads and drives under the scope of supply of contractor to employer. SFU feeders shall be provided for Hopper heaters, Insulator's heaters, marshalling cabinet for ALI. 6) Complete microprocessor-based ESP management and control system including the intermittent charging TR set controllers, rapping system controllers, communication controllers etc. The system provided shall be capable for integrated operation from UCB and shall be provided with compatible PC, printer, keyboard, TFT monitors etc. for control of all ESP systems. Additionally, redundant LAN port shall be provided for integration with station wide LAN of DDCMIS. 7) One set of "NO" & "NC" contacts (suitably wired up to field JB's) of High- and Low-level switches of each ESP ash hopper (except hoppers in First to Third Field) shall be provided for remote use. In First to Third Field ESP ash hoppers, Radar based or 3D type Acoustic Frequency Waves based Level Scanner System shall be provided for continuous level monitoring. 8) Contractor shall provide two (2) independent routes for the cables between ESP control room and ESP. Cable trays on these routes and also inside the ESP area shall be in vertical configuration. Contractor shall provide the cable trays along with its supporting structure arrangement on his scope of trestles. 9) Drive motors and actuators, couplings and coupling guards for all rotating auxiliaries. 10) Requirement of UPS if any shall be under the scope of contractor.		
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES			
1.18.00	CHP/AHP ELECTRICALS The control system for all the ash handling and Coal Handling Plant (Main plant scope) drives shall be DCS based as indicated in C&I chapter.			
1.18.01	Local control panels for coal handling plant & ash handling plant as indicated in relevant chapter.			
1.18.02	Variable frequency drives for rotary feeders in silo area and other drives as per system requirement.			
1.18.03	CHP ELECTRICAL SYSTEM a) Supply and Installation of HT Load Break Switches & Dry type transformers for Stacker& Reclaimer, HT junction boxes, Local control panels etc., for Coal Handling Plant as indicated in relevant chapter. b) Two (2) nos. DC MCCB Boxes shall be provided at each MCC location of DC requirement which shall receive 220V DC from the main CHP DCDB. In addition to that, one (1) no DC lighting board for emergency lighting shall be provided in each MCC rooms taking one (1) no MCCB feeder from each bus-section of CHP DCDB.			
1.19.00	EMPLOYER’S REQUIREMENT In addition to above, following items required for Employer’s use are also included in bidder’s scope. These equipment’s shall conform to technical specification requirements as stipulated in Part B for respective equipment’s. 1. 415V switchgear feeders as indicated below (at suitable location to be decided during detailed engineering). (a) 4 Nos. MCCB–125A (b) 4 Nos. MCCB–250A (c) 4 Nos. MCCB-400 A (d) 6 Nos. ACB outgoing – 1000 A (in unit emergency switchgear and station service switchgear for feeding owner’s loads). Supply of cable and associated cabling work for the above feeders is not in Bidder's scope of supply			
1.20.00	PAINTING FOR ELECTRICAL EQUIPMENT Unless explicitly stated in relevant chapters of the specification, the painting of all electrical equipment shall be as follows:			
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	The thickness of finish coat shall be minimum 50 microns (minimum total DFT shall be 100 microns). However, in case electrostatic process of painting is offered for any electrical equipment, minimum paint thickness of 50 microns shall be acceptable for finish coat. In case procedure is not indicated, Epoxy based paint with suitable additives shall be used. Paint shade for various Equipment shall be as follows:																															
	<table><tr><th>Sl no.</th><th>Item Description</th><th>Procedure</th><th>Paint Shade</th></tr><tr><td>1.</td><td>Generator and Auxiliaries</td><td>-</td><td>RAL 5012</td></tr><tr><td>2.</td><td>Motors</td><td>-</td><td>RAL 5012</td></tr><tr><td>3.</td><td>VFD Transformer and Reactor Enclosures</td><td>-</td><td>RAL5012</td></tr><tr><td>4.</td><td>VFD Panels</td><td>-</td><td>RAL 9002 Front and Rear RAL 5012 Sides</td></tr><tr><td>5.</td><td>Transformers and Oil Tanker</td><td>a) Inside of Tank and Accessories-Oil and Heat Resistant b) External surface of transformer and accessories- Chemical resistant epoxy zinc phosphate primer, MIO (Micaceous iron oxide) as intermediate paint followed by polyurethane finish paint.</td><td>Full Glossy White RAL 5012</td></tr><tr><td>6.</td><td>Transformers-Cooler &</td><td>a) External surface- ISO 12944-5:2018, Table D.1,</td><td>RAL 5012</td></tr></table>	Sl no.	Item Description	Procedure	Paint Shade	1.	Generator and Auxiliaries	-	RAL 5012	2.	Motors	-	RAL 5012	3.	VFD Transformer and Reactor Enclosures	-	RAL5012	4.	VFD Panels	-	RAL 9002 Front and Rear RAL 5012 Sides	5.	Transformers and Oil Tanker	a) Inside of Tank and Accessories-Oil and Heat Resistant b) External surface of transformer and accessories- Chemical resistant epoxy zinc phosphate primer, MIO (Micaceous iron oxide) as intermediate paint followed by polyurethane finish paint.	Full Glossy White RAL 5012	6.	Transformers-Cooler &	a) External surface- ISO 12944-5:2018, Table D.1,	RAL 5012			
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		Radiators	System no. G5.05 b) Internal surface- Hot oil proof, low viscosity varnish and subsequent flushing with transformer oil	NA	
	7.	Transformer marshalling Box	-	SS No painting	
	8.	Dry Type Transformers	a) External Surface of Enclosure b) Internal Surface of Enclosure	RAL 5012 Full Glossy White	
	9.	MV and LT Switchgear,	a) Front and Rear b) Extreme ends c) AC and DC MCCB Box d) Local Push Button Stations e) Lighting and Welding trf	RAL 9002 RAL 5012 RAL 9002 RAL 9002 RAL 9002	
	10.	IPBD/ MV Bus Ducts/LT Bus Ducts	a) Exterior b) Interior c) Conductor surface	RAL 5012 Matt Mat Black/Manufacturers standard/Painted Aluminum alloy	
	11.	NGR Cubicle	a) Heat Resistant Paint system b) Interior	RAL 5012 Glossy White	
	12.	PT-VT Cubicle	a) High quality Primer and Two coats of Synthetic enamel paint b) Interior	RAL 5012 Glossy White	
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-IIB ELECTRICAL SYSTEM / EQUIPMENTS	PAGE 22 OF 28

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES 			
	in the relevant schedule of Section - VII- (BPS) and the same shall be considered for the evaluation of the bids. The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract and upon certification by the Employer's engineer. 2. The type tests shall be carried out in presence of the Employer's representative, for which minimum 07 days' notice shall be given by the Contactor. The Contactor shall obtain the Employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set-up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out. 3. In case the Contactor has conducted such specified type test(s) within period as per Table-A (of clause no. 1.23.00 of this chapter) as on the date of bid opening, he may submit during detailed engineering the type test reports to the Employer for waive of conductance of such test(s). These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The Employer reserves the right to waive conducting of any or all the specified type test(s) under this contract. In case type tests are waived, the type test charges shall not be payable to the Contactor. 4. Further the Contactor shall only submit the reports of the type tests as listed in "LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED" and carried out within period as per Table -A (of clause no. 1.23.00 of this chapter) from the date of bid opening. Such type tests shall be under "Report category" These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. However if the Contactor is not able to submit report of the type test(s) conducted within period as per Table -A (of clause no. 1.23.00 of this chapter) from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the Contactor shall conduct all			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-IIB ELECTRICAL SYSTEM / EQUIPMENTS PAGE 24 OF 28

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES																																
	such tests under this contract at no additional cost to the Employer either at third party lab or in presence of client/Employers representative and submit the reports for approval. Table-A <table><tr><th>S.No.</th><th>Equipment</th><th>Type test report validity (in years)</th></tr><tr><td>1.</td><td>Generator & Excitation System</td><td>10</td></tr><tr><td>2.</td><td>HT and LT Motors</td><td>10</td></tr><tr><td>3.</td><td>VFD (including panels, AC/DC Reactors, Transformers (in case of non-integrated type)</td><td>10</td></tr><tr><td>4.</td><td>a. Power Transformers (GT, UT, ST, ICT) and Reactors b. OLTC c. Power transformer Bushing / Reactor Bushing (132kV and above class) d. Neutral Grounding Resistor e. Neutral Grounding Reactor f. Auxiliary oil filled transformer and dry type transformers</td><td>a. 5 b. 10 c. 7 d. 10 e. 10 f. 5</td></tr><tr><td>5.</td><td>MV Switchgear, LV switchgear, Bus ducts and Numerical relay</td><td>10</td></tr><tr><td>6.</td><td>Circuit Breaker/Isolator/Lightening Arrester/Wave Trap</td><td>Pl. refer B-17 (Switchyard)</td></tr><tr><td>7.</td><td>Instrument Transformers</td><td>Pl. refer B-17 (Switchyard)</td></tr><tr><td>8.</td><td>DG set</td><td>10</td></tr><tr><td>9.</td><td>HT, LT Power and control Cables</td><td>10</td></tr></table>			S.No.	Equipment	Type test report validity (in years)	1.	Generator & Excitation System	10	2.	HT and LT Motors	10	3.	VFD (including panels, AC/DC Reactors, Transformers (in case of non-integrated type)	10	4.	a. Power Transformers (GT, UT, ST, ICT) and Reactors b. OLTC c. Power transformer Bushing / Reactor Bushing (132kV and above class) d. Neutral Grounding Resistor e. Neutral Grounding Reactor f. Auxiliary oil filled transformer and dry type transformers	a. 5 b. 10 c. 7 d. 10 e. 10 f. 5	5.	MV Switchgear, LV switchgear, Bus ducts and Numerical relay	10	6.	Circuit Breaker/Isolator/Lightening Arrester/Wave Trap	Pl. refer B-17 (Switchyard)	7.	Instrument Transformers	Pl. refer B-17 (Switchyard)	8.	DG set	10	9.	HT, LT Power and control Cables	10
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES 		
	S.No.	Equipment	Type test report validity (in years)
	10.	Cable tray support	10
	11.	Lighting: LED and Other equipment	10
	12.	Battery and Battery Charger	7
	13.	Energy Meters – ABT	5
	14.	Load Break Switch	10
	15.	Insulators (Porcelain/ Glass)	Pl. refer B-17 (Switchyard)
	16.	Composite Insulators	Pl. refer B-17 (Switchyard)
1.22.00	MANDATORY SPARES Contractor's scope shall include Mandatory Spares of all equipment's as mentioned in the relevant portion of Technical Specification.		
1.23.00	VARIABLE FREQUENCY DRIVE (VFD) VFD shall be provided for various motors as specified elsewhere in the specifications. Medium Voltage VFD: The Variable frequency drive (VFD) system shall be of a modern proven design for similar applications in power plants/industry. The system shall be either Current Source Inverter (CSI) or Voltage Source Inverter (VSI) type with minimum eighteen (18) pulse design. 415 V/690 V LV VFD: The Variable frequency drive (VFD) system shall be of a modern proven design for similar applications in power plants/industry. The system shall be either Current Source Inverter (CSI) or Voltage Source Inverter		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIB ELECTRICAL SYSTEM / EQUIPMENTS PAGE 26 OF 28

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1.24.00	(VSI) type with minimum Twelve (12) pulse design. For drives less than 100 KW Six (6) pulse can be offered meeting all other requirements. Reports to be submitted by the Bidder: a) Contractor shall submit soft copy of approved CAT-1 & final "AS BUILT" single line diagrams (Key SLD) of Main plant, switchyard and BOP areas in AutoCAD format for record of the employer. b) Electrical simulation studies preferably in ETAP have to be carried out by contractor on plant auxiliary power supply network. This shall include but not limited to 33KV, 11KV, 6.6 kV and 415V SWGR. c) Steady state analysis such as power flow studies, Tap optimization, short circuit studies and motor starting studies including MDBFP and highest rating motor on the bus starting study, CB rating, fault current and sizing c) of power transformers, auxiliary transformers etc. Transient Simulation studies such as Insulation coordination etc. shall also be done by the bidder. Both the steady state and transient study results along with original files shall be submitted to the employer for review/approval. (i.e in ETAP/PSCAD/PSSE etc.) d) In compliance to the grid connectivity, Bidder shall provide all necessary technical data/models and carryout all necessary studies (in PSS/E) as indicated in "Formats of Technical Data for connectivity Agreement-FORMAT-CON-TD-2" applicable for Thermal Power plants as per the CERC (Central Electricity Regulatory Commission)-Connectivity and General Network Access to the interstate -Transmission system Regulation-2022. The list of cases for which the simulations are to be carried out is enclosed as Typical formats "FORMAT-CON-TD2" is at Annexure-E1 to this chapter. e) Study results along with original files in ETAP & PSCAD/PSS/E Format shall also be submitted by the bidder to the Employer for review / approval. Contractor shall submit the soft copy of the Electrical simulation files. f) Along with all required background data files and libraries for review and record of the employer.		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIB ELECTRICAL SYSTEM / EQUIPMENTS	PAGE 27 OF 28

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES 		
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FORMAT-CONN-TD-2

TECHNICAL CONNECTION DATA TO BE FURNISHED BY THERMAL/ HYDRO/ NUCLEAR GENERATING STATIONS INCLUDING PUMPED STORAGE PROJECTS(PSP) FOR SIGNING OF CONNECTIVITY AGREEMENT FOR INTERCONNECTION WITH THE INTER-STATE TRANSMISSION SYSTEM

A. Introduction

This document is designed to act as a guideline for exchange of technical connection data for the purpose of interconnection of the generation plant with ISTS alongwith exchange of accurate modelling data. Availability of accurate modelling data shall enable assessment of compliances of applicable regulations, adequacy of power system & assessment of equipment performance for secure and reliable interconnection with the ISTS Grid.

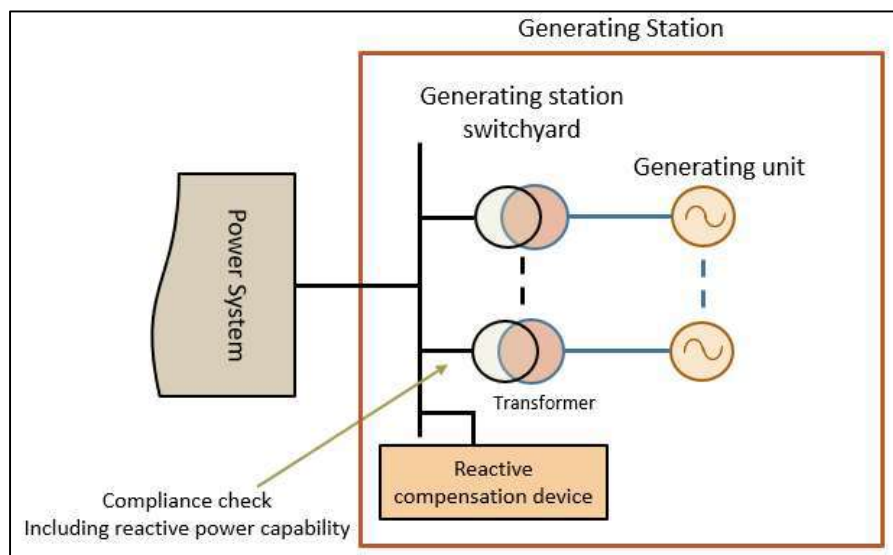
B. Regulation

CEA Technical Standards for Connectivity to Grid, 2007 and its amendments thereof: Clause 6.4d

"Provided that in order to carry out the said study, the requester shall present the mathematical model of the equipment in accordance with the requirements as stipulated by the Appropriate Transmission Utility or distribution licensee, as the case may be."

C. General Considerations

- i. The compliances stipulated in CEA Technical Standards for Connectivity to Grid including reactive power capability of the unit shall be assessed at the unit level (high voltage terminal of generating unit).



- ii. The applicant shall follow the industry best practices and applicable industry standards in respect of the equipment installation and its operation and maintenance.

D. Compliance with existing rules and regulations

All applicants seeking connection to the grid shall comply with all the applicable regulations as enacted or amended thereof from time to time, including the following:

- i. Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007;
- ii. Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2010;
- iii. Central Electricity Authority (Measures Relating to Safety & Electric Supply) Regulations, 2010;
- iv. Central Electricity Regulatory Commission (Communication System for InterState Transmission of Electricity) Regulations, 2017;
- v. Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006;

- vi. Central Electricity Regulatory Commission (Connectivity and General Network Access to the inter-State Transmission System) Regulations, 2022;
- vii. Central Electricity Regulatory Commission (Fees and Charges for Regional Load Despatch Centres) Regulations, 2019;
- viii. Central Electricity Authority (Technical Standards for Communication System in Power System Operation) Regulations, 2020;
- ix. Central Electricity Regulatory Commission (Furnishing of Technical Details by the Generating Companies) Regulations, 2009;
- x. Central Electricity Authority (Cyber Security in Power Sector) Guidelines, 2021;
- xi. Any other regulations and standards as specified from time to time.

E. Description

i. Coal-fired thermal generation plant

Coal-fired power plants typically burn coal to heat a boiler that produces high-temperature, high-pressure steam that is passed through the turbine to produce mechanical energy. Synchronous machines coupled with the steam turbine convert mechanical energy into electrical energy at a suitable voltage level. Typical arrangement of coal-fired thermal generator is depicted in Figure-13.

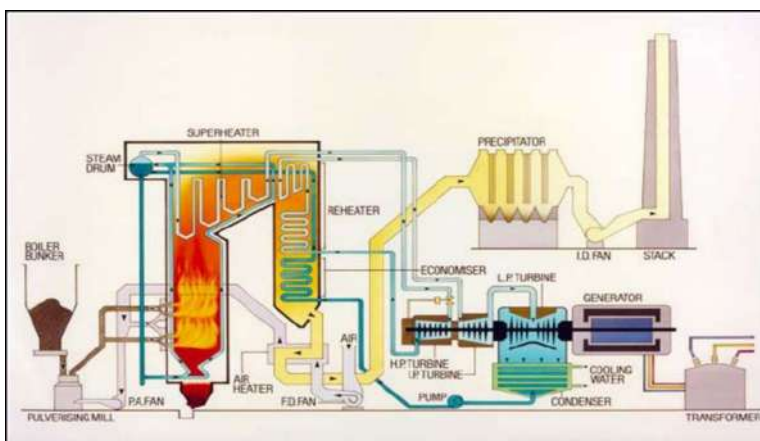


Figure-13: Typical schematic of coal fired thermal generation plant

Generally, coal-fired thermal generating units are high speed machines and therefore the construction of rotor is cylindrical in nature.

ii. Hydropower plant

Hydro Power Plant uses water as the source of energy wherein conversion of water kinetic energy is converted into mechanical energy by suitable turbines. The synchronous generator coupled with the turbine, in turn, converts mechanical energy into electrical energy at an appropriate voltage level. Typical arrangement of a hydro-power generating station is depicted in Figure 14. Based on the topology of quantum of water /storage, hydro-power plants are broadly classified into the following categories:

a. Run-of-river

Run of river hydropower projects have no, or very little, storage capacity behind the dam and generations are dependent on the timing and size of river flows.

b. Reservoir (HPP)

Reservoir-based hydropower schemes usually have dams for the storage of water and the large volume of water contained helps in regulating water flows during different seasonal conditions. A hydroelectric reservoir makes use of the potential energy of water for generating electricity. Water is held back by the dam, and released through a turbine, which in turn produces electricity. Reservoir capacities can be small or very large, depending on the characteristics of the site and the economics of dam construction.

c. Pumped storage (PSP)

Pumped-storage hydroelectricity (PSH), or pumped hydroelectric energy storage (PHES), is a type of hydroelectric energy storage used by electric power systems for load balancing. The method stores energy in the form of gravitational potential energy of water, pumped from a lower elevation reservoir to a higher elevation. Low-cost surplus off-peak electric power is typically used to run the pumps. During periods of high electrical demand, the stored water is released through turbines to produce electric power.

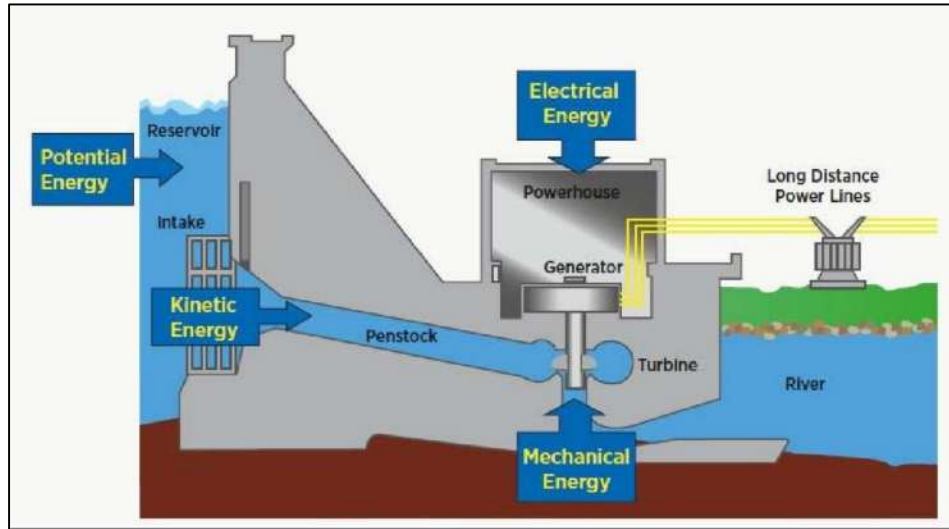


Figure-14: Typical schematic of a hydro power plant

Types of hydro- turbines

Based on the construction of turbines used within hydro-electric plants, it can be broadly classified into the following three types:

- a) Pelton wheel turbine
- b) Kaplan Turbine
- c) Francis Turbine

iii. Gas power plant classification

The gas turbine power plants which are used in the electric power industry are classified into two main groups as per the cycle of operation and configuration:

a. Open cycle gas turbine (OCGT)

In the open cycle, air at the ambient condition is drawn into the compressor (either an axial-flow or centrifugal compressor) where its temperature and pressure are raised. The high-pressure air proceeds into the combustion chamber, where the fuel is burnt at constant pressure. The high-temperature gases then enter the turbine where they expand to the atmospheric pressure while producing power output. The exhaust gases leaving the turbine are thrown out (not recirculated), causing the cycle to be classified as an open cycle. All masses are typically on the same shaft (the compressor, combustion chamber, and turbine). This is also

referred to as a “single-shaft” gas turbine as depicted in Figure-15.

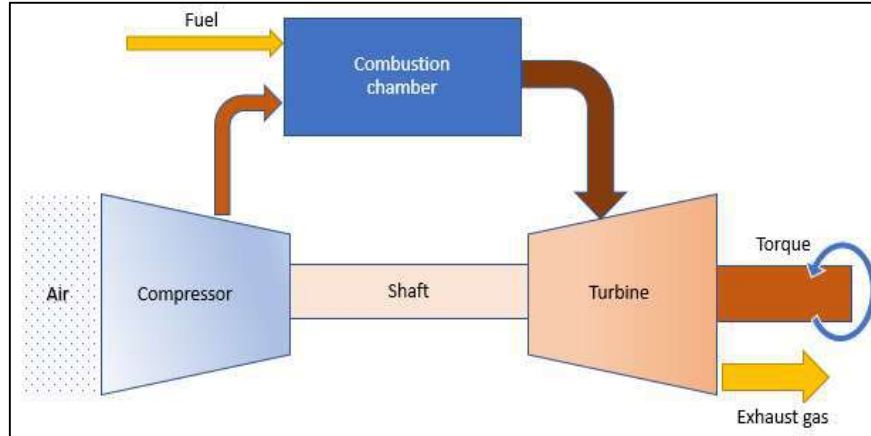


Figure-15: Open cycle gas turbine

b. Closed cycle gas turbine (CCGT)

In a closed cycle gas turbine, working fluid does not come in contact with atmospheric air. The compression and expansion process remain the same but the combustion process is replaced by a constant pressure heat addition process from an external source. The exhaust process is replaced by constant pressure heat rejection process to the ambient air. The exhaust gases leaving the turbine are cooled in heat exchanger called sink where it rejects heat. Therefore, in this cycle, the same working fluid is recirculated, causing cycle to be classified as close cycle as shown in Figure 16.

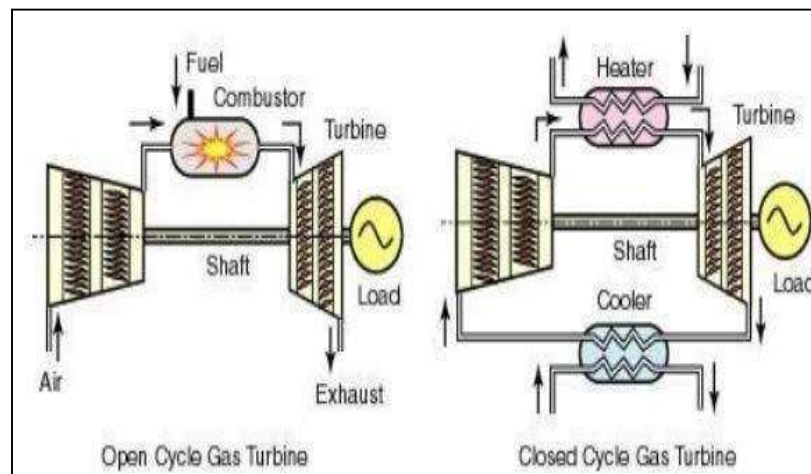


Figure 16: Typical Open and Close cycle Gas Turbine

iv. Reactive power capability of thermal generating unit

As per CEA Technical Standards for Connectivity to Grid, thermal generating unit shall be capable of operating at rated output for power factor varying 0.85 lagging (over-excited) to 0.95 leading (under-excited). Provided further that the above performance shall also be achieved with voltage variation of $\pm 5\%$ of nominal, frequency variation of $+3\%$ and -5% and combined voltage and frequency variation of $\pm 5\%$. However, for gas turbines, the above performance shall be achieved for voltage variation of $\pm 5\%$.

During over-excited mode of operation (lagging power factor), the machine is required to deliver active and reactive power (Ex-Bus) simultaneously whereas during under-excited operation mode (leading power factor), the machine shall inject active power while absorbing reactive power (Ex-Bus). The convention to be followed in this regard is depicted in Figure-17.

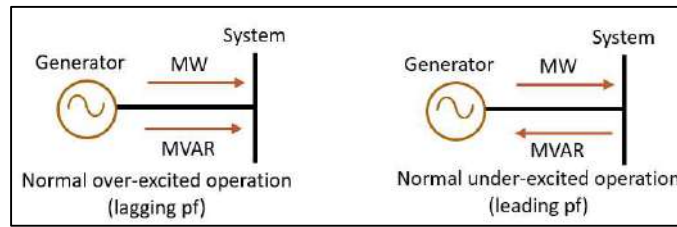


Figure-17: Leading and lagging operation of generator unit

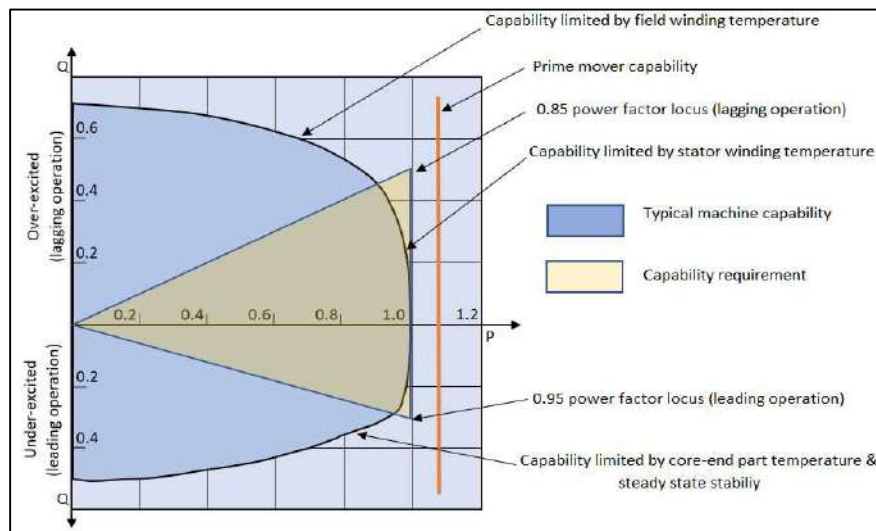


Figure-18: Typical reactive capability curve of thermal generating unit

The performance of machine is constrained due to rotor, stator & iron core parts temperature. Therefore, based on the limitations imposed due to rotor winding temperature, stator winding temperature, iron core parts temperature & stability limit, the final capability of the machines shall be arrived after considering such conditions. The reactive capability is expressed in terms of P-Q curve as depicted in Figure-18.

Synchronous machines shall be capable of demonstrating continuous rated output (active and reactive power) with the variations of $\pm 5\%$ voltage variations and frequency variations of $+ 3\%$ and -5% alongwith combined voltage and frequency variations. The overall working envelope of machine considering both constraints (voltage and frequency) is shown in Figure-19. In addition to constraints indicated in the above P-Q curve, any other limitations including prime mover capability, Valve Wide Open Condition, etc. are also required for evaluating machine performance.

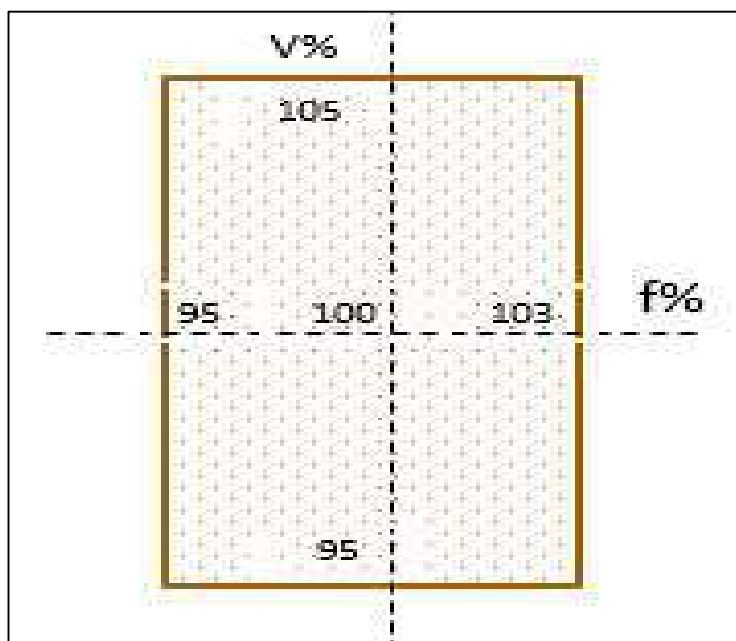


Figure-19: Combined voltage and frequency dependence on machine capability

v. Short circuit ratio (SCR) of Generating Unit

It is defined as the ratio of the field current required to generate rated voltage on an open circuit to the field current required to circulate rated armature current on

sustained symmetrical short-circuit with the machine running at rated speed. It affects the physical size, operating characteristics and cost of the synchronous machine. For a lower value of SCR, the machine shall be very sensitive to the load variations and accordingly, the percentage variation in terminal voltage shall be higher. SCR is a measure of stability of an electromagnetic generator. Also, the synchronising power of machine with low SCR is less resulting in lower stability limit. The typical SCR derived from OCC and SCC are depicted in Figure-20.

$$SCR = \frac{I_f \text{ for rated open circuit voltage}}{I_f \text{ for rated short circuit current}} = \frac{oa}{od}$$

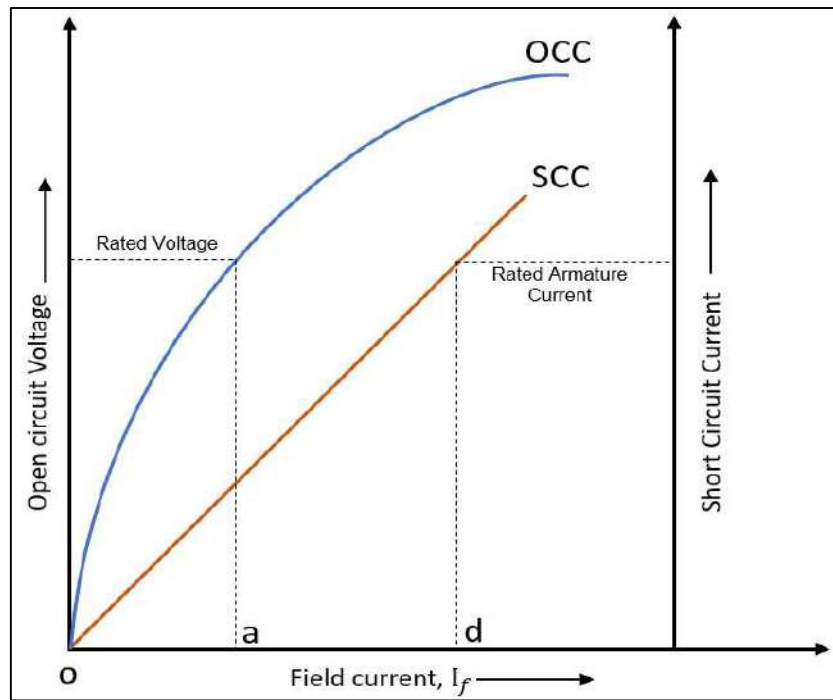


Figure-20: SCC and OCC characteristics

vi. Droop characteristics of Generating unit

Droop is one of the key parameter of the generating unit demonstrating the changes in active power in response to frequency changes outside the dead band as depicted in Figure-21. Droop corresponds to the deviation in frequency from the dead band (as a percentage of the nominal 50 Hz) that would result in a 100% change in generator MW output from the maximum level. Droop of a

synchronous machine shall be evaluated using equation given hereunder.

$$\text{Droop \%} = 100 \times \frac{\Delta F / F}{\Delta P / P}$$

Δ is the frequency deviation beyond the upper or lower limit of generator's dead band (in Hz)

ΔP is active power change (in MW); P is the Maximum Operating Level (in MW)

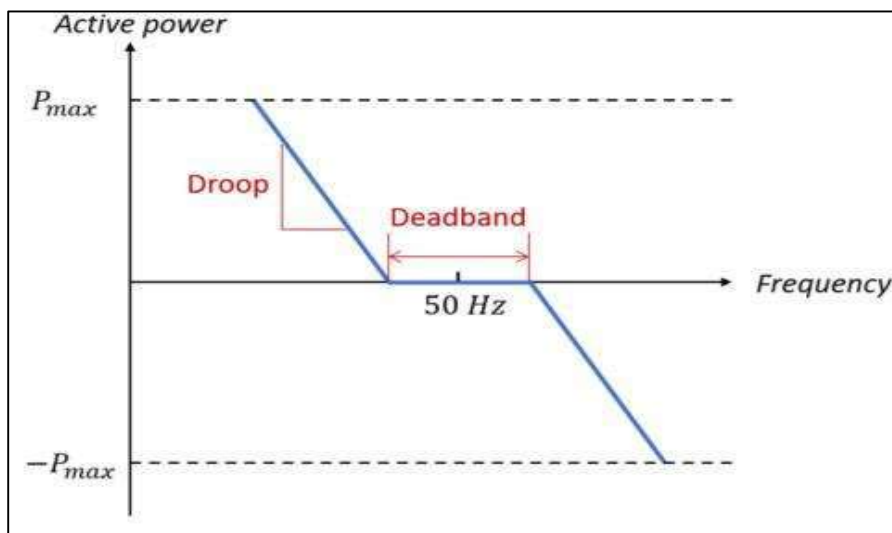


Figure-21: Droop characteristics of synchronous generator

vii. Simulation models for conventional generating stations

Conventional Generators shall be modelled using the generic model available in PSS/E model library. The applicable models for Synchronous machines, Excitation systems, Turbine-Governor and Power System Stabilizers are given hereunder (*Source: PSS/E model library*). Applicants can also submit the model data corresponding to another PSS/E based generic model if the performance matches such model. Typical models used for simulating generating units are depicted in Figure-22.

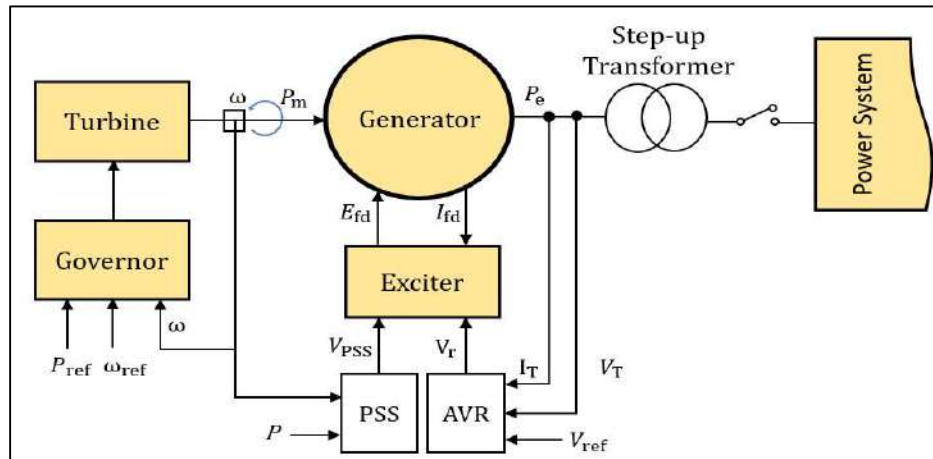


Figure-22: Components of conventional generating unit

(a) Generic Models for Synchronous machine

Hydro machines	Thermal, Gas, Diesel & Nuclear machines
GENSAL- Salient pole machine with quadratic saturation function	Round Rotor GENROU –Machine model with quadratic saturation function
GENSAE – Salient pole machine with exponential saturation function	GENROE – Machine model with exponential saturation function
	Salient Pole Machine GENSAL –Machine with quadratic saturation function GENSAE – Machine with exponential saturation function

(b) Excitation system model

PSS/E-based generic models for excitation systems are broadly classified into three groups:

- Type DC: for excitation systems with a DC exciter
- Type AC: for excitation systems with an AC exciter
- Type ST: for excitation systems with a static exciter

The following table shows the types of models separated into their respective groups.

DC exciter	AC exciter	Static excitation system
Type DC1A	Type AC1A	Type ST1A
Type DC2A	Type AC2A	Type ST2A
Type DC3A	Type AC4A	Type ST3A
Type DC4B	Type AC5A	Type ST4B
	Type AC6A	Type ST5B
	Type AC7B	Type ST6B
	Type AC8B	Type ST7B
		Type ST7C

(c) Power system stabilizer

Power System Stabilizer (PSS) is a control system applied at a generator that monitors variables such as current, voltage and shaft speed and sends the appropriate control signals to the voltage regulator to improve the damping of power system oscillations.

The most important aspect when considering a PSS model is the number of inputs. The following table shows the type of models separated based on the inputs:

Type	Inputs	Remarks
PSS1A	Single input	Two lead-lags

Type	Inputs	Remarks
		Inputs can either be speed, frequency, or power
PSS2B	Dual input	Rotational speed deviation and electrical power deviation as inputs Most common type Supersedes PSS2A (three versus two lead lags)
PSS3B	Dual input	Rotational speed deviation and bus frequency deviation as inputs Stabilizing signal is a vector sum of processed signals

(d) Generic models for steam turbine-governor

The following table is a list of generic models of steam turbines:

Type	Name	Remarks
BBGOV1	Brown – Boveri turbine governor model	Mainly used for a steam turbine with electrical damping feedback
IEEEG1	IEEE type 1 Speed-Governor Model	Used to represent non-reheat, tandem compound, and cross compound types.
IEEEG2	IEEE Type 2 Speed-Governing Model	Linearized model for representing a hydro turbine-governor and penstock dynamics
IEEEG3	IEEE type 3 turbine-governor model	Includes a more complex representation of the governor controls than IEEEG2
IEESGO	IEEE Standard Model	Simple model of reheat steam turbine
TGOV1	Steam-turbine governor	Mainly used for a steam turbine with reheater
TGOV2	Steam –turbine governor with fast valving	Fast valving model of steam turbine
TGOV3	Modified IEEE Type 1 Speed-Governing Model with fast	Modification of IEEEG1 for fast valving studies

Type	Name	Remarks
	valving	
TGOV4	Modified IEEE Type 1 Speed-Governing Model with PLU and EVA	Model of steam turbine and boiler, explicit action for both control valve (CV) and inlet valve (IV), main reheat and LP steam effects and boiler
TGOV5	IEEE Type 1 Speed-Governor Model Modified to Include Boiler Controls	Most common type of governor model, based on TGOV1 with boiler controls
TURCZT	Czech hydro or steam turbine governor model	General-purpose hydro and thermal turbine- governor model. Penstock dynamic is not included in the model
CRCMGV	Cross-compound turbine	-

(e) Generic models for hydro turbine-governor

The following table is a list of common generic models of hydro turbines:

Type	Name	Remarks
HYG0V	Hydro-turbine Governor	Simple hydro model with unrestricted head race and tail race, no surge tank
HYG0V2	Hydro-turbine Governor	Linearized hydro turbine governor model
HYG0VDU	Hydro turbine-governor model with speed dead band	Added asymmetrical dead band
HYG0VM	Hydro-Turbine Governor	Includes detailed representation of surge chamber
WEHGOV	Woodward Electric Hydro Governor Model	Woodward hydro governor with a non-linear model for penstock dynamics
HYG0VT	Hydro Turbine-Governor	Travelling-wave solution applied to

Type	Name	Remarks
	traveling wave model	penstock and tunnel
PIDGOV	Hydro Turbine Governor	Straight forward penstock configuration with PID governor
HYGOVR1	Fourth order lead-lag hydro-turbine	for a unit with digital controls, allows a nonlinear relationship between the gate position and power
TURCZT	Czech hydro or steam turbine governor model	General-purpose hydro and thermal turbine- governor model. Penstock dynamic is not included in the model
TWDM1T	Tail water depression hydro governor model 1	Same basic permanent and transient droop elements as the HYGOV model, but it adds a representation for a tail water depression protection system
TWDM2T	Tail water depression hydro governor model 2	Same as TWDM1T and uses a governor proportional-integral-derivative (PID) controller
WPIDHY	Woodward PID hydro governor model	Includes governor controls representing a Woodward PID hydro governor. The model includes a nonlinear gate/power relationship and a linearized turbine/penstock model.
WSHYDD	WECC double derivative hydro governor model	Double-derivative hydro turbine-governor mode. Includes two dead band, also includes a nonlinear gate/power relationship and a linearized turbine/penstock model
WSHYGP	WECC GP hydro governor plus turbine model	WECC GP hydro turbine-governor model with a PID controller, penstock

Type	Name	Remarks
		dynamics are similar to those of the WECC WSHYDD

(f) Generic models for gas turbine-governor

The following table is a list of common generic models of gas turbines:

Type	Name	Remarks
GAST	Gas turbine governor	Simplified model for industrial gas turbine (i.e. OCGT)
GAST2A	Gas turbine governor	More detailed GT from GAST. Governor can be configured for droop or isochronous control. Includes temperature control
GASTWD	Woodward Gas Turbine-Governor model	Same detail of turbine dynamics as GAST2A but with a Woodward governor controls
WESGOV	Westinghouse Digital governor for Gas Turbine	Westinghouse 501 combination turbine governor
GGOV1	GE General Governor/Turbine model	General purpose GE GT model (neglects ICV control)
PWTBD1	Pratt & Whitney Turboden turbine-governor	Turbine load PI control with valve and look-up table
URCSCT	Combined cycle, single shaft turbine- governor model	-
URGS3T	WECC gas turbine governor	-

Transfer function block diagrams of the above-mentioned generic models are given in **Annexure-6**.

Technical Connection Data and compliance Report submission by Generators (Thermal/Hydro/Nuclear) and PSP

A. General details

1.	Name of the Applicant Company	:	
2.	URN No.	:	
3.	Details of Grant of Connectivity (a) Connectivity Intimation No. (b) Date	:	
4.	Quantum of Connectivity Granted (MW) (Maximum injection & Maximum drawal to be indicated for PSP)	:	
5.	Location of Generation Plant Latitude Longitude	:	(The applicant shall also attach the Survey of India Toposheet indicating the location of the facility}
6.	Installed capacity of Generating station/PSP (MW)	:	
7.	Address for Correspondence	:	
8.	Contact Person 8.1 Primary Contact Person (a) Name (b) Designation (c) Phone No. (d) E-mail 8.2 Alternate Contact Person (a) Name (b) Designation (c) Phone No. (d) E-mail	:	
9.	Expected Date of Commercial Operation	:	

B. Technical Connection data

1. Details of Generation Plant /PSP

1.	Type of Generation Plant (Hydro, Thermal, Gas, Diesel, Nuclear, PSP, Nuclear)	:	
2.	Auxiliary Consumption (%)	:	
3.	Maximum Export Capacity Required (MW)	:	
4.	Maximum Import Capacity required This is the amount of import capacity that the site will require during startup (MVA)	:	
5.	Maximum power required by plant during motoring mode (in case of PSP) (MW) and duration of motoring mode considering reservoir size	:	
6.	Round trip Efficiency(%) for PSP	:	
7.	Reservoir Details for PSP (MWL/ FRL/ MDDL) in Meters	:	
8.	Station house load during normal operating conditions (MW/MVAR)	:	
9.	Expected running regime e.g. base load, peaking, etc	:	
10.	Basic System details	:	The applicant shall submit the basic system details as per Annexure-1

2. Interconnecting Transmission Line (ITL)

1.	Name of Sending End S/s (Generator end)	:			
2.	Name of Receiving End S/s (ISTS end)	:			
3.	Voltage level (kV)	:			
4.	Length of ITL (Kms)	:			
5.	Tower Configuration (S/c, D/c, M/c)	:			
6.	Type of Conductor	:			
7.	OPGW available (Yes/No)	:			
8.	No. of Fibre in OPGW (24/48F)	:			
9.	OPGW/Line Shared with another GenCo or another plant of same owner	:			
			R (pu)	X (pu)	B (pu)
10.	Conductor positive sequence R X B parameters in pu/km/ckt (considering 100MVA base)				
11.	ITL positive sequence R X B parameters in pu/km/ckt (considering 100MVA base)				
12.	ITL zero sequence R X B parameters in pu/km/ckt (considering 100MVA base)				

Note: Applicant shall attach the details of ITL as per **Annexure-2**

3. Generating Unit details

Sl. No.	Particulars	Unit – 1	Unit - 2	Unit – 3
1.	Unit Rating (MVA)			
2.	Rated terminal voltage (kV)			
3.	Rated power factor			
4.	Rated frequency (Hz)			
5.	Rated speed (rpm)			
6.	Rated excitation (in Amperes and Volts)			
7.	Type of synchronous machine (Round rotor or salient pole), Nos. of Poles			
8.	Type of Generator Cooling System (Water, Hydrogen, etc.)			
9.	Normal Max. Continuous Generation Capacity at Normal operating temperature (MW)			
10.	Normal Max. Continuous Export Capacity at Normal operating temperature (MW)			
11.	Maximum (Peaking) generating Capacity at min ambient air temperature (MW)			
12.	Maximum (Peaking) Export Capacity at min ambient air temperature (MW)			
13.	Minimum Continuous Generating Capacity (MW)			
14.	Minimum Export Generating Capacity (MW)			
15.	Normal Maximum Lagging MVAR at rated MW output			

16.	Normal Maximum Leading MVAR at rated MW output			

Note: Applicant shall append unit nos. in case no. of units are more than 3

4. Generator Data for Fault (Short Circuit Studies)

1.	Direct Axis Transient Reactance	X_d'	
2.	Sub-transient Reactance	X_d''	
3.	Synchronous Reactance	X_s	
4.	Zero Sequence Reactance	X_0	
5.	Negative Sequence Reactance	X_2	

5. Dynamic Simulation Data

1.	Direct Axis Positive Phase Sequence Synchronous Reactance in pu	X_d	
2.	Quadrature Axis Positive Phase Sequence Synchronous Reactance in pu	X_q	
3.	Direct Axis Transient Reactance (unsaturated) in pu	X_d'	
4.	Quadrature Axis Transient Reactance (unsaturated) in pu	X_q'	
5.	Sub-Transient Reactance (unsaturated) in pu	X_d''	
6.	Armature Leakage Reactance in pu	X_l	
7.	Direct Axis Transient open circuit Time Constant (Secs)	T_{do}'	
8.	Direct Axis Sub-transient open circuit Time Constant (Secs)	T_{do}''	
9.	Quadrature Axis Transient open circuit Time Constant (Secs)	T_{qo}''	

10.	Quadrature Axis Sub-transient open circuit Time Constant (Secs)	T_{q0}''	
11.	Inertia constant of total rotating mass (generator, AVR, turbo-governor set) H in MWs/MVA	sec	
12.	Speed Damping D		
13.	Saturation constant S (1.0) in p.u.		
14.	Saturation constant S (1.2) in p.u.		

Note:

1. Applicant shall attach the **Generator open circuit and short circuit characteristics** indicating the following graphs:
 - a. Graph of excitation current versus terminal voltage and stator current;
 - b. No load excitation current;
 - c. Excitation current at rated current.
2. Applicant shall attach the **Generator V-curve** indicating terminal (armature) current versus generating unit field voltage.
3. Applicant shall attach the Complete Generator OEM Technical Datasheet indicating generator parameters including impedance & time constants, etc.

6. Excitation System

Type of Automatic Voltage Regulator (AVR)		
1.	Manufacturer and product details	
2.	Type of control system:- Analogue or digital	
3.	As found settings (obtained either from HMI or downloaded from controller in digital systems)	
Type of excitation system		
4.	Static excitation system OR Indirect excitation system (i.e. rotating exciter) AC exciter, or DC exciter	
5.	Details of AVR converter - Rated excitation current (converter rating in Amperes)	
6.	Six pulse thyristor bridge or PWM converter	
Source of excitation supply		
7.	Excitation transformer or auxiliary supply (Details thereof)	
8.	If excitation transformer, nameplate information such as type of transformer, HV and LV winding ratings, positive and zero sequence impedance, tap positions, voltage step per tap is required.	
Excitation limiters		
9.	Under Excitation Limiters settings	
10.	Over Excitation Limiters settings	
11.	Voltage/frequency limiter	
12.	Stator current limiter	
13.	Minimum excitation current limiter	
Power System Stabilizer		

14.	Is the AVR equipped with a PSS (In accordance with CEA Technical Standards for Connectivity to Grid, 2007 as amended)	
15.	How many input Channels does the PSS have? (speed, real power output or both	
	If the PSS uses speed, is this a derived speed signal (i.e. synthesized speed signal) or measured directly (i.e. actual rotor speed)?	

Note:

1. *Applicant shall attach the drawings of the excitation system (supplied by OEM) along with excitation system SLD.*
2. *Applicant shall attach the saturation curves of the exciter (if applicable – see Type AC and DC)*

7. Two Winding Transformer Data

1.	Rating Capacity (HV-LV)	
2.	Voltage rating (kV) (Line to Line)	
3.	Number of Power Transformers	
4.	Cooling Type	
5.	Rating at different cooling as mentioned above	
6.	Type of Transformer (Constant Ohmic impedance/ Constant percentage Impedance)	
7.	Transformer vector Group	
8.	Tap changer (ON Load Tap changer)	
9.	Number of steps and step size	
10.	Neutral earthing (solid or through reactance)	
11.	% Impedance at 75°C (HV-LV)	
12.	% Resistance at 75°C (HV-LV)	
13.	% Reactance at 75°C (HV-LV)	
14.	Transformer positive sequence resistance (R_1) in pu	
15.	Transformer positive sequence reactance (X_1) in pu	
16.	Transformer zero sequence resistance (R_0) in pu	
17.	Transformer zero sequence reactance (X_0) in pu	
18.	Nature of Tap Changer (on load/off load)	
19.	Number of steps and step size	

8. Three Winding Transformer Data

1.	Rating Capacity (HV-LV, HV-IV, IV-LV)	
2.	Voltage rating (Line to Line)	
3.	Number of Power Transformers	
4.	Cooling Type	
5.	Rating at above different cooling	
6.	Type of Transformer (Constant Ohmic impedance/ Constant percentage impedance)	
7.	Transformer Vector Group	
8.	Tap changer (ON/OFF Load Tap changer)	
9.	Number of steps and step size	
10.	Neutral earthing (solid or through reactance)	
11.	% Impedance at 75°C (HV-IV)	
12.	% Resistance at 75°C (HV-IV)	
13.	% Reactance at 75°C (HV-IV)	
14.	% Impedance at 75°C (HV-LV)	
15.	% Resistance at 75°C (HV-LV)	
16.	% Reactance at 75°C (HV-LV)	
17.	% Impedance at 75°C (IV-LV)	
18.	% Resistance at 75°C (IV-LV)	
19.	% Reactance at 75°C (IV-LV)	
20.	Transformer Vector group	
21.	Positive sequence resistance (R_{1HL1}) between HV/IV in pu	
22.	Positive sequence reactance (X_{1HL1}) between HV/IV in pu	
23.	Zero sequence resistance (R_{0HL1}) between HV/IV in pu	

24.	Zero sequence reactance (X_{0HL1}) between HV/IV in pu	
25.	Positive sequence resistance (R_{1HL2}) between HV/LV in pu	
26.	Positive sequence reactance (X_{1HL2}) between HV/ LV in pu	
27.	Transformer zero sequence resistance (R_{0HL2}) between HV/LV in pu	
28.	Zero sequence reactance (X_{0HL2}) between HV/LV in pu	
29.	Positive sequence resistance (R_{1L1L2}) between IV/ LV in pu	
30.	Positive sequence reactance (X_{1L1L2}) between IV/LV in pu	
31.	Zero sequence resistance (R_{0L1L2}) between IV/LV in pu	
32.	Zero sequence reactance (X_{0L1L2}) between IV/LV in pu	
33.	Positive sequence resistance ($R_{1HL1//L2}$) between HV/(IV+LV) in pu	
34.	Positive sequence reactance ($X_{1HL1//L2}$) between HV/(IV+LV) in pu	
35.	Zero sequence resistance ($R_{0HL1//L2}$) between HV/(IV+LV) in pu	
36.	Zero sequence reactance ($X_{0HL1//L2}$) between HV/(IV+LV) in pu	

Note: Applicant shall attach the OEM Technical datasheet for Generator step-up transformer indicating rating, impedance, short circuit parameters.

9. Shunt Reactor

1.	Rated Voltage (Line to Line) (1.0 pu)	:	
2.	Rated capacity at rated voltage (MVAR)	:	
3.	Three phase unit or Single-phase unit	:	
4.	Cooling system	:	
5.	Rated current	:	
6.	Construction type (Core/Shell)	:	
7.	Neutral Grounding (Solidly earthed/ through reactor)	:	
8.	Range of constant impedance	:	Upto pu voltage
9.	Reactor knee point voltage (pu)	:	

Note: Applicant shall attach the OEM Technical datasheet for Shunt reactor indicating rating, impedance, knee point voltage.

10. Technical particulars of Turbine:

Applicant shall submit the turbine details of the generating unit as per **Annexure-3**.

11. Data and voice communication

1.	Type Data Gateway (Remote Terminal Unit/ Substation Automation System Gateway)	:	(Whether RTU/ Substation Automation System Gateway; and Number of data ports)
2.	Data Communication connectivity Standard followed (As per interface requirement and other guideline made available by the respective RLDC)	:	(Type of Communication Protocol, i.e. 104 (Ethernet), etc.)

3.	Write here the communication media, interface and capacity being targeted for Connectivity for Data and voice Communication	:	(Communication media: For example fibre optics, PLCC, etc. Interface: Ethernet, G.703 etc Capacity: 1200baud, 64Kbps, 2 Mbps, etc)

12. Modeling details:

Applicant shall submit the model parameter data for each component of Generating Unit including Synchronous machine model, excitation system model, turbine governor (as per applicable configuration), power system stabilizer as per **Annexure-4**.

13. PSS/E Single Line Diagram (Single Machine Infinite Bus Model)

Note: Applicant shall attach herewith PSS/E based SLD of generation plant indicating each generating unit.

14. Open circuit magnetization curve

Note: Applicant shall attach herewith the Open circuit magnetization curve of generating unit.

15. Dynamic simulation test

Note: Applicant shall attach herewith the plant response with tables/ appropriate plots of electrical quantities including Voltage, Current, Active power, Reactive Power (Plant and Unit) for all compliances as per CEA Technical Standards for Connectivity to Grid as per **Annexure-5**.

C. The applicant has attached a copy of the affidavit towards the fulfillment of terms and conditions as specified in the CEA (Technical Standards for Connectivity to the Grid) Regulations, 2007 as amended as per **Annexure-A**.

D. Applicant has submitted the details including terminal bay equipment data,

Communication & metering data under its scope as per **Annexure-B**.

- E.** Applicant has undertaken studies including voltage stability, protection co-ordination, machine dynamics, resonance, sub-station grounding and fault duties of equipment to be installed at generating station premise (as the case may be) so that the overall system performance is not constrained during steady state and contingency conditions. The sub-station grounding design should be such that the earth fault factor of the system should remain below 1.4. Sub-station grounding should be in line with provisions of Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2010.

Resonance including ferro-resonance studies has been carried out by applicant covering possible network topologies for excitation of series/parallel resonant point by network impedance scanning and they shall implement the remedial measure at their end in this context.

- F.** Applicant has further attached the following drawings (soft copy) alongwith application:
- 1) Site plan in appropriate scale indicating Generators, Transformer, Site building (pdf & autocad copy)
 - 2) Site plan of the ISTS substation at which connectivity granted (pdf & autocad copy)
 - 3) General Arrangement (GA) drawing indicating proposed facility
 - 4) Electrical Single Line Diagram (SLD) of the proposed facility detailing all significant items of plant (pdf & autocad copy)
 - 5) Electrical Single Line Diagram (SLD) of ISTS substation at which connectivity granted (pdf & autocad copy)
 - 6) Sub-Station Automation System (SAS) ring diagram indicating interconnections of various IEDs/Engg PC/Gateway etc.
 - 7) Equipment drawings for confirming the ratings
-

- 8) CRP (Control & Relay Panel) & scheme drawings containing protection details of the transmission line
- 9) PLCC/FOTE drawings for the transmission lines under the scheme
- 10) Details of Communication System
- 11) Detailed calculation sheet for deriving the maximum ampacity of the conductor as per IEEE-738 Standards, Central Electricity Authority (Technical Standards for Connectivity to Grid), Regulations 2007 and its amendments thereof, Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2010 & CEA Transmission Planning Criteria, 2013 and its amendments thereof.

This is to certify that the above data submitted with the application are pertaining to Connectivity with ISTS sought. Further, any additional data sought for processing the application shall be furnished.

Authorized Signatory of Applicant

Name:

Designation:

Seal:

Place:

Date:

(To be notarized on a Rs. 100 non-judicial stamp paper)

Annexure-A

Affidavit to be submitted by the Conventional Generator grantee towards fulfilment of various compliances as specified in the CEA (Technical Standards for Connectivity to the Grid) Regulations, 2007 and its amendments thereof (to be provided on applicant's company authorized signatory not below the rank of CMD or CEO or MD)

Date.....

Connectivity Intimation No:

Connectivity intimation date:

I(Name).....S/o Shri (Father's name) working as (designation) in (Name of the Applicant organization / entity), having its registered office at (Address of the Applicant organization / entity), do solemnly affirm that (name of generating station along with Installed capacity & location of connectivity granted by CTU) complies with all applicable provisions as laid out in the Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 and its amendments thereof and CERC (Connectivity and General Network Access to Inter State Transmission System) Regulations, 2022 and directions through various orders including the following:

1. The excitation system for every generating unit:
 - a) have state of the art excitation system
 - b) have Automatic Voltage Regulator (AVR) (for generators of 100MW rating and above)
 - c) The Automatic Voltage Regulator of generator of 100 MW and above shall include Power System Stabilizer (PSS)
2. The short circuit ratio of generator is as per IEC-34

3. The generator transformer winding has delta construction on low voltage side and star connection on high voltage side. Star point of high voltage side is effectively(solidly) earthen so as to achieve earth fault factor of 1.4 or less
4. All generating machines irrespective of capacity have electronically controlled governing system with appropriate speed/load characteristics to regulate frequency. The governors of thermal generating units have a droop of 3 to 6% and those of hydro generating units 0 to 10%.
5. Generating Unit is capable of operating at rated output for power factor varying between 0.85 lagging (over-excited) to 0.95 leading (under-excited).
6. The above performance is also achieved with voltage variation of $\pm 5\%$ of nominal, frequency variation of $+ 3\%$ and -5% and combined voltage and frequency variation of $\pm 5\%$. However, for gas turbines, the above performance shall be achieved for voltage variation of $\pm 5\%$.
7. The coal and lignite based thermal generating unit is capable of generating up to 105% of Maximum Continuous Rating (MCR) (subject to maximum load capability under Valve Wide Open Condition) for short duration to provide the frequency response.
8. The hydro generating units are capable of generating up to 110% of rated capacity (subject to rated head being available) on continuous basis.
9. Every generating unit have standard protections to protect the units not only from faults within the units and within the station but also from faults in transmission lines. For generating unit having rated capacity greater than 100 MW, two independent sets of protections acting on two independent sets of trip coils fed from independent Direct Current (DC) supplies shall be provided. The protections are not be limited to the Local Breaker Back-up (LBB) protection
10. Hydro generating units having rated capacity of 50 MW and above are capable of operation in synchronous condenser mode, wherever feasible.
11. Bus bar protection has been provided at the switchyard of generating station.

12. Automatic synchronization facilities have been provided.
13. The station auxiliary power requirement, including voltage and reactive requirements, did not impose operating restrictions on the grid beyond those specified in the Grid Code.
14. In case of hydro generating units, self-starting facility has been provided. The hydro generating station also have a small diesel generator for meeting the station auxiliary requirements for black start.
15. The sub-station associated with the generating station is in conformity with the provisions specified in respect of “Sub-station” under Part III of CEA (Technical Standards for Connectivity to Grid) Regulations, 2007 and its amendments thereof.

I am aware that in case any discrepancies / incompleteness are found in the documents submitted to CTU, the connection offer (CONN-TD-5) / connectivity agreement (CONN-CA-6) shall not be processed further. I am also aware that if at any stage any falsity / inaccuracy / incorrectness is detected in the documents / statements (name of generator) shall be solely liable for disconnection from the Grid along with all associated liabilities / consequences in this regard.

Name of the Authorised Signatory:

Signature:

Company Stamp (mandatory):

Annexure-B

Data Format-I

A. Generation switchyard/Pooling Station end:

1.	Name of substation and ownership:	
2.	Name of the bay and bay identification number:	

B. Sub-station (ISTS) End at which Connectivity is granted:

1.	Name of substation and ownership:	
2.	Name of the bay and bay identification number:	

Data Format-II-A

Equipment to be provided in the allocated bay meeting the technical standards as per Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 and amendments thereof

Bus switching scheme:

A. Generation/Pooling Station end: [.....]

B. ISTS end: [.....]

Equipment Details:

Sl. No.	Name of Equipment	Generation Switchyard /Pooling Station end			ISTS Substation End at which Connectivity is granted		
		Type (AIS/GIS/ MTS)	Nos	Ratings	Type (AIS/GIS/ MTS)	Nos	Ratings
For GIS Substation							
1	Circuit Breaker (with PIR /CSD (if required))						
2	Disconnecting Switch						
3	Maintenance Earthing Switch						
4	High speed Earthing switch						
5	CT with core details						
6	Bus PT						

Sl. No.	Name of Equipment	Generation Switchyard /Pooling Station end			ISTS Substation End at which Connectivity is granted		
		Type (AIS/GIS/MTS)	Nos	Ratings	Type (AIS/GIS/MTS)	Nos	Ratings
7	Surge Arrester						
For AIS Substation							
1	Circuit Breaker (with PIR /CSD if required))						
2	Isolator (with no. of Earth Switch as required)						
3	CT with core details						
4	CT (Metering)						
5	Line CVT						
6	Bus CVT						
7	PT (Metering)						
8	Wave trap						
9	Surge Arrester						
10	ICT						
11	Bus Reactor						
12	Line Reactor						
13	NGR						
14	NCT						
15	ESS (Energy Storage System)						

Sl. No.	Name of Equipment	Generation Switchyard /Pooling Station end			ISTS Substation End at which Connectivity is granted		
		Type (AIS/GIS/MTS)	Nos	Ratings	Type (AIS/GIS/MTS)	Nos	Ratings
16	Any other equipment details (.....)						

Note: In case of more than two substations, the same shall be appended.

Data Format-II (B)

Protection Equipment to be provided by applicant shall be meeting the technical standards as per Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 and amendments thereof and shall be compatible & matching with the equipment installed at other end

(Please specify type, make and model of all main relays as applicable)

Name of Substation and Voltage level:

A. Generation end/Pooling substation end and Voltage Level:

B. Connectivity substation end and Voltage Level:

Name of Lines along with Tower Configuration (S/c, D/c, M/c):

Type of Conductor: (Bundle Configuration, Dia/ Type and Ampacity)

Protection Details:

Sl. No.	Description	Generation Switchyard / Pooling station end	ISTS Substation End at which Connectivity is granted
		Protection Type, Make and Model	
1.	Line protection relay MAIN-I (Distance / Differential)		
2.	Line protection relay MAIN-II (Distance / Differential)		
3.	Auto reclose relays		
4.	Bay Control Unit		
5.	Any Other Protection Equipment		

Note: In case of more than two substations, the same shall be appended.

Data Format-III (A)

System Recording Equipment to be provided in the allocated bay meeting the technical standards as per Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 and amendments thereof

Sl. No.	Name of Equipment's	Generation Switchyard / Pooling Station end		ISTS Substation End at which Connectivity is granted	
		Nos.	Ratings	Nos.	Ratings
1.	Event Logger				
2.	Disturbance recorder				
3.	Fault locator				
4.	PLCC details of transmission line				
5.	FOTE details				
6.	Any other equipment (Please indicate)				

Note: In case of more than two substations, the same shall be appended.

Data format-III (B)

Communication Equipment details upto Data Collection Point SCADA equipment shall be meeting the technical standards as per Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 and amendments thereof and shall be compatible to facilitate exchange of data with the existing system installed in the ISTS network

Sl. No	Name of Equipment	Nos.	Ratings
1.	Data Acquisition System - Remote Terminal Unit/SAS/DAS Gateway		
2(a)	Communication Equipment SDH required if any i. At the Generating/Pooling station ii. At data collection point (DCP)		
2(b)	Approach Cable & FODP i. At the Generating/ Pooling station ii. At data collection point (DCP)		
3	WAMS Phasor Measurement Unit(s) for measuring three phase current of all the feeders and three phase bus voltage at *220kV and above Generator		

***Note:** PMU locations shall be as per latest prevailing guidelines of CEA/Prevailing standards

Data Format –III (C)

**Cyber Security compliance as per CEA (Cyber Security in Power Sector)
Guidelines 2021**

Sl. No.	Name of Equipment	Nos.	Remarks
1.	Perimeter security Redundant Firewalls between SAS Gateway/RTU and FOTE		

Data Format –III (D)**Format for Communication inputs for Generator****A. Generator connectivity details with ISTS Station to be provided**

1	Generator location	
	Common Pooling Station (CPS) Location (if exists)	
2	Generator Connectivity with CPS (33/220/400kV voltage)	
	Line length from Gen to CPS in km	
3	Provision of communication from pre pooling station to CPS (Fibre/ Leased Line/ Others)	

B. Bay details at ISTS S/s

Sl. No.	Description	
1	Ownership (Gen/ISTS S/s Owner)	
2	Voltage level (220/400kV/Other)	
3	ISTS Substation from where connectivity granted	
4	Bay Number/s	

C. Communication Equipment details along with PMU

Sl. No.	Data Type	Gen End	ISTS S/s End	
		Installed /Provisioned	Scope (With Gen or ISTS S/s Owner)	Installed /Provisioned
1	Approach cable			
2	FODP			
3	PMU			
4	FOTE			

D. FOTE Details

Sl. No.	Particulars	Gen End	ISTS S/s end
1	Make		
2	Model		
3	Capacity (e.g. STM16)		
4	No. of supported optical directions (e.g. 5 MSP)		

Data format-IV

**Details of the modification/alteration to existing facilities for accommodating
proposed connection and its estimated cost**

Data format -V

Communication Link details up to ISTS Data Collection Point

Requirement of Channels:

- i. 2 Nos Data Channel (600Baud) /64 Kbps or Ethernet channel for RTU/SAS/DAS
- ii. 1 No Speech channel
- iii. 1 No. Data Channel (2 Mbps) for PMU

Data Collection Point for: Generating/Pooling Station Name

Data Collection Point (DCP): Name of ISTS Station

Wideband Link (Configuration of Data & Voice channel in wideband Link by Regional ULDC Team): -

Channel: DCP Name- Respective RLDC

Data format-VI**Site responsibility schedule****A. Principle & Procedure:**

The responsibility of control, operation, maintenance & all matters pertaining to safety of equipment's and apparatus at the connection point shall lie with the connectivity grantee. The grantee may enter into a separate O&M contract with the owner of the substation based on mutually agreed terms and conditions for ease of day-to-day O&M of the equipment which are located in the premises of the substation.

List of equipment and their ownership at the connection point:

Sl. No.	Name of Equipment	Ownership	
		Generation Switchyard / Pooling Station end	ISTS Substation end at which Connectivity is granted
1.	Circuit Breaker (with PIR /CSD if required))		
2.	Isolator (with no. of Earth Switch as required)		
3.	Disconnecting Switch(For GIS)		
4.	Maintenance Earthing Switch (For GIS)		
5.	High speed Earthing switch (For GIS)		
6.	CT		
7.	CT (Metering)		
8.	Line CVT		

Sl. No.	Name of Equipment	Ownership	
		Generation Switchyard / Pooling Station end	ISTS Substation end at which Connectivity is granted
9.	Bus CVT		
10.	PT (Metering)		
11.	Wave trap		
12.	Surge Arrester		
13.	ICT		
14.	Bus Reactor		
15.	Line Reactor		
16.	NGR		
17.	NCT		
18.	ESS (Energy Storage System)		
19.	Any other Equipment (....)		

Annexure-1**Basic System details**

Sl. No.	Description	Values
1	System operating voltage	
2	Maximum voltage of the system (rms)	
3	Rated frequency	
4	Nos. of phases	
5	Rated insulation levels	
i.	Impulse withstand voltage for (1.25/50 micro second) - Transformer and Reactors - For other equipment - For insulator string	
ii.	Switching impulse withstand voltage (250/2500 micro second) dry and wet	
iii.	One-minute power frequency dry withstand voltage (rms)	
iv.	One-minute power frequency dry and wet withstand voltage (rms)	
6.	Corona extinction voltage	
7.	Max. radio interference voltage for frequency between 0.5MHz and 2MHz	
8.	Minimum creepage distance for insulator string/longrod insulators/ outdoor bushings	
9.	Minimum creepage distance for switchyard equipment	
10.	Max. fault current capacity (kA for ...sec)	

Annexure-2**Data pertaining to interconnecting transmission line**

A. Conductor		
i.	Name of conductor	
ii.	Outside diameter	
iii.	DC Resistance (ohm/km)	
iv.	Number of conductors in bundle	
v.	Bundle spacing (mm)	
vi.	Maximum operating Temperature (degree C)	
vii.	Ampacity at maximum operating Temperature (A) with calculation sheet as per IEEE 738 & CEA Technical standard/CEA Planning criteria)	
B. Earth Wire		
i.	Diameter of Earthwire	
ii.	DC Resistance (ohm/km)	
C. OPGW		
i.	OPGW diameter (mm)	
ii.	OPGW cross-section area (mm ²)	
iii.	Number of Strands	
iv.	Diameter of each strands	
v.	DC Resistance (Ohms/km)	
vi.	Short Circuit Current (kA)	
vii.	OPGW Sag - Tension chart	
viii.	Fiber type considered in OPGW	
ix.	No. of fibers available for use	
x.	Fiber loss (dB) Attenuation	

	Chromatic Dispersion	
xi.	FODP terminations capacity	
D. Communication Equipment		
i.	Transmission Equipment (SDH) capacity (STM4/16)	
ii.	Optical Directions supported	
iii.	Make and model of Transmission Equipment	
iv.	Ethernet card/ ports details and availability for use	

Annexure-3

1. Turbine Details (Thermal)

Category	Parameter Description	Data
Manufacturer of turbine	Manufacturer and name plate details Rating of turbine	
Type of Governor	Electro-mechanical governor	
	Digital electric governor	
	Block diagram of the speed governor	
Ramp rates	How fast can the turbine increase and/or decrease load, specified in MW/min	
	Stroke limits of speed changer (values of full stroke, full load and no-load in mm)	
Droop	Droop setting (% on machine base)	
	Frequency influence limiters - Maximum frequency deviation limiter (eg +/-2 Hz) - Maximum influence limiter (eg 10% of rating)	
Dead band	Details of frequency dead band (typically in Hz)	
Steam turbine	Tandem compound: all sections on one shaft with a single generator	
	Cross compound: consists of two shafts, each connected to a generator and driven by one or more turbine section	
	Turbine sections: High pressure (HP), intermediate pressure (IP) and lowpressure (LP)	
	Reheat or non-reheat: In a reheat, steam upon leaving HP section returns to boiler where it passed through reheater before entering IP section	

Category	Parameter Description	Data
	Valves: - Main inlet stop valve (MSV) - Governor control valve (CV) - Reheater stop valve (RSV) - Intercept valves (IV)	
	Turbine control action: - Boiler follow mode - Turbine follow mode - Coordinated control	
	Fast valving /bypass operation	
	Block diagram of the turbine load control	
	Reheater volume (m ³), volume flow (kg/s), and average specific volume (m ³ /kg)	

2. Turbine Details-Hydro (to be filled in for the HPP and PSP separately)

Category	Parameter Description	Data
Type of prime mover	Hydro-electric turbine Other (Pumped storage)	
Manufacturer of turbine	Manufacturer and name plate details	
Modes of operation	Type of modes of operation capable: - Generator - Pump storage - Synchronous condenser	
Governor	- Electro-mechanical governor (including settings and drawings) - Digital electric governor (including settings and drawings) - PID governor details and settings - Transient droop (dashpot) governor details and settings - Tacho-accelerometric governor details and settings - Input transducer details - Transfer function data	
	Digital electric governor	
Ramp rates	How fast can the turbine increase and/or decrease load, specified in MW/min Guide vane/wicket gate characteristic, including opening, closing rates/times and limits	
	Droop setting (% on machine base)	

Category	Parameter Description	Data
Droop	Frequency influence limiters - Maximum frequency deviation limiter (eg +/-2 Hz) - Maximum influence limiter (eg 10% of rating)	
Dead band	Details of frequency dead band (typically in Hz or RPM)	
Hydro-electric turbine	Type of hydro turbine	
	Impulse turbines : typical with high head plants (Pelton wheel)	
	Reaction turbine : typical with low and medium head plants (such as Francis and Kaplan turbine)	
Penstock	Head, water flow, velocity and pressure (e.g. intake and outtake/draft tube)	
	Length (m)	
	Area (m ²)	
	Internal penstock diameter	
	Pipe thickness, material or other characteristics (such as tapering)	
	Non-elastic or elastic	
	Linear or non-linear model (with or without relief valve) or Kaplan model	
	Flow of water through turbine (m ³ /s) – with gates fully open	
Pressure relief valve	Number of penstocks supplied from common tunnel	
	Drawings/schematics	
	Settings	
	Operational descriptions	

Category	Parameter Description	Data
Surge tank, reservoir and tail water (i.e. head)	Vertical distance between the upper reservoir and level of turbine (in meters)	
	Head at turbine admission (lake head minus tailrace head) – (in meters)	
	Head loss due to friction in conduit (in meters)	
	Surge tank height, diameter and other characteristics (e.g. restricted inlet orifice)	
Pump characteristics	Active power draw vs head (table)	
	PSS status when pumping (on/off/not used)	
Synchronous condenser	Dewatered when operating as Syncon (yes/no)	
	Losses when operating as Syncon: - Mechanical loss (0 Mvar): MW - Copper loss (table) MW loss as a function of MVar output	
Other	Details of protection schemes that could influence dynamics (if any)	
	Details of resonance chamber for pipes (if any)	
	Temperature (e.g. water, ambient, unit)	
	Characteristic curve of blade versus gate (from 0MW to maximum MW)	

3. Turbine Details-Gas (to be filled in for the GT and ST separately)

Category	Parameter Description	Data
Type of prime mover	- Open cycle gas turbine - Aero-derivative (twin shaft) gas turbine - Combined cycle plant (closed cycle gas turbine)	
Manufacturer of turbine	Manufacturer and name plate details	
Governor	Electro-mechanical governor (including settings and drawings)	
	Digital electric governor (including settings and drawings)	
Ramp rates	How fast can the turbine increase and/or decrease load, specified in MW/min Guide vane/wicket gate characteristic, including opening, closing rates/times and limits	
Droop	Droop setting (% on machine base)	
	Frequency influence limiters - Maximum frequency deviation limiter (eg +/-2 Hz) - Maximum influence limiter (eg 10% of rating)	
Dead band	Details of frequency dead band (typically in Hz or RPM)	
Technology	- Open cycle - Close cycle	
Gas turbine	Does turbine operate in dual fuel (gas and liquid fuel)	
	Inlet guide vane (IGV) characteristic	
	Limit for exhaust gas temperature (EGT)	
	Base load/frequency control	
	Power output versus ambient temperature	
	No load fuel flow and turbine gain (determined by relationship of active power versus fuel valve position or fuel stroke reference)	
	Details on heat recovery steam generator (HRSG)	

Category	Parameter Description	Data
Combine cycle plant	- Block diagram - GT output vs heat relationship (look up table) - Drum time constant Pressure loss due to friction in boiler tubes	
	Size of steam turbine	
	Frequency control of ST	
	Time lag and relationship of GT and ST	
	Is the combined cycle plant a single shaft plant – i.e. the gas and steam turbine are on same shaft and drive same generator	

Annexure-4**Generic Models for synchronous machine**

There are two typical groups of synchronous machine models, depending upon the type of machine:

- Round rotor machine (2 poles):
 - GENROU – Round rotor machine model with quadratic saturation function
 - GENROE – Round rotor machine model with exponential saturation function
- Salient pole machine (more than two poles):
 - GENSAL – Salient pole machine with quadratic saturation function
 - GENSAE – Salient pole machine with exponential saturation function

Category	Parameter Description	Data
GENERATOR model		
GENROU OR GENROE	Direct axis open circuit transient time constant T_{do}' in sec	
	Direct axis open circuit sub-transient time constant T_{do}'' in sec	
	Quadrature axis open circuit transient time constant T_{qo}' in sec	
	Quadrature axis open circuit sub-transient time constant T_{qo}'' in sec	
	Inertia constant of total rotating mass H in MW.s/MVA	
	Speed Damping D	
	Direct axis synchronous reactance X_d in p.u. (Unsaturated)	
	Quadrature axis synchronous reactance X_q in p.u. (Unsaturated)	
	Direct axis transient synchronous reactance X_d' in p.u.	

Category	Parameter Description	Data
GENERATOR model		
	(Unsaturated)	
	Quadrature axis transient synchronous reactance X_q' in p.u. (Unsaturated)	
	Direct axis sub-transient synchronous reactance X_d'' in p.u. (Unsaturated)	
	Quadrature axis sub-transient synchronous reactance X_q'' in p.u. (Unsaturated)	
	Stator leakage reactance X_l in p.u.	
	Saturation constant S1 (1.0) in p.u.	
	Saturation constant S2 (1.2) in p.u.	
GENSAE OR GENSAL	Direct axis open circuit transient time constant T_{do}' in sec	
	Direct axis open circuit sub-transient time constant T_{do}'' in sec	
	Quadrature axis open circuit sub-transient time constant T_{qo}'' in sec	
	Inertia constant of total rotating mass H in MW.s/MVA	
	Speed Damping D	
	Direct axis synchronous reactance X_d in p.u. (Unsaturated)	
	Quadrature axis synchronous reactance X_q in p.u. (Unsaturated)	
	Direct axis transient synchronous reactance X_d' in p.u. (Unsaturated)	
	Direct axis sub-transient synchronous reactance X_d'' in p.u. (Unsaturated) = Quadrature axis sub-transient synchronous reactance X_q'' in p.u. (Unsaturated)	

Category	Parameter Description	Data
GENERATOR model		
	Stator leakage reactance X_l in p.u.	
	Saturation constant S (1.0) in p.u.	
	Saturation constant S (1.2) in p.u.	

Category	Parameter Description	Data
DC Exciter		
ESDC1A OR ESDC2A	T_R regulator input filter time constant (sec)	
	K_A (> 0) (pu) voltage regulator gain	
	T_A (s), voltage regulator time constant	
	T_B (s), lag time constant	
	T_C (s), lead time constant	
	V_{RMAX} (pu) regulator output maximum limit or Zero	
	V_{RMIN} (pu) regulator output minimum limit	
	K_E (pu) exciter constant related to self-excited field	
	T_E (> 0) rotating exciter time constant (sec)	
	K_F (pu) rate feedback gain	
	T_{F1} (> 0) rate feedback time constant (sec)	
	Switch	
	E_1 , exciter flux at knee of curve (pu)	
	$SE(E_1)$, saturation factor at knee of curve	
	E_2 , maximum exciter flux (pu)	
	$SE(E_2)$, saturation factor at maximum exciter flux (pu)	
ESDC3A	T_R regulator input filter time constant (sec)	
	K_V (pu) limit on fast raise/lower contact setting	
	V_{RMAX} (pu) regulator output maximum limit or Zero	
	V_{RMIN} (pu) regulator output minimum limit	
	T_{RH} (> 0) Rheostat motor travel time (sec)	
	T_E (> 0) exciter time-constant (sec)	
	K_E (pu) exciter constant related to self-excited field	

Category	Parameter Description	Data
DC Exciter		
	V _{EMIN} (pu) exciter minimum limit	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	
ESDC4B	T _R regulator input filter time constant (sec)	
	K _P (pu) (> 0) voltage regulator proportional gain	
	K _I (pu) voltage regulator integral gain	
	K _D (pu) voltage regulator derivative gain	
	T _D voltage regulator derivative channel time constant (sec)	
	V _{RMAX} (pu) regulator output maximum limit	
	V _{RMIN} (pu) regulator output minimum limit	
	K _A (> 0) (pu) voltage regulator gain	
	T _A voltage regulator time constant (sec)	
	K _E (pu) exciter constant related to self-excited field	
	T _E (> 0) rotating exciter time constant (sec)	
	K _F (pu) rate feedback gain	
	T _F (> 0) rate feedback time constant (sec)	
	V _{EMIN} (pu) minimum exciter voltage output	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	

Category	Parameter Description	Data
AC Exciter		
ESAC1A	T_R regulator input filter time constant (sec)	
	T_B (s), lag time constant	
	T_C (s), lead time constant	
	K_A (> 0) (pu) voltage regulator gain	
	T_A (s), voltage regulator time constant	
	V_{AMAX} (pu) regulator output maximum limit	
	V_{AMIN} (pu) regulator output minimum limit	
	T_E (> 0) rotating exciter time constant (sec)	
	K_F (pu) rate feedback gain	
	T_F (> 0) rate feedback time constant (sec)	
	K_C (pu) rectifier loading factor proportional to commutating reactance	
	K_D (pu) demagnetizing factor, function of AC exciter reactances	
	K_E (pu) exciter constant related to self-excited field	
	E_1 , exciter flux at knee of curve (pu)	
	$SE(E_1)$, saturation factor at knee of curve	
	E_2 , maximum exciter flux (pu)	
	$SE(E_2)$, saturation factor at maximum exciter flux (pu)	
	V_{RMAX} (pu) regulator output maximum limit	
	V_{RMIN} (pu) regulator output minimum limit	
ESAC2A	T_R regulator input filter time constant (sec)	
	T_B (s), lag time constant	
	T_C (s), lead time constant	

Category	Parameter Description	Data
AC Exciter		
	$K_A (> 0)$ (pu) voltage regulator gain	
	T_A (s), voltage regulator time constant	
	V_{AMAX} (pu) regulator output maximum limit	
	V_{AMIN} (pu) regulator output minimum limit	
	K_B , Second stage regulator gain	
	V_{RMAX} (pu) regulator output maximum limit	
	V_{RMIN} (pu) regulator output minimum limit	
	$T_E (> 0)$ rotating exciter time constant (sec)	
	V_{FEMAX} , parameter of V_{EMAX} , exciter field maximum output	
	K_H , Exciter field current feedback gain	
	K_F (pu) rate feedback gain	
	$T_F (> 0)$ rate feedback time constant (sec)	
	K_C (pu) rectifier loading factor proportional to commutating reactance	
	K_D (pu) demagnetizing factor, function of AC exciter reactances	
	K_E (pu) exciter constant related to self-excited field	
	E_1 , exciter flux at knee of curve (pu)	
	$SE(E_1)$, saturation factor at knee of curve	
	E_2 , maximum exciter flux (pu)	
	$SE(E_2)$, saturation factor at maximum exciter flux (pu)	
	T_R regulator input filter time constant (sec)	
	T_B (s), lag time constant	

Category	Parameter Description	Data
AC Exciter		
ESAC3A	T_C (s), lead time constant	
	K_A (> 0) (pu) voltage regulator gain	
	T_A (s), voltage regulator time constant	
	V_{AMAX} (pu) regulator output maximum limit	
	V_{AMIN} (pu) regulator output minimum limit	
	T_E (> 0) rotating exciter time constant (sec)	
	V_{EMIN} (pu) minimum exciter voltage output	
	K_R (> 0), Constant associated with regulator and alternator field power supply	
	K_F (pu) rate feedback gain	
	T_F (> 0) rate feedback time constant (sec)	
	K_N , Exciter feedback gain	
	EFDN, A parameter defining for which value of UF the feedback gain shall change from K_F to K_N	
	K_C , rectifier regulation factor (pu)	
	K_D , exciter regulation factor (pu)	
	K_E (pu) exciter constant related to self-excited field	
	V_{FEMAX} , parameter of V_{EMAX} , exciter field maximum output	
	E_1 , exciter flux at knee of curve (pu)	
	SE(E_1), saturation factor at knee of curve	
	E_2 , maximum exciter flux (pu)	
	SE(E_2), saturation factor at maximum exciter flux (pu)	
	T_R regulator input filter time constant (sec)	

Category	Parameter Description	Data
AC Exciter		
ESAC4A	V_{IMAX} , Maximum value of limitation of the integrator signal V_I in p.u	
	V_{IMIN} , Minimum value of limitation of the signal V_I in p.u.	
	T_B (s), lag time constant	
	T_C (s), lead time constant	
	K_A (> 0) (pu) voltage regulator gain	
	T_A (s), voltage regulator time constant	
	V_{RMAX} (pu) regulator output maximum limit	
	V_{RMIN} (pu) regulator output minimum limit	
	K_C , rectifier regulation factor (pu)	
ESAC5A	T_R regulator input filter time constant (sec)	
	K_A (> 0) (pu) voltage regulator gain	
	T_A (s), voltage regulator time constant	
	V_{RMAX} (pu) regulator output maximum limit	
	V_{RMIN} (pu) regulator output minimum limit	
	K_E (pu) exciter constant related to self-excited field	
	T_E (> 0) rotating exciter time constant (sec)	
	K_F (pu) rate feedback gain	
	T_{F1} (sec), Regulator stabilizing circuit time constant in seconds	
	T_{F2} (sec), Regulator stabilizing circuit time constant in seconds	
	T_{F3} (sec), Regulator stabilizing circuit time constant in seconds	

Category	Parameter Description	Data
AC Exciter		
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	
AC6A	T _R regulator input filter time constant (sec)	
	K _A (> 0) (pu) voltage regulator gain	
	T _A (s), voltage regulator time constant	
	T _K (sec), Lead time constant	
	T _B (s), lag time constant	
	T _C (s), lead time constant	
	V _{AMAX} (pu) regulator output maximum limit	
	V _{AMIN} (pu) regulator output minimum limit	
	V _{RMAX} (pu) regulator output maximum limit	
	V _{RMIN} (pu) regulator output minimum limit	
	T _E (> 0) rotating exciter time constant (sec)	
	VFELIM, Exciter field current limit reference	
	K _H , Damping module gain	
	V _{HMAX} , damping module limiter	
	T _H (sec), damping module lag time constant	
	T _J (sec), damping module lead time constant	
	K _C , rectifier regulation factor (pu)	
	K _D , exciter regulation factor (pu)	
	K _E (pu) exciter constant related to self-excited field	

Category	Parameter Description	Data
AC Exciter		
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	
AC7B	T _R (sec) regulator input filter time constant	
	K _{PR} (pu) regulator proportional gain	
	K _{IR} (pu) regulator integral gain	
	K _{DR} (pu) regulator derivative gain	
	T _{DR} (sec) regulator derivative block time constant	
	V _{RMAX} (pu) regulator output maximum limit	
	V _{RMIN} (pu) regulator output minimum limit	
	K _{PA} (pu) voltage regulator proportional gain	
	K _{IA} (pu) voltage regulator integral gain	
	V _{AMAX} (pu) regulator output maximum limit	
	V _{AMIN} (pu) regulator output minimum limit	
	K _P (pu)	
	K _L (pu)	
	K _{F1} (pu)	
	K _{F2} (pu)	
	K _{F3} (pu)	
	T _{F3} (sec) time constant (> 0)	
	K _C (pu) rectifier loading factor proportional to commutating reactance	
	K _D (pu) demagnetizing factor, function of AC exciter	

Category	Parameter Description	Data
AC Exciter		
	reactances	
	K_E (pu) exciter constant related to self-excited field	
	T_E (pu) exciter time constant (>0)	
	V_{FEMAX} (pu) exciter field current limit (> 0)	
	V_{EMIN} (pu)	
	E_1 , exciter flux at knee of curve (pu)	
	$SE(E_1)$, saturation factor at knee of curve	
	E_2 , maximum exciter flux (pu)	
	$SE(E_2)$, saturation factor at maximum exciter flux (pu)	
AC8B	T_R (sec) regulator input filter time constant	
	K_{PR} (pu) regulator proportional gain	
	K_{IR} (pu) regulator integral gain	
	K_{DR} (pu) regulator derivative gain	
	T_{DR} (sec) regulator derivative block time constant	
	V_{PIDMAX} (pu) PID maximum limit	
	V_{PIDMIN} (pu) PID minimum limit	
	K_A (pu) voltage regulator proportional gain	
	T_A (sec) voltage regulator time constant	
	V_{RMAX} (pu) regulator output maximum limit	
	V_{RMIN} (pu) regulator output minimum limit	
	K_C (pu) rectifier loading factor proportional to commutating reactance	
	K_D (pu) demagnetizing factor, function of AC exciter reactances	

Category	Parameter Description	Data
AC Exciter		
	K_E (pu) exciter constant related to self-excited field	
	T_E (pu) exciter time constant (>0)	
	V_{FEMAX} (pu) max exciter field current limit (> 0)	
	V_{EMIN} (pu),	
	E_1 , exciter flux at knee of curve (pu)	
	$SE(E_1)$, saturation factor at knee of curve	
	E_2 , maximum exciter flux (pu)	
	$SE(E_2)$, saturation factor at maximum exciter flux (pu)	

Category	Parameter Description	Data
Static Exciter		
ST1A	T_R (sec) regulator input filter time constant	
	V_{IMAX} , Controller Input Maximum	
	V_{IMIN} , Controller Input Minimum	
	T_C (s), Filter 1st Derivative Time Constant	
	T_B (s), I Filter 1st Delay Time Constant	
	T_{C1} (s), Filter 2nd Derivative Time Constant	
	T_{B1} (s), Filter 2nd Delay Time Constant	
	K_A (pu) voltage regulator proportional gain	
	T_A (sec) voltage regulator time constant	
	V_{AMAX} (pu) regulator output maximum limit	
	V_{AMIN} (pu) regulator output minimum limit	
	V_{RMAX} (pu) regulator output maximum limit	
	V_{RMIN} (pu) regulator output minimum limit	
	K_C (pu) rectifier loading factor proportional to commutating reactance	
	K_F (pu) rate feedback gain	
	T_F (> 0) rate feedback time constant (sec)	
	K_{LR} , Current Input Factor	
	I_{LR} , Current Input Reference	
	T_R (sec) regulator input filter time constant	
	K_A (pu) voltage regulator proportional gain	
	T_A (sec) voltage regulator time constant	
	V_{RMAX} (pu) regulator output maximum limit	

Category	Parameter Description	Data
Static Exciter		
ST2A	V_{RMIN} (pu) regulator output minimum limit	
	K_E (pu) exciter constant related fo self-excited field	
	T_E (pu) exciter time constant (>0)	
	K_F (pu) rate feedback gain	
	T_F (> 0) rate feedback time constant (sec)	
	K_P (pu) voltage regulator proportional gain	
	K_I (pu) voltage regulator integral gain	
	K_C (pu) rectifier loading factor proportional to commutating reactance	
	EFDMAX	
ST3A	T_R (sec) regulator input filter time constant	
	V_{IMAX} , Maximum value of limitation of the signal VI in p.u.	
	V_{IMIN} , Minimum value of limitation of the signal VI in p.u.	
	K_M , Forward gain constant of the inner loop field regulator	
	T_C (s), lag time constant	
	T_B (s), lead time constant	
	K_A (pu) voltage regulator proportional gain	
	T_A (sec) voltage regulator time constant	
	V_{RMAX} (pu) regulator output maximum limit	
	V_{RMIN} (pu) regulator output minimum limit	
	K_G , Feedback gain constant of the inner loop field regulator	
	K_P (pu) voltage regulator proportional gain	
	K_I (pu) voltage regulator integral gain	

Category	Parameter Description	Data
Static Exciter		
	V_{BMAX} , Maximum value of limitation of the signal VB in p.u.	
	K_C (pu) rectifier loading factor proportional to commutating reactance	
	X_L , Reactance associated with potential source	
	V_{GMAX} , Maximum value of limitation of the signal VG in p.u.	
	Θ_P (degrees)	
	T_M (sec), Forward time constant of the inner loop field regulator	
	V_{MMAX} , Maximum value of limitation of the signal VM in p.u.	
	V_{MMIN} , Minimum value of limitation of the signal VM in p.u.	
ST4B	T_R (sec) regulator input filter time constant	
	K_{PR} (pu) regulator proportional gain	
	K_{IR} (pu) regulator integral gain	
	V_{RMAX} (pu) regulator output maximum limit	
	V_{RMIN} (pu) regulator output minimum limit	
	T_A (sec) voltage regulator time constant	
	K_{PM} , Regulator gain	
	K_{IM} , Regulator gain	
	V_{MMAX} , Maximum value of limitation of the signal in p.u.	
	V_{MMIN} , Minimum value of limitation of the signal in p.u.	
	K_G	
	K_P (pu) voltage regulator proportional gain	
	K_I (pu) voltage regulator integral gain	

Category	Parameter Description	Data
Static Exciter		
	VBMAX	
	K _C (pu) rectifier loading factor proportional to commutating reactance	
	X _L	
	Θ _P (degrees)	
ST5B	T _R regulator input filter time constant (sec)	
	T _{C1} lead time constant of first lead-lag block (voltage regulator channel) (sec)	
	T _{B1} lag time constant of first lead-lag block (voltage regulator channel) (sec)	
	T _{C2} lead time constant of second lead-lag block (voltage regulator channel) (sec)	
	T _{B2} lag time constant of second lead-lag block (voltage regulator channel) (sec)	
	K _R (>0) (pu) voltage regulator gain	
	V _{RMAX} (pu) voltage regulator maximum limit	
	V _{RMIN} (pu) voltage regulator minimum limit	
	T ₁ voltage regulator time constant (sec)	
	K _C (pu)	
	TUC1 lead time constant of first lead-lag block (under-excitation channel) (sec)	
	TUB1 lag time constant of first lead-lag block (under-excitation channel) (sec)	
	TUC2 lead time constant of second lead-lag block (under-excitation channel) (sec)	

Category	Parameter Description	Data
Static Exciter		
	TUB2 lag time constant of second lead-lag block (under-excitation channel) (sec)	
	TOC1 lead time constant of first lead-lag block (over-excitation channel) (sec)	
	TOB1 lag time constant of first lead-lag block (over-excitation channel) (sec)	
	TOC2 lead time constant of second lead-lag block (over-excitation channel) (sec)	
	TOB2 lag time constant of second lead-lag block (over-excitation channel) (sec)	
ST6B	TR regulator input filter time constant (sec)	
	KPA (pu) (> 0) voltage regulator proportional gain	
	KIA (pu) voltage regulator integral gain	
	KDA (pu) voltage regulator derivative gain	
	TDA voltage regulator derivative channel time constant (sec)	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	KFF (pu) pre-control gain of the inner loop field regulator	
	KM (pu) forward gain of the inner loop field regulator	
	KCI (pu) exciter output current limit adjustment gain	
	KLR (pu) exciter output current limiter gain	
	ILR (pu) exciter current limit reference	
	VRMAX (pu) voltage regulator output maximum limit	

Category	Parameter Description	Data
Static Exciter		
	VRMIN (pu) voltage regulator output minimum limit	
	KG (pu) feedback gain of the inner loop field voltage regulator	
	TG (> 0) feedback time constant of the inner loop field voltage regulator (sec)	
ST7B	TR regulator input filter time constant (sec)	
	TG lead time constant of voltage input (sec)	
	TF lag time constant of voltage input (sec)	
	Vmax (pu) voltage reference maximum limit	
	Vmin (pu) voltage reference minimum limit	
	KPA (pu) (>0) voltage regulator gain	
	VRMAX (pu) voltage regulator output maximum limit	
	VRMIN (pu) voltage regulator output minimum limit	
	KH (pu) feedback gain	
	KL (pu) feedback gain	
	TC lead time constant of voltage regulator (sec)	
	TB lag time constant of voltage regulator (sec)	
	KIA (pu) (>0) gain of the first order feedback block	
	TIA (>0) time constant of the first order feedback block (sec)	

Category	Parameter Description	Data
Stabilizer Model		
PSS1A	A ₁ , Filter coefficient	
	A ₂ , Filter coefficient	
	T _R , transducer time constant	
	T ₁ , 1st Lead-Lag Derivative Time Constant	
	T ₂ , 1st Lead-Lag Delay Time Constant	
	T ₃ , 2nd Lead-Lag Derivative Time Constant	
	T ₄ , 2nd Lead-Lag Delay Time Constant	
	T _w , Washout Time Constant	
	T _w , Washout Time Constant	
	K _s , input channel gain	
	V _{STMAX} , Controller maximum output	
	V _{STMAX} , Controller minimum output	
PSS2B	T _{W1} , 1st Washout 1th Time Constant	
	T _{W2} , 1st Washout 2th Time Constant	
	T ₆ , 1st Signal Transducer Time Constant	
	T _{W3} , 2nd Washout 1th Time Constant	
	T _{W4} , 2nd Washout 2th Time Constant	
	T ₇ , 2nd Signal Transducer Time Constant	
	K _{S2} , 2nd Signal Transducer Factor	
	K _{S3} , Washouts Coupling Factor	
	T ₈ , Ramp Tracking Filter Deriv. Time Constant	
	T ₉ , Ramp Tracking Filter Delay Time Constant	
	K _{S1} , PSS Gain	

Category	Parameter Description	Data
Stabilizer Model		
	T ₁ , 1st Lead-Lag Derivative Time Constant	
	T ₂ , 1st Lead-Lag Delay Time Constant	
	T ₃ , 2nd Lead-Lag Derivative Time Constant	
	T ₄ , 2nd Lead-Lag Delay Time Constant	
	T ₁₀ , 3rd Lead-Lag Derivative Time Constant	
	T ₁₁ , 3rd Lead-Lag Delay Time Constant	
	V _{S1MAX} , Input 1 Maximum limit	
	V _{S1MIN} , Input 1 Minimum limit	
	V _{S2MAX} , Input 2 Maximum limit	
	V _{S2MIN} , Input 2 Minimum limit	
	V _{STMAX} , Controller Maximum Output	
	V _{STMIN} , Controller Minimum Output	
PSS3B	K _{S1} (pu) ($\neq 0$), input channel #1 gain	
	T ₁ input channel #1 transducer time constant (sec)	
	T _{w1} input channel #1 washout time constant (sec)	
	K _{S2} (pu) , input channel #2 gain	
	T ₂ input channel #2 transducer time constant (sec)	
	T _{w2} input channel #2 washout time constant (sec)	
	T _{w3} (0), main washout time constant (sec)	
	A ₁ , Filter coefficient	
	A ₂ , Filter coefficient	
	A ₃ , Filter coefficient	
	A ₄ , Filter coefficient	

Category	Parameter Description	Data
Stabilizer Model		
	A ₅ , Filter coefficient	
	A ₆ , Filter coefficient	
	A ₇ , Filter coefficient	
	A ₈ , Filter coefficient	
	V _{STMAX} , Controller maximum output	
	V _{STMAX} , Controller minimum output	

Category	Parameter Description	Data
Turbine Governor model		
BBGOV1	fcut (≥ 0) (pu), cut off frequency	
	K _S , frequency gain	
	K _{LS} (> 0)	
	K _G	
	K _P , power regulator gain	
	T _N (sec) (> 0)	
	K _D , damping gain	
	T _D (sec) (> 0), damping time constant	
	T ₄ (sec), high pressure time constant	
	K ₂ , intermediate pressure time constant	
	T ₅ (sec), intermediate re-heater time constant	
	K ₃ , high pressure time constant	
	T ₆ (sec), re-heater time constant	
	T ₁ (sec), measuring transducer time constant	
	SWITCH	
	P _{MAX} , maximum power output limiter	
	P _{MIN} , minimum power output limiter	
TGOV1	R, Permanent Droop	
	T1 (> 0) (sec), Steam bowl time constant	
	V _{MAX} , Maximum valve position	
	V _{MIN} , Minimum valve position	
	T2 (sec), Time constant	
	T3 (> 0) (sec), reheater time constant	

Category	Parameter Description	Data
Turbine Governor model		
	Dt, Turbine damping coefficient	
	V _{MAX} , V _{MIN} , D _t and R are in per unit on generator MVA base. T ₂ /T ₃ = high-pressure fraction.	
CRCMGV	P _{MAX} (HP)1, maximum HP value position (on generator base)	
	R (HP), HP governor droop	
	T1 (HP) (>0), HP governor time constant	
	T3 (HP) (>0), HP turbine time constant	
	T4 (HP) (>0), HP turbine time constant	
	T5 (HP) (>0), HP reheater time constant	
	F (HP), fraction of HP power ahead of reheater	
	DH (HP), HP damping factor (on generator base)	
	P _{MAX} (LP), maximum LP value position (on generator base)	
	R (LP), LP governor droop	
	T1 (LP) (>0), LP governor time constant	
	T3 (LP) (>0), LP turbine time constant	
	T4 (LP) (>0), LP turbine time constant	
	T5 (LP) (>0), LP turbine time constant	
	F (LP), fraction of LP power ahead of reheater	
	DH (LP), LP damping factor (on generator base)	
	K, Governor gain, (1/droop) pu	
	T1 (sec), Lag time constant (sec)	
	T2 (sec), Lead time constant (sec)	
	T3 (> 0) (sec), valve position time constant	
	Uo (pu/sec), maximum valve opening rate	

Category	Parameter Description	Data
Turbine Governor model		
IEEEG1	Uc (< 0) (pu/sec), maximum valve closing rate	
	P _{MAX} (pu on machine MVA rating)	
	P _{MIN} (pu on machine MVA rating)	
	T4 (sec), time constant for steam inlet	
	K1, HP fraction	
	K2, LP fraction	
	T5 (sec), Time Constant for Second Boiler Pass [s]	
	K3, HP Fraction	
	K4, LP fraction	
	T6 (sec), Time Constant for Third Boiler Pass [s]	
	K5, HP Fraction	
	K6, LP fraction	
	T7 (sec), Time Constant for Fourth Boiler Pass [s]	
	K7, HP Fraction	
	K8, LP fraction	
IEEEG2	K, Governor gain	
	T1 (sec), Governor lag time constant	
	T2 (sec), Governor lead time constant	
	T3 (>0) (sec), Gate actuator time constant	
	P _{MAX} (pu on machine MVA rating), gate maximum	
	P _{MIN} (pu on machine MVA rating), gate minimum	
	T4 (>0) (sec), water starting time	
	T _G , (>0) (sec), gate servomotor time constant	

Category	Parameter Description	Data
Turbine Governor model		
IEEEG3	T_P (>0) (sec), pilot value time constant	
	U_o (pu per sec), opening gate rate limit	
	U_c (pu per sec), closing gate rate limit (< 0)	
	P_{MAX} maximum gate position (pu on machine MVA rating)	
	P_{MIN} minimum gate position (pu on machine MVA rating)	
	σ , permanent speed droop coefficient	
	δ , transient speed droop coefficient	
	T_R , (>0) (sec), Dashpot time constant	
	T_W (>0) (sec), water starting time	
	a_{11} (>0), Turbine coefficient	
	a_{13} , Turbine coefficient	
	a_{21} , Turbine coefficient	
	a_{23} (>0), Turbine coefficient	
IEESGO	T_1 , Controller Lag	
	T_2 , Controller Lead Compensation	
	T_3 , Governor Lag (> 0)	
	T_4 , Delay Due To Steam Inlet Volumes	
	T_5 , Reheater Delay	
	T_6 , Turbine, pipe, hood Delay	
	K_1 , 1/Per Unit Regulation	
	K_2 , Fraction	
	K_3 , fraction	
	P_{MAX} , Upper Power Limit	

Category	Parameter Description	Data
Turbine Governor model		
	P_{MIN} , Lower Power Limit	
TGOV2	R (pu), permanent droop	
	T1 (>0) (sec), Steam bowl time constant	
	V_{MAX} (pu), Maximum valve position	
	V_{MIN} (pu), Minimum valve position	
	K (pu), Governor gain	
	T3 (>0) (sec), Time constant	
	Dt (pu), Turbine damping coefficient	
	Tt (>0) (sec), Valve time constant	
	T _A , Valve position at time 2 (fully closed after fast valving initialization)	
	T _B , Valve position at time 3 (start to reopen after fast valving initialization)	
	T _C , Valve position at time 4 (again fully open after fast valving initializations)	
TGOV3	K, Governor gain	
	T1 (sec), Governor lead time constant	
	T2 (sec), Governor lag time constant	
	T3 (>0) (sec), Valve positioner time constant	
	U _o , Maximum valve opening velocity	
	U _c (< 0), Maximum valve closing velocity	
	P_{MAX} , Maximum valve opening	
	P_{MIN} , Minimum valve opening	
	T4 (sec), Inlet piping/steam bowl time constant	

Category	Parameter Description	Data
Turbine Governor model		
	K1, Fraction of turbine power developed after first boiler pass	
	T5 (> 0) (sec), Time constant of second boiler pass	
	K2, Fraction of turbine power developed after second boiler pass	
	T6 (sec), Time constant of crossover or third boiler pass	
	K3, Fraction of hp turbine power developed after crossover or third boiler pass	
	TA (sec), Valve position at time 2 (fully closed after fast valving initializations)	
	TB (sec), Valve position at time 3 (start to reopen after fast valving initializations)	
	TC (sec), Valve position at time 4 (again fully open after fast valving initializations)	
	PRMAX (pu), Max. pressure in reheater	
	K, The inverse of the governor speed droop	
	T1 (sec), The governor controller lag time constant	
	T2 (sec), The governor controller lead time constant	
	T3 (>0) (sec), The valve servomotor time constant for the control valves	
	Uo, The control valve open rate limit	
	Uc (<0), The control valve close rate limit	
	KCAL	
	T4 (sec), The steam flow time constant	
	K1	
	T5 (> 0) (sec)	

Category	Parameter Description	Data
Turbine Governor model		
TGOV4	K2	
	T6 (sec)	
	P _{RMAX}	
	KP	
	KI	
	TFuel (sec)	
	TFD1 (sec)	
	TFD2 (sec)	
	Kb	
	Cb (> 0) (sec)	
	TIV (> 0) (sec)	
	UOIV	
	UCIV	
	R (>0)	
	Offset	
	CV position demand characteristic	
	CV #2 offset	
	CV #3 offset	
	CV #4 offset	
	IV position demand characteristic	
	IV #2 offset	
	CV valve characteristic	
	IV valve characteristic	

Category	Parameter Description	Data
Turbine Governor model		
	CV starting time for valve closing (sec)	
	CV closing rate (pu/sec)	
	Time closed for CV #1 (sec)	
	Time closed for CV #2	
	Time closed for CV #3	
	Time closed for CV #4	
	IV starting time for valve closing (sec)	
	IV closing rate (pu/sec)	
	Time closed for IV #1 (sec)	
	Time closed for IV #2 (sec)	
	TRPLU (>0) (sec)	
	PLU rate level	
	Timer	
	PLU unbalance level	
	TREVA (>0) (sec)	
	EVA rate level	
	EVA unbalance level	
	Minimum load reference (pu)	
	Load reference ramp rate (pu/sec)	
	K, The inverse of the governor speed droop	
	T1 (sec), The governor controller lag time constant	
	T2 (sec), The governor controller lead time constant	
	T3 (>0) (sec), The valve servomotor time constant for the control valves	

Category	Parameter Description	Data
Turbine Governor model		
TGOV5	Uo, The control valve open rate limit	
	Uc (<0), The control valve close rate limit	
	V _{MAX} , The maximum valve area	
	V _{MIN} , The minimum valve area	
	T4 (sec), The steam flow time constant	
	K1, The fractions of the HP	
	K2, fractions of the LP	
	T5 (sec), The first reheater time constant	
	K3, The fractions of the HP	
	K4, fractions of the LP	
	T6 (sec), second reheater time constant	
	K5, The fractions of the HP	
	K6, fractions of the LP	
	T7 (sec), crossover time constant	
	K7, The fractions of the HP	
	K8, fractions of the LP	
	K9, The adjustment to the pressure drop coefficient as a function of drum pressure	
	K10, The gain of anticipation signal from main stream flow	
	K11, The gain of anticipation signal from load demand	
	K12, The gain for pressure error bias	
	K13, The gain between MW demand and pressure set point	
	K14, Inverse of load reference servomotor time constant (= 0.0 if load reference does not change).	

Category	Parameter Description	Data
Turbine Governor model		
	R _{MAX} , The load reference positive rate of change limit	
	R _{MIN} , The load reference negative rate of change limit	
	L _{MAX} , The maximum load reference	
	L _{MIN} , The minimum load reference	
	C1, The pressure drop coefficient	
	C2, The gain for the pressure error bias	
	C3, The adjustment to the pressure set point	
	B, The frequency bias for load reference control	
	CB (>0) (sec), The boiler storage time constant	
	KI, The controller integral gain	
	TI (sec), The controller proportional lead time constant	
	T _R (sec), The controller rate lead time constant	
	T _{R1} (sec), The inherent lag associated with lead TR (usually about TR/10)	
	C _{MAX} , The maximum controller output	
	C _{MIN} , The minimum controller output	
	T _D (sec), The time delay in the fuel supply system	
	T _F (sec), The fuel and air system time constant	
	TW (sec), The water wall time constant	
	P _{sp} (initial) (>0), The initial throttle pressure set point	
	TMW (sec), The MW transducer time constant	
	KL (0.0 or 1.0), The feedback gain from the load reference	
	KMW (0.0 or 1.0), The gain of the MW transducer	
	DPE (pu pressure), The dead band in the pressure error signal	

Category	Parameter Description	Data
Turbine Governor model		
	for load reference control	
	- The fractions of the HP unit's mechanical power developed by the various turbine stages. The sum of K1, K3, K5 and K7 constants should be one for a non cross-compound unit. - Similarly fractions of the LP unit's mechanical power should be zero for a non cross-compound unit. For a cross-compound unit, the sum of K1 through K8 should equal one.	
TURCZT	f _{DEAD} (pu), Frequency Dead Band	
	f _{MIN} (pu), Frequency Minimum Deviation	
	f _{MAX} (pu), Frequency Maximum Deviation	
	KKOR (pu), Frequency Gain	
	K _M > 0 (pu), Power Measurement Gain	
	K _P (pu), Regulator Proportional Gain	
	S _{DEAD} (pu), Speed Dead Band	
	K _{STAT} (pu), Speed Gain	
	K _{HP} (pu), High Pressure Constant	
	T _C (sec), Measuring transducer time constant	
	T ₁ (sec), Regulator Integrator Time Constant	
	TEHP (sec), Hydro Converter Time Constant	
	TV > 0 (sec), Regulation Valve Time Constant	
	THP (sec), High Pressure Time Constant	
	T _R (sec), Reheater time constant	
	TW (sec), Water Time Constant	
	NT _{MAX} (pu), Power Regulator-Integrator Maximum Limiter	

Category	Parameter Description	Data
Turbine Governor model		
	NT _{MIN} (pu), Power Regulator-Integrator Minimum Limiter	
	G _{MAX} (pu), Valve Maximum Open	
	G _{MIN} (pu), Valve Minimum Open	
	V _{MIN} (pu/sec), Valve Maximum Speed Close	
	V _{MAX} (pu/sec), Valve Maximum Speed Open	
HYGOV	R, permanent droop	
	r, temporary droop	
	T _r (>0) governor time constant	
	T _f (>0) filter time constant	
	T _g (>0) servo time constant	
	+ VELM, gate velocity limit	
	G _{MAX} , maximum gate limit	
	G _{MIN} , minimum gate limit	
	TW (>0) water time constant	
	At, turbine gain	
	Dturb, turbine damping	
	qNL, no power flow	
	R, permanent droop	
	r, temporary droop	
	T _r (>0) governor time constant	
	T _f (>0) filter time constant	
	T _g (>0) servo time constant	
	+ VELM, gate velocity limit	

Category	Parameter Description	Data
Turbine Governor model		
HYGOVDU	G _{MAX} , maximum gate limit	
	G _{MIN} , minimum gate limit	
	TW (>0) water time constant	
	At, turbine gain	
	D _{turb} , turbine damping	
	qNL, no power flow	
	DBH (pu), droop for over-speed, (> 0)	
	DBL (pu), droop for under-speed, (< 0)	
	TRate (MW), turbine rating, if zero, then MBASE used	
	P _{rated} , rated turbine power (MW)	
	Q _{rated} , rated turbine flow (cfs or cms)	
	H _{rated} , rated turbine head (ft or m)	
	G _{rated} , gate position at rated conditions (pu)	
	QNL, no power flow (pu of Q _{rated})	
	R, permanent droop (pu)	
	r, temporary droop (pu)	
	Tr, governor time constant (> 0) (sec)	
	Tf, filter time constant (> 0) (sec)	
	Tg, servo time constant (> 0) (sec)	
	MXGTOR, maximum gate opening rate (pu/sec)	
	MXGTCR, maximum gate closing rate (< 0) (pu/sec)	
	MXBGOR, maximum buffered gate opening rate (pu/sec)	
	MXBGCR, maximum buffered gate closing rate (< 0) (pu/sec)	

Category	Parameter Description	Data
Turbine Governor model		
HYGOVM	BUFLIM, buffer upper limit (pu)	
	GMAX, maximum gate limit (pu)	
	GMIN, minimum gate limit (pu)	
	RVLVCR, relief valve closing rate (< 0) (pu/sec) or MXJDOR, maximum jet deflector opening rate (pu/sec)	
	RVLMAX, maximum relief valve limit (pu) or MXJDCR, maximum jet deflector closing rate (< 0) (pu/sec)	
	HLAKE, lake head (ft or m)	
	HTAIL, tail head (ft or m)	
	PENL/A, summation of penstock, scroll case and draft tube lengths/ cross sections (> 0)(1/ft or 1/m)	
	PENLOS, penstock head loss coefficient (ft/cfs ² or m/cms ²)	
	TUNL/A, summation of tunnel lengths/cross sections (> 0) (1/ft or 1/m)	
	TUNLOS, tunnel head loss coefficient (ft/cfs ² or m/cms ²)	
	SCHARE, surge chamber effective cross section (> 0) (ft ² or m ²)	
	SCHMAX, maximum water level in surge chamber (ft or m)	
	SCHMIN, minimum water level in surge chamber (ft or m)	
	SCHLOS, surge chamber orifice head loss coefficient (ft/cfs ² or m/cms ²)	
	DAMP1, turbine damping under RPM1	
	RPM1, over speed (pu)	
	DAMP2, turbine damping above RPM2	
	RPM2, over speed (pu)	
	R-PERM-GATE (Feedback settings)	

Category	Parameter Description	Data
Turbine Governor model		
WEHGOV	R-PERM-PE (Feedback settings)	
	TPE (sec), Power time constant	
	Kp, Proportional gain	
	KI, Integral gain	
	KD, Derivative gain	
	TD (sec), Derivative time constant	
	TP (sec), Gate servo time constant	
	TDV (sec), Time constant	
	Tg (sec), Gate servo time constant	
	GTMXOP (>0), Max gate opening velocity	
	GTMXCL (<0), Max gate closing velocity	
	GMAX, Maximum governor output	
	GMIN, Minimum governor output	
	DTURB, Turbine damping factor	
	TW (sec), Water inertia time constant	
	Speed Dead Band (DBAND)	
	DPV, Governor limit factor	
	DICN, Gate limiter modifier	
	GATE 1	
	GATE 2	
	GATE 3	
	GATE 4	
	GATE 5	

Category	Parameter Description	Data
Turbine Governor model		
	FLOW G1	
	FLOW G2	
	FLOW G3	
	FLOW G4	
	FLOW G5	
	FLOW P1	
	FLOW P2	
	FLOW P3	
	FLOW P4	
	FLOW P5	
	FLOW P6	
	FLOW P7	
	FLOW P8	
	FLOW P9	
	FLOW P10	
	PMECH1	
WEHGOV	PMECH2	
	PMECH3	
	PMECH4	
	PMECH5	
	PMECH6	
	PMECH7	
	PMECH8	

Category	Parameter Description	Data
Turbine Governor model		
	PMECH9	
	PMECH10	
HYGOVT	Prated, rated turbine power (MW)	
	Qrated, rated turbine flow (cfs or cms)	
	Hrated, rated turbine head (ft or m)	
	Grated, gate position at rated conditions (pu)	
	QNL, no power flow (pu of Qrated)	
	R, permanent droop	
	r, temporary droop (pu)	
	Tr, governor time constant (> 0) (sec)	
	Tf, filter time constant (> 0) (sec)	
	Tg, servo time constant (> 0) (sec)	
	MXGTOR, maximum gate opening rate (pu/sec)	
	MXGTCR, maximum gate closing rate (< 0) (pu/sec)	
	MXBGOR, maximum buffered gate opening rate (pu/sec)	
	MXBGCR, maximum buffered gate closing rate (< 0) (pu/sec)	
	BUFLIM, buffer upper limit (pu)	
	GMAX, maximum gate limit (pu)	
	GMIN, minimum gate limit (pu)	
	RVLVCR, relief valve closing rate (< 0) (pu/sec) or MXJDOR, maximum jet deflector opening rate (pu/sec)	
	RVLMAX, maximum relief valve limit (pu) or MXJDCR, maximum jet deflector closing rate (< 0) (pu/sec)	
	HLAKE, lake head (ft or m)	

Category	Parameter Description	Data
Turbine Governor model		
	HTAIL, tail head (ft or m)	
	PENLGTH, penstock length (ft or m)	
	PENLOS, penstock head loss coefficient (ft/cfs ² or m/cms ²)	
	TUNLGTH, tunnel length (ft or m)	
	TUNLOS, tunnel head loss coefficient (ft/cfs ² or m/cms ²)	
	SCHARE, surge chamber effective cross section (>0) (ft ² or m ²)	
	SCHMAX, maximum water level in surge chamber (ft or m)	
	SCHMIN, minimum water level in surge chamber (ft or m)	
	SCHLOS, surge chamber orifice head loss coefficient (ft/cfs ² or m/cms ²)	
	DAMP1, turbine damping under RPM1	
	RPM1, overspeed (pu)	
	DAMP2, turbine damping above RPM2	
	RPM2, overspeed (pu)	
	PENSPD, penstock wave velocity (>0) (ft/sec or m/sec)	
	PENARE, penstock cross section (>0) (ft ² or m ²)	
	TUNSPD, tunnel wave velocity (>0) (ft/sec or m/sec)	
	TUNARE, tunnel cross section (>0) (ft ² or m ²)	
	Rperm, permanent drop, pu	
	Treg (sec), speed detector time constant	
	Kp, proportional gain, pu/sec	
	Ki, reset gain, pu/sec	
	Kd, derivative gain, pu	

Category	Parameter Description	Data
Turbine Governor model		
PIDGOV	Ta (sec) > 0, controller time constant	
	Tb (sec) > 0, gate servo time constant	
	Dturb, turbine damping factor, pu	
	G0, gate opening at speed no load, pu	
	G1, intermediate gate opening, pu	
	P1, power at gate opening G1, pu	
	G2, intermediate gate opening, pu	
	P2, power at gate opening G2, pu	
	P3, power at full opened gate, pu	
	Gmax, maximum gate opening, pu	
	Gmin, minimum gate opening, pu	
	Atw > 0, factor multiplying Tw, pu	
	Tw (sec) > 0, water inertia time constant	
	Velmax, minimum gate opening velocity, pu/sec	
	Velmin < 0, minimum gate closing velocity, pu/sec	
HYGOVR1	db1, Intentional dead band width, Hz	
	Err, deadband hysteresis (p.u.)	
	Td (sec), Input filter time constant, s	
	T1 (sec), Lead time constant 1, s	
	T2 (sec) q, Lag time constant 1, s	
	T3 (sec), Lead time constant 2, s	
	T4 (sec), Lag time constant 2, s	
	T5 (sec), Lead time constant 3, s	

Category	Parameter Description	Data
Turbine Governor model		
	T6 (sec), Lag time constant 3, s	
	T7 (sec), Lead time constant 4, s	
	T8 (sec), Lag time constant 4, s	
	KP, proportional gain	
	R, Steady-state droop, p.u.	
	Tt, Power feedback time constant, s	
HYGOVR1	KG, Gate servo gain, p.u.	
	TP (sec), Gate servo time constant, s	
	VELOPEN, Maximum gate opening velocity, p.u./s	
	VELCLOSE, Maximum gate closing velocity, p.u./s (<0)	
	PMAX, Maximum gate opening, p.u. of mwcap	
	PMIN, Minimum gate opening, p.u. of mwcap	
	db2, Unintentional deadband, MW	
	TW (>0) water time constant	
	At, turbine gain	
	Dturb, turbine damping	
	qNL, no power flow	
	Trate (Turbine MW rating)	
	fDEAD (pu), Frequency Dead Band	
	fMIN (pu), Frequency Minimum Deviation	
	fMAX (pu), Frequency Maximum Deviation	
	KKOR (pu), Frequency Gain	
	KM > 0 (pu), Power Measurement Gain	

Category	Parameter Description	Data
Turbine Governor model		
TURCZT	KP (pu), Regulator Proportional Gain	
	SDEAD (pu), Speed Dead Band	
	KSTAT (pu), Speed Gain	
	KHP (pu), High Pressure Constant	
	TC (sec), Measuring transducer time constant	
	T 1 (sec), Regulator Integrator Time Constant	
	TEHP (sec), Hydro Converter Time Constant	
	TV > 0 (sec), Regulation Valve Time Constant	
	THP (sec), High Pressure Time Constant	
	TR (sec), Reheater time constant	
	TW (sec), Water Time Constant	
	NTMAX (pu), Power Regulator-Integrator Maximum Limiter	
	NTMIN (pu), Power Regulator-Integrator Minimum Limiter	
	GMAX (pu), Valve Maximum Open	
	GMIN (pu), Valve Minimum Open	
	VMIN (pu/sec), Valve Maximum Speed Close	
	VMAX (pu/sec), Valve Maximum Speed Open	
TWDM1T	R, permanent droop	
	r, temporary droop	
	Tr, governor time constant (>0)	
	Tf, filter time constant (>0)	
	Tg, servo time constant (>0)	
	VELMX, open gate velocity limit (pu/sec)	

Category	Parameter Description	Data
Turbine Governor model		
TWDM1	VELMN, close gate velocity limit (pu/sec) (<0)	
	GMAX, maximum gate limit	
	GMIN, minimum gate limit	
	TW, water time constant (sec) (>0)	
	At, turbine gain	
	Dturb, turbine damping	
	qNL, no power flow	
	F1, frequency deviation (pu)	
	TF1, time delay (sec)	
	F2, frequency deviation (pu)	
	sF2, frequency (pu/sec)	
	TF2, time delay (sec)	
	GMXRT, rate with which GMAX changes when TWD is tripped (pu/sec)	
	NREF, setpoint frequency deviation (pu)	
	Tft, frequency filter time constant (>0)	
	TREG (sec), governor time constant (s)	
	Reg, permanent droop (p.u. on generator MVA rating)	
	KP, controller proportional gain (p.u.)	
	KI, controller integral gain (p.u./s)	
	KD, controller derivative gain (p.u.-s)	
	TA (sec) (> 0), controller time constant (s)	
	TB (sec) (> 0), controller time constant (s)	
	VELMX (pu/sec), open gate velocity limit (p.u./s)	

Category	Parameter Description	Data
Turbine Governor model		
TWDM2	VELMN (pu/sec) (> 0), close gate velocity limit (p.u./s)	
	GATMX (pu), maximum gate limit (p.u.)	
	GATMN (pu), minimum gate limit (p.u.)	
	TW (sec) (> 0), water time constant (s)	
	At, turbine gain	
	qNL, flow rate at no load (p.u.)	
	Dturb, turbine damping factor	
	F1, frequency deviation (pu)	
	TF1, time delay (sec)	
	F2, frequency deviation (pu)	
	sF2, frequency (pu/sec)	
	TF2, time delay (sec)	
	PREF, power reference (pu)	
	Tft, frequency filter time constant (sec) (>0)	
	TREG (sec), governor time constant (s)	
	REG1, permanent droop (p.u. on generator MVA base)	
	KP, controller proportional gain (p.u.)	
	KI, controller integral gain (p.u./s)	
	KD, controller derivative gain (p.u./s)	
	TA (>0) (sec), controller time constant (s)	
	TB (>0) (sec), controller time constant (s)	
	VELMX (>0), open gate velocity limit (p.u./s)	
	VELMN (<0), close gate velocity limit (p.u./s)	

Category	Parameter Description	Data
Turbine Governor model		
WPIDHY	GATMX, maximum gate limit (p.u.)	
	GATMN, minimum gate limit (p.u.)	
	TW (>0) (sec), water time constant (s)	
	PMAX, maximum gate position (p.u.)	
	PMIN, minimum gate position (p.u.)	
	D	
	G0, gate position at no load (p.u.)	
	G1, first gate intermediate position (p.u.)	
	P1, power at gate position G1 (p.u. on generator MVA rating)	
	G2, second gate intermediate position (p.u.)	
	P2, power at gate position G2 (p.u. on generator MVA rating)	
	P3, power at fully open gate (p.u. on generator MVA rating)	
WSHYDD	db1, deadband width (p.u.)	
	Err, deadband hysteresis (p.u.)	
	Td (sec), input filter time constant (s)	
	K1, derivative gain (p.u.)	
	Tf (sec), derivative time constant (s)	
	KD, double derivative gain (p.u.)	
	KP, integral gain (p.u.)	
	R, droop (p.u. on Trate)	
	Tt, power feedback time constant (s)	
	KG, gate servo gain (p.u.)	
	TP (sec), gate servo time constant (s)	

Category	Parameter Description	Data
Turbine Governor model		
WSHYDD	VELOPEN (>0), maximum gate opening rate (p.u./s)	
	VELCLOSE (>0), maximum gate closing rate (p.u./s)	
	PMAX, maximum gate opening (p.u.)	
	PMIN, minimum gate opening (p.u.)	
	db2, deadband (p.u.)	
	GV1, coordinate of power-gate look-up table (p.u. gate)	
	PGV1, coordinate of power-gate look-up table (p.u. power)	
	GV2, coordinate of power-gate look-up table (p.u. gate)	
	PGV2, coordinate of power-gate look-up table (p.u. power)	
	GV3, coordinate of power-gate look-up table (p.u. gate)	
	PGV3, coordinate of power-gate look-up table (p.u. power)	
	GV4, coordinate of power-gate look-up table (p.u. gate)	
	PGV4, coordinate of power-gate look-up table (p.u. power)	
	GV5, coordinate of power-gate look-up table (p.u. gate)	
	PGV5, coordinate of power-gate look-up table (p.u. power)	
	Aturb, turbine lead time constant multiplier	
	Bturb (> 0), turbine lag time constant multiplier	
	Tturb (> 0) (sec), turbine time constant (s)	
	Trate, turbine rating (MW)	
	db1, deadband width (p.u.)	
	Err, deadband hysteresis (p.u.)	
	Td (sec), input filter time constant (s)	
	K1, derivative gain (p.u.)	

Category	Parameter Description	Data
Turbine Governor model		
WSHYGP	Tf (sec), derivative time constant (s)	
	KD, double derivative gain (p.u.)	
	KP, integral gain (p.u.)	
	R, droop (p.u. on Trate)	
	Tt, power feedback time constant (s)	
	KG, gate servo gain (p.u.)	
	TP (sec), gate servo time constant (s)	
	VELOPEN (>0), maximum gate opening rate (p.u./s)	
	VELCLOSE (>0), maximum gate closing rate (p.u./s)	
	PMAX, maximum gate opening (p.u.)	
	PMIN, minimum gate opening (p.u.)	
	db2, deadband (p.u.)	
	GV1, coordinate of power-gate look-up table (p.u. gate)	
	PGV1, coordinate of power-gate look-up table (p.u. power)	
	GV2, coordinate of power-gate look-up table (p.u. gate)	
	PGV2, coordinate of power-gate look-up table (p.u. power)	
	GV3, coordinate of power-gate look-up table (p.u. gate)	
	PGV3, coordinate of power-gate look-up table (p.u. power)	
	GV4, coordinate of power-gate look-up table (p.u. gate)	
WSHYGP	PGV4, coordinate of power-gate look-up table (p.u. power)	
	GV5, coordinate of power-gate look-up table (p.u. gate)	
	PGV5, coordinate of power-gate look-up table (p.u. power)	
	Aturb, turbine lead time constant multiplier	

Category	Parameter Description	Data
Turbine Governor model		
	Bturb (> 0), turbine lag time constant multiplier	
	Tturb (> 0) (sec), turbine time constant (s)	
	Trate, turbine rating (MW)	
GAST	R, permanent droop	
	T1 (>0) (sec), Governor mechanism time constant	
	T2 (>0) (sec), Turbine power time constant	
	T3 (>0) (sec), Turbine exhaust temperature time constant	
	Ambient temperature load limit, AT	
	KT, Temperature limiter gain	
	VMAX, Maximum turbine power	
	VMIN, Minimum turbine power	
	Dturb, Turbine damping factor	
	W, governor gain (1/droop) (on turbine rating)	
	X (sec) governor lead time constant	
	Y (sec) (> 0) governor lag time constant	
	Z, governor mode:1 Droop or 0 ISO	
	ETD (sec), Turbine exhausts time constant	
	TCD (sec), Gas turbine dynamic time constant	
	TRATE turbine rating (MW)	
	T (sec), Fuel control time constant	
	MAX (pu) limit (on turbine rating)	
	MIN (pu) limit (on turbine rating)	
	ECR (sec), Combustor time constant	

Category	Parameter Description	Data
Turbine Governor model		
GAST2A	K3, Fuel control gain	
	a (> 0) valve positioner	
	b (sec) (> 0) valve positioner	
	c valve positioner	
	Tf (sec) (> 0), Fuel system time constant	
	Kf, feedback gain	
	K5, Radiation shield	
	K4, Radiation shield	
	T3 (sec) (> 0), Radiation shield time constant	
	T4 (sec) (> 0), Thermocouple time constant, seconds	
	Tt (> 0), Temperature control time constant	
	T5 (sec) (> 0), Temperature control time constant	
	af1, describes the turbine characteristic	
	bf1, describes the turbine characteristic	
	af2, describes the turbine characteristic	
	bf2, describes the turbine characteristic	
	cf2, describes the turbine characteristic	
	TR (degree), Rated temperature	
	K6 (pu), Minimum fuel flow	
	TC (degree), Temperature control	
	KDROOP (on turbine rating)	
	KP, Proportional gain	
	KI, Integral gain	

Category	Parameter Description	Data
Turbine Governor model		
GASTWD	KD, Derivative gain	
	ETD (sec), Turbine exhaust time constant	
	TCD (sec), Gas turbine dynamic time constant	
	TRATE turbine rating (MW)	
	T (sec), Fuel control time constant	
	MAX (pu) limit (on turbine rating)	
	MIN (pu) limit (on turbine rating)	
	ECR (sec), Combustor time constant	
	K3, Fuel control gain	
	a (> 0) valve positioner	
	b (sec) (> 0) valve positioner	
	c valve positioner	
	tf (sec) (> 0), Fuel system time constant	
	Kf, feedback gain	
	K5, Radiation shield	
	K4, Radiation shield	
	T3 (sec) (> 0), Radiation shield time constant	
	T4 (sec) (> 0), Thermocouple time constant, seconds	
	tt (> 0), Temperature control time constant	
	T5 (sec) (> 0), Temperature control time constant	
	af1, describes the turbine characteristic	
	bf1, describes the turbine characteristic	
	af2, describes the turbine characteristic	

Category	Parameter Description	Data
Turbine Governor model		
	bf2 (>0), describes the turbine characteristic	
	cf2, describes the turbine characteristic	
	TR(degree), Rated temperature1	
	K6 (pu), Minimum fuel flow	
	TC (degree), Temperature control1	
	TD (sec) (> 0), Power transducer	
WESGOV	ΔTC (sec), Δt sample for controls	
	ΔTP (sec), Δt sample for PE	
	Power Droop	
	Kp, Trubine proportional gain	
	TI (> 0) (sec), Integral time constant	
	T1 (sec), Constant time	
	T2 (sec), Constant time	
	ALIM	
	Tpe (sec), Power time constant	
	R, Permanent droop, pu	
	Tpelec, Electrical power transducer time constant, sec	
	maxerr, Maximum value for speed error signal	
	minerr, Minimum value for speed error signal	
	Kpgov, Governor proportional gain	
	Kigov, Governor integral gain	
	Kdgov, Governor derivative gain	
	Tdgov, Governor derivative controller time constant, sec	

Category	Parameter Description	Data
Turbine Governor model		
GGOV1	vmax, Maximum valve position limit	
	vmin, Minimum valve position limit	
	Tact, Actuator time constant, sec	
	Kturb, Turbine gain	
	Wfnl, No load fuel flow, pu	
	Tb, Turbine lag time constant, sec	
	Tc, Turbine lead time constant, sec	
	Teng, Transport lag time constant for diesel engine, sec	
	Tfload, Load Limiter time constant, sec	
	Kpload, Load limiter proportional gain for PI controller	
	Kiload, Load limiter integral gain for PI controller	
	Ldref, Load limiter reference value pu	
	Dm, Mechanical damping coefficient, pu	
	Ropen, Maximum valve opening rate, pu/sec	
	Rclose, Maximum valve closing rate, pu/sec	
	Kimw, Power controller (reset) gain	
	Aset, Acceleration limiter setpoint, pu/sec	
	Ka, Acceleration limiter gain	
	Ta, Acceleration limiter time constant, sec (> 0)	
	Trate, Turbine rating (MW) ¹	
	db, Speed governor deadband	
	Tsa, Temperature detection lead time constant, sec	
	Tsb, Temperature detection lag time constant, sec	

Category	Parameter Description	Data
Turbine Governor model		
	Rup, Maximum rate of load limit increase	
	Rdown, Maximum rate of load limit decrease	
PWTBD1	Trate (MW), Turbine rating (MW)	
	K (pu), Proportional gain	
	Ki (pu), Integral gain	
	Vrmax (pu), Upper Limit of PI controller	
	Vrmin (pu), Lower Limit of PI controller	
	Tv (s) (>0), Control valve Time Constant	
	Lo (pu/sec) (>0), Control valve open rate limit	
	Lc (pu/sec) (>0), Control valve close rate limit	
	Vmax (pu), Maximum valve position	
	Vmin (pu), Minimum valve position	
	Tb1 (s), steam buffer time constant	
	Tb2 (s), steam buffer time constant	
	v1 (pu), valve position 1	
	p1 (pu), power output for valve position v1	
	v2 (pu), valve position 2	
	p2 (pu), power output for valve position v2	
	v3 (pu), valve position 3	
	p3 (pu), power output for valve position v3	
	v4 (pu), valve position 4	
	p4 (pu), power output for valve position v4	
	v5 (pu), valve position 5	

Category	Parameter Description	Data
Turbine Governor model		
PWTBD1	p5 (pu), power output for valve position v5	
	v6 (pu), valve position 6	
	p6 (pu), power output for valve position v6	
	v7 (pu), valve position 7	
	p7 (pu), power output for valve position v7	
	v8 (pu), valve position 8	
	p8 (pu), power output for valve position v8	
	v9 (pu), valve position 9	
	p9 (pu), power output for valve position v9	
	v10 (pu), valve position 10	
	p11 (pu), power output for valve position v11	
	v11 (pu), valve position 11	
	p11 (pu), power output for valve position v11	
	W, governor gain (1/droop) (on turbine rating)	
	X (sec) governor lead time constant	
	Y (sec) (> 0) governor lag time constant	
	Z, governor mode:1 Droop or 0 ISO	
	ETD (sec), Turbine exhausts time constant	
	TCD (sec), Gas turbine dynamic time constant	
	TRATE turbine rating (MW)	
	T (sec), Fuel control time constant	
	MAX (pu) limit (on turbine rating)	
	MIN (pu) limit (on turbine rating)	

Category	Parameter Description	Data
Turbine Governor model		
URCSCT	ECR (sec), Combustor time constant	
	K3, Fuel control gain	
	a (> 0) valve positioner	
	b (sec) (> 0) valve positioner	
	c valve positioner	
	Tf (sec) (> 0), Fuel system time constant	
	Kf, feedback gain	
	K5, Radiation shield	
	K4, Radiation shield	
	T3 (sec) (> 0), Radiation shield time constant	
	T4 (sec) (> 0), Thermocouple time constant, seconds	
	Tt (> 0), Temperature control time constant	
	T5 (sec) (> 0), Temperature control time constant	
	af1, describes the turbine characteristic	
	bf1, describes the turbine characteristic	
	af2, describes the turbine characteristic	
	bf2, describes the turbine characteristic	
	cf2, describes the turbine characteristic	
	TR (degree), Rated temperature	
	K6 (pu), Minimum fuel flow	
	TC (degree), Temperature control	
	K, Governor gain, (1/droop) pu	
	T1 (sec), Lag time constant (sec)	

Category	Parameter Description	Data
Turbine Governor model		
	T2 (sec), Lead time constant (sec)	
	T3 (> 0) (sec), valve position time constant	
	Uo (pu/sec), maximum valve opening rate	
	Uc (< 0) (pu/sec), maximum valve closing rate	
	PMAX (pu on machine MVA rating)	
	PMIN (pu on machine MVA rating)	
URSCT	T4 (sec), time constant for steam inlet	
	K1, HP fraction	
	K2, LP fraction	
	T5 (sec), Time Constant for Second Boiler Pass [s]	
	K3, HP Fraction	
	K4, LP fraction	
	T6 (sec), Time Constant for Third Boiler Pass [s]	
	K5, HP Fraction	
	K6, LP fraction	
	T7 (sec), Time Constant for Fourth Boiler Pass [s]	
	K7, HP Fraction	
	K8, LP fraction	
	ST Rating, Steam turbine rating (MW)	
	POUT A, Plant total, point A (MW)	
	STOUT A, Steam turbine output, point A (MW)	
	POUT B, Plant total, point B (MW)	
	STOUT B, Steam turbine output, point B (MW)	

Category	Parameter Description	Data
Turbine Governor model		
	POUT C, Plant total, point C (MW)	
	STOUT C, Steam turbine output, point C (MW)	
URGS3T	R	
	T1 (> 0) (sec)	
	T2 (> 0) (sec)	
	T3 (> 0) (sec)	
	Lmax	
	Kt	
	Vmax	
	Vmin	
	Dturb	
	Fidle	
	Rmax	
	Linc (> 0)	
	Tltr (>0) (sec)	
	Ltrat	
	a	
	b (> 0)	
	db1, dead band width (p.u.)	
	Err, deadband hysteresis (p.u.)	
	db2, dead band width (p.u.)	
	GV1, coordinate of power-gate look-up table (p.u. gate)	
	PGV1, coordinate of power-gate look-up table (p.u. power)	

Category	Parameter Description	Data
Turbine Governor model		
	GV2, coordinate of power-gate look-up table (p.u. gate)	
	PGV2, coordinate of power-gate look-up table (p.u. power)	
	GV3, coordinate of power-gate look-up table (p.u. gate)	
	PGV3, coordinate of power-gate look-up table (p.u. power)	
	GV4, coordinate of power-gate look-up table (p.u. gate)	
	PGV4, coordinate of power-gate look-up table (p.u. power)	
	GV5, coordinate of power-gate look-up table (p.u. gate)	
	PGV5, coordinate of power-gate look-up table (p.u. power)	
	Ka	
	T4	
	T5	
	MWCAP	

Annexure-5

List of Test/Study Reports required to be furnished by applicant in compliance of CEA (Technical Standards for Connectivity to the Grid) Regulations, 2007 as amended

In compliance of Connectivity Standards, the applicant shall submit the following Test/Study Reports as part of CONN-4 documents as per the sequence indicated below:

- 1) Details of excitation system of generating unit
- 2) Short circuit ratio of generating unit
- 3) Reactive power capability

Clause No. of Connectivity Regulation	Detailed clause	Reports/data in compliance of CEA Technical Standards for Connectivity to the Grid for Conventional Generators
A1(1)	New Generating units The excitation system for every generating unit: a) shall have state of the art excitation system b) Shall have Automatic Voltage Regulator (AVR). Generators of 100 MW rating and above shall have Automatic Voltage Regulator with digital control and two separate	1. Applicant shall submit the details of excitation system alongwith parameters of the proposed generating unit For the generator capacity exceeding 100MW, applicant shall submit the details of PSS and AVR alongwith parameters to be used.

Clause No. of Connectivity Regulation	Detailed clause	Reports/data in compliance of CEA Technical Standards for Connectivity to the Grid for Conventional Generators
	channels having independent inputs and automatic changeover; The Automatic Voltage Regulator of generator of 100 MW and above shall include Power System Stabilizer (PSS)	
A1 (2)	The short circuit ratio for generator shall be as per IEC-34	Applicant shall be required to furnish the OEM document depicting SCR of generating unit.
A1 (3)	The generator transformer winding shall have delta construction on low voltage side and star connection on high voltage side. Star point of high voltage side shall be effectively(solidly) earthen so as to achieve earth fault factor of 1.4 or less	1. Applicant shall submit the SLD of station depicting connection configuration of Generator transformer and generating unit Applicant shall submit the earth fault factor at sub-station
A1 (4)	All generating machines irrespective of capacity shall have electronically controlled governing system with appropriate speed/load characteristics to regulate	Applicant shall submit the GTP/manual indicating droop characteristics of generating unit

Clause No. of Connectivity Regulation	Detailed clause	Reports/data in compliance of CEA Technical Standards for Connectivity to the Grid for Conventional Generators																
	frequency. The governors of thermal generating units shall have a droop of 3 to 6% and those of hydro generating units 0 to 10%.																	
A1 (5)	Generating Units located near load centre, shall be capable of operating at rated output for power factor varying between 0.85 lagging (over-excited) to 0.95 leading (under-excited) and Generating Units located far from load centres shall be capable of operating at rated output for power factor varying between 0.9 lagging (over-excited) to 0.95 leading (Under-excited). The above performance shall also be achieved with voltage variation of ± 5% of nominal, frequency variation of + 3% and -5% and combined voltage and frequency variation of ±5%. However, for gas turbines, the above	Applicant shall submit report indicating performance of power plant with the help of unit PQ capability curves considering different voltage levels (1.05,1.0,0.95 pu) under different power factors (0.85 lag- unity-0.95 lead). List of studies to be provided are tabulated below: a) With fixed frequency (50Hz) <table><tr><th>Voltage</th><th>1.0 PF</th><th>0.95 lagging</th><th>0.95 leading</th></tr><tr><td>1.0 pu</td><td>To be provided</td><td>To be provided</td><td>To be provided</td></tr><tr><td>0.95 pu</td><td>To be provided</td><td>To be provided</td><td>-</td></tr><tr><td>1.05 pu</td><td>To be provided</td><td>-</td><td>To be provided</td></tr></table>	Voltage	1.0 PF	0.95 lagging	0.95 leading	1.0 pu	To be provided	To be provided	To be provided	0.95 pu	To be provided	To be provided	-	1.05 pu	To be provided	-	To be provided
Voltage	1.0 PF	0.95 lagging	0.95 leading															
1.0 pu	To be provided	To be provided	To be provided															
0.95 pu	To be provided	To be provided	-															
1.05 pu	To be provided	-	To be provided															

Clause No. of Connectivity Regulation	Detailed clause	Reports/data in compliance of CEA Technical Standards for Connectivity to the Grid for Conventional Generators																							
	performance shall be achieved for voltage variation of ±5%.	b) With fixed voltage (1pu) <table><tr><th>Frequency</th><th>1.0 PF</th><th>0.95 lagging</th><th>0.95 leading</th></tr><tr><td>+ 3%</td><td>To be provided</td><td>To be provided</td><td>To be provided</td></tr><tr><td>-5%</td><td>To be provided</td><td>To be provided</td><td>To be provided</td></tr></table>				Frequency	1.0 PF	0.95 lagging	0.95 leading	+ 3%	To be provided	To be provided	To be provided	-5%	To be provided	To be provided	To be provided								
Frequency	1.0 PF	0.95 lagging	0.95 leading																						
+ 3%	To be provided	To be provided	To be provided																						
-5%	To be provided	To be provided	To be provided																						
		c) With variable voltage and frequency <table><tr><th></th><th>1.0 PF</th><th>0.85 lagging</th><th>0.95 leading</th></tr><tr><td>V:1.05pu, Δf:+5%</td><td>To be provided</td><td>To be provided</td><td>To be provided</td></tr><tr><td>V:1.05pu, Δf:-5%</td><td>To be provided</td><td>To be provided</td><td>To be provided</td></tr><tr><td>V: 0.95pu, Δf:+5%</td><td>To be provided</td><td>To be provided</td><td>To be provided</td></tr><tr><td>V: 0.95pu, Δf:-5%</td><td>To be provided</td><td>To be provided</td><td>To be provided</td></tr></table>					1.0 PF	0.85 lagging	0.95 leading	V:1.05pu, Δf:+5%	To be provided	To be provided	To be provided	V:1.05pu, Δf:-5%	To be provided	To be provided	To be provided	V: 0.95pu, Δf:+5%	To be provided	To be provided	To be provided	V: 0.95pu, Δf:-5%	To be provided	To be provided	To be provided
	1.0 PF	0.85 lagging	0.95 leading																						
V:1.05pu, Δf:+5%	To be provided	To be provided	To be provided																						
V:1.05pu, Δf:-5%	To be provided	To be provided	To be provided																						
V: 0.95pu, Δf:+5%	To be provided	To be provided	To be provided																						
V: 0.95pu, Δf:-5%	To be provided	To be provided	To be provided																						

Clause No. of Connectivity Regulation	Detailed clause	Reports/data in compliance of CEA Technical Standards for Connectivity to the Grid for Conventional Generators
A1 (6)	The coal and lignite based thermal generating units shall be capable of generating up to 105% of Maximum Continuous Rating (MCR) (subject to maximum load capability under Valve Wide Open Condition) for short duration to provide the frequency response.	Applicant shall submit the generator unit capability depicting MCR under valve wide open (VWO) condition
A1 (7)	The hydro generating units shall be capable of generating up to 110% of rated capacity (subject to rated head being available) on continuous basis	Applicant (Hydro) shall submit the generator unit capability depicting 110% generating capacity on continuous basis.
A1 (8)	Every generating unit shall have standard protections to protect the units not only from faults within the units and within the station but also from faults in transmission lines. For generating unit having rated capacity greater than 100 MW, two independent sets of protections acting on two independent sets of trip coils fed from independent Direct	Applicant shall submit the protection schemes to be implemented for compliance of CEA Technical Standards

Clause No. of Connectivity Regulation	Detailed clause	Reports/data in compliance of CEA Technical Standards for Connectivity to the Grid for Conventional Generators
	Current (DC) supplies shall be provided. The protections shall include but not be limited to the Local Breaker Back-up (LBB) protection	
A1 (9)	Hydro generating units having rated capacity of 50 MW and above shall be capable of operation in synchronous condenser mode, wherever feasible.	Applicant (for unit capacity more than 50MW) shall submit generating unit OEM GTP indicating capability of operation hydro unit under synchronous condenser mode. In case of non-availability of the facility of synchronous condenser mode of operation, the detailed reasoning for the same should be furnished.
A1 (10)	Bus bar protection shall be provided at the switchyard of all generating station.	Applicant shall submit the bus bar scheme implemented in sub-station
A1 (11)	Automatic synchronization facilities shall be provided in the requester's Project.	Applicant shall submit the details of relay provided with synchronization facility at generating station
A1 (12)	The station auxiliary power requirement, including voltage and reactive requirements, shall not impose operating restrictions on the grid beyond	Applicant shall submit declaration that station auxiliary power requirement, including voltage and reactive requirements, shall not impose operating restrictions on the

Clause No. of Connectivity Regulation	Detailed clause	Reports/data in compliance of CEA Technical Standards for Connectivity to the Grid for Conventional Generators
	those specified in the Grid Code or state Grid Code as the case may be.	grid beyond those specified in the Grid Code or State Grid Code as the case may be.
A1 (13)	In case of hydro generating units, self-starting facility may be provided. The hydro generating station may also have a small diesel generator for meeting the station auxiliary requirements for black start.	Applicant shall submit the details of self-starting facilities implemented in respect of generating unit for hydro generating stations.
DA1 (14)	The standards in respect of the sub-stations associated with the generating stations shall be in accordance with the provisions specified in respect of 'Sub-station' under Part III of these Standards.	Applicant shall submit the details of sub-station equipment as a part of CON-4 data.

In order to check the performance of generating unit, applicant shall submit the plant model (Generic) compatible to PSS/E latest version with following information:

- SLD (Unit & Switchyard Sub-station)
- Generating OEM Technical datasheet
- Excitation system Technical datasheet
- Power System Stabilizer Technical datasheet

- Turbine governor system Technical datasheet
- PSS/E model shall demonstrate the steady state as well as dynamic state performance of the complete plant.
- Model should be suitable for an integration time step between 1ms and 20ms, and suitable for operation up-to 100s

List of simulation tests to be carried out in PSS/E software:

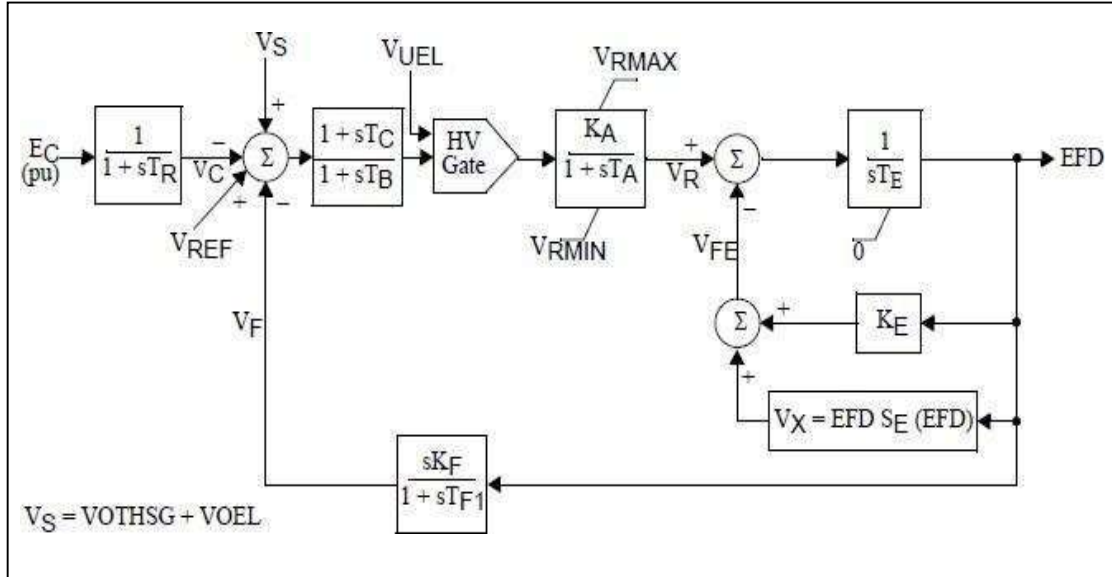
Sl. No.	Name of test	Remarks
1	Voltage Step (up/down) response of exciters of generator unit	Applicant shall submit the step response of exciter for following conditions: a) Change of POI voltage from 1.0 to 0.95pu b) Change of POI voltage from 1.0 to 1.05pu Report shall include relevant plots of electrical quantities including voltage, current, active power, reactive power, electrical angle of candidate Generator and balance units.
2	Generator response during Single line to ground fault (100ms) at its terminal (considering nil fault impedance)	Applicant shall submit the generator response during SLG fault at Generator terminal. Report shall include relevant plots of electrical quantities including voltage, current, active power, reactive power, angle of candidate Generator and balance units.

Sl. No.	Name of test	Remarks
3	Generator response during Three phase fault (100ms) at its terminal (considering nil fault impedance)	Applicant shall submit the generator response during three phase fault at bus bar (including GT). Report shall include relevant plots of electrical quantities including voltage, current, active power, reactive power, electrical angle of candidate Generator and balance units.
4	Generator droop test	Applicant shall demonstrate the droop characteristics of a Generating Unit
5	Reactive power capability of generator unit for voltage limits of $\pm 5\%$, frequency variations of $+ 3\%$ and -5% and its combined effect	Applicant shall submit the reactive power absorption/injection capability of Generating unit as individual and aggregated response at HV bus bar through simulation. Applicant shall attach the plots of electrical quantities including terminal voltage, field voltage, stator current, field current, active power & reactive power, EFD.

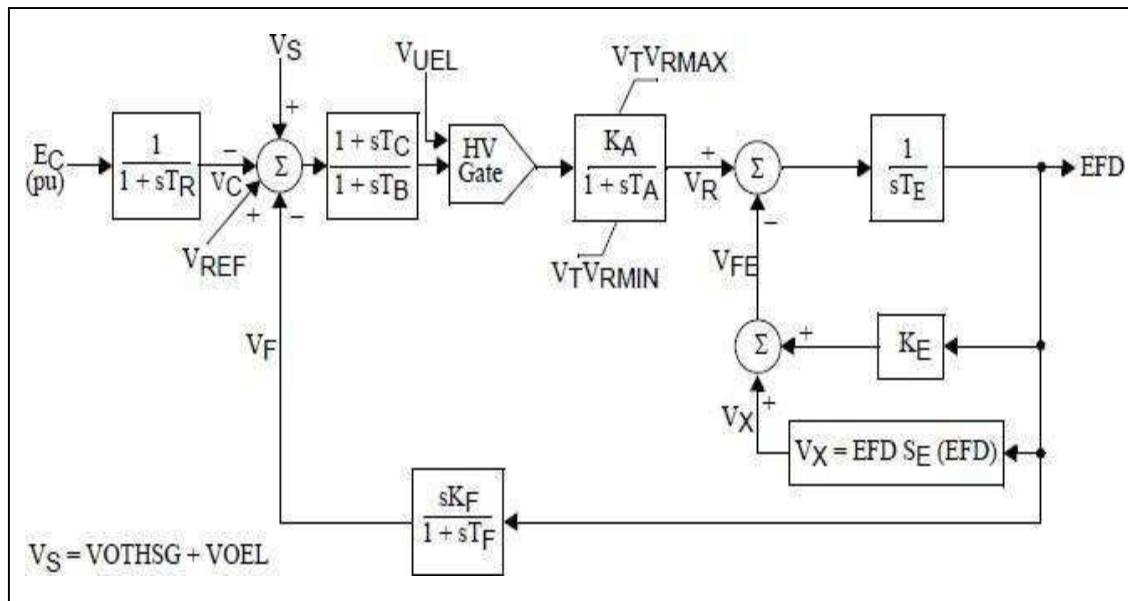
Annexure-6

1. DC Exciters Generic model:

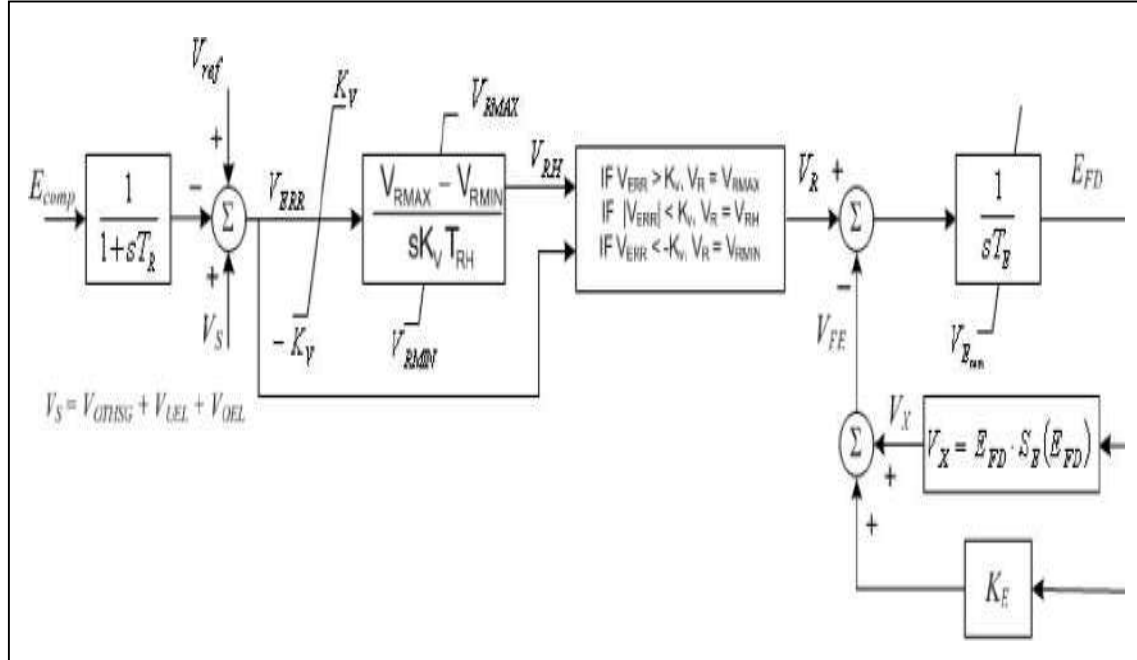
➤ Type DC1A: 1992 IEEE type DC1A excitation system model



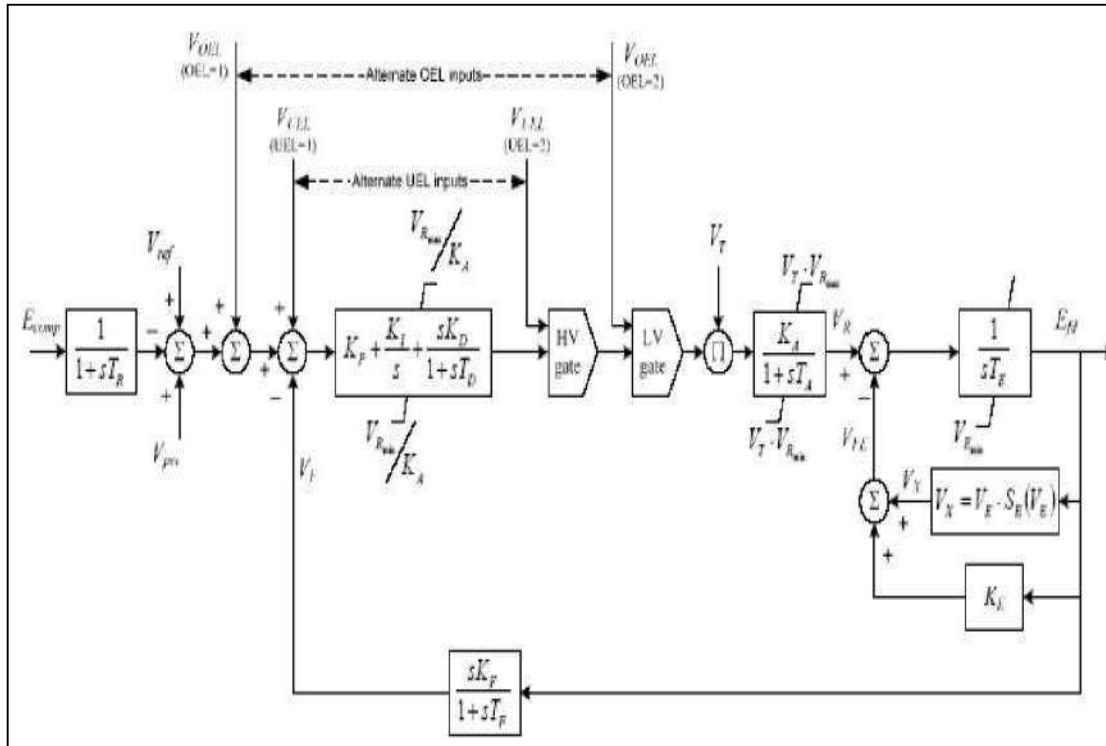
➤ Type DC2A: 1992 IEEE type DC2A excitation system model



➤ **Type DC3A: IEEE 421.5 2005 DC3A excitation system**

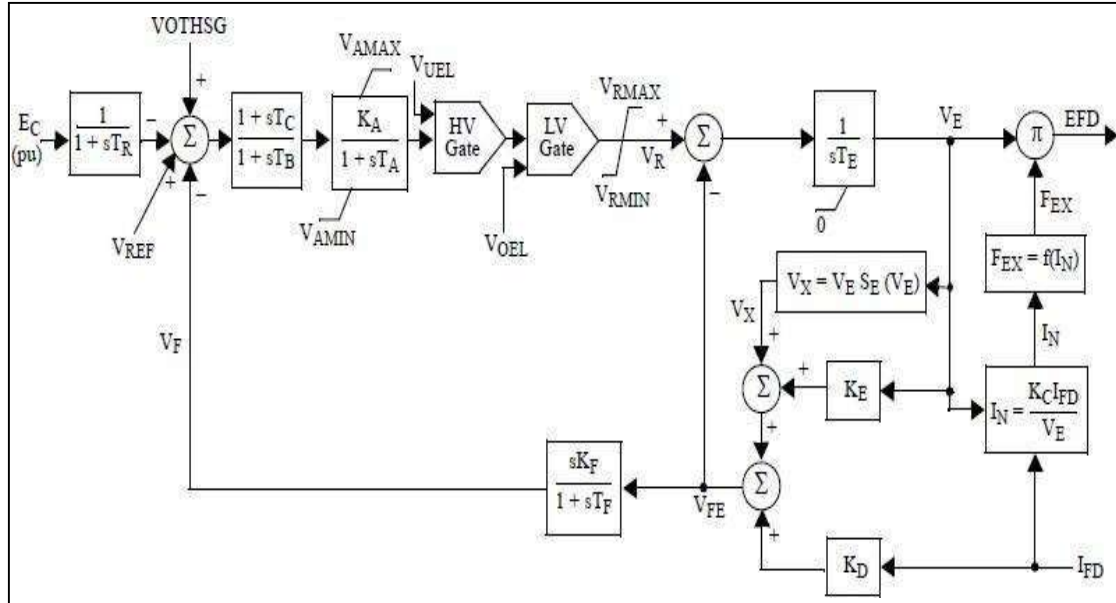


➤ **Type DC4B: IEEE 421.5 2005 DC4B excitation system**

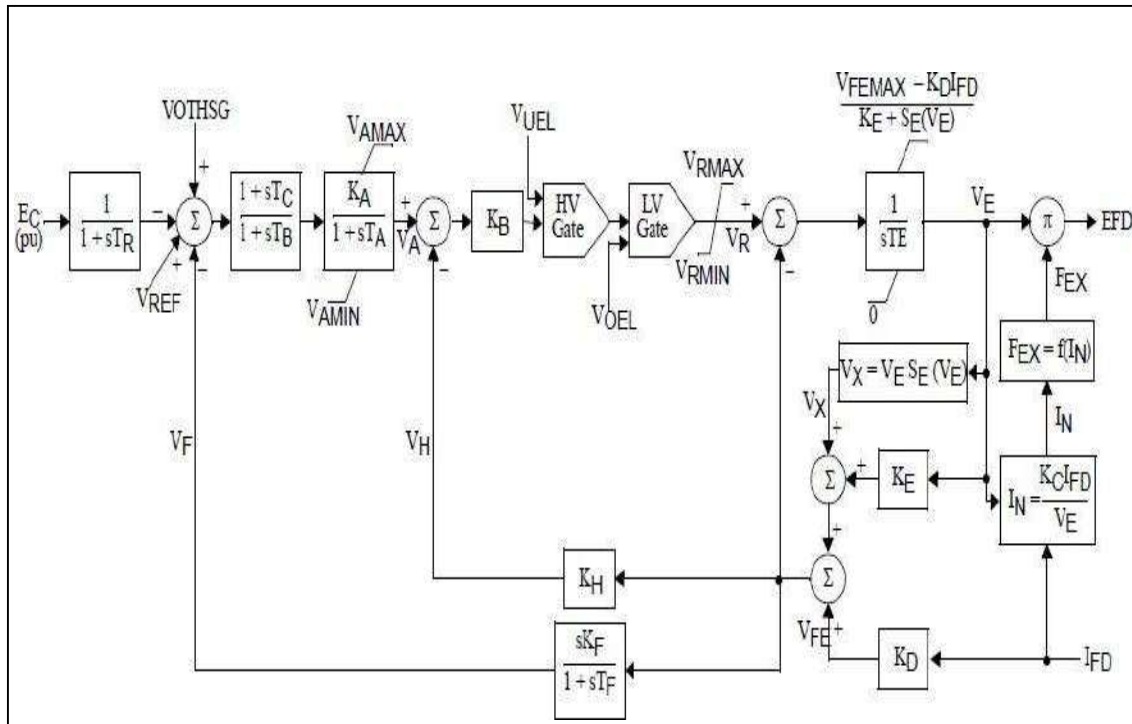


2. AC Exciters Generic Models:

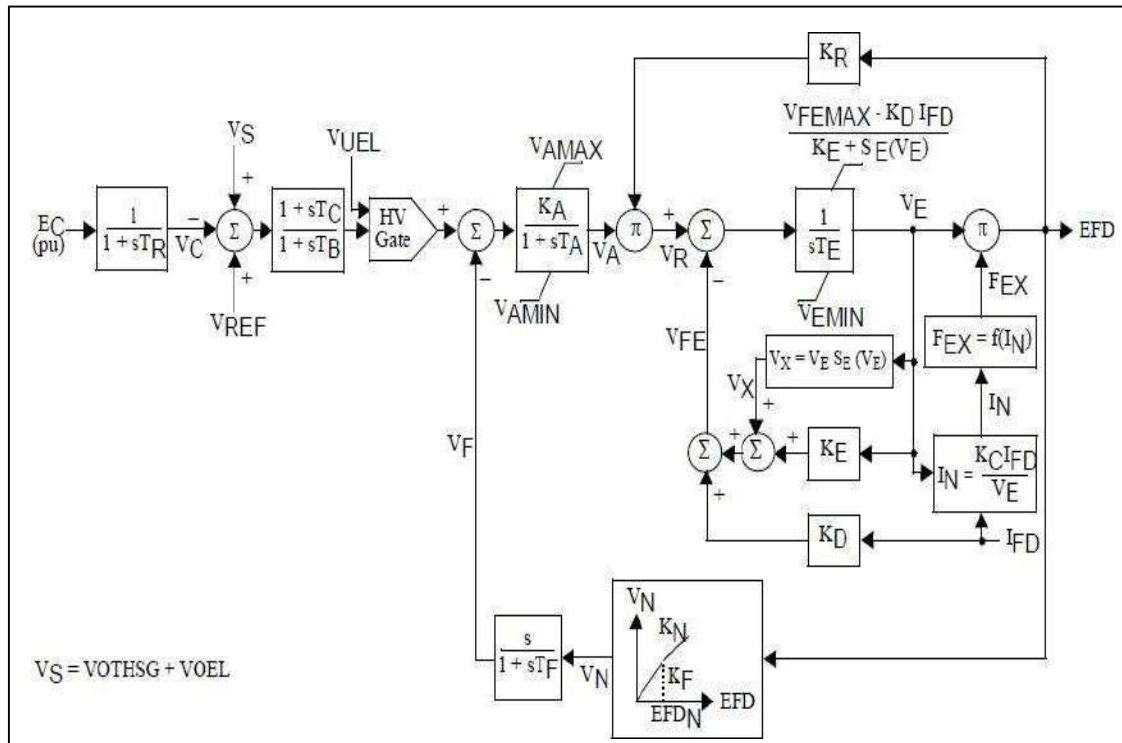
➤ Type AC1A: 1992 IEEE type AC1A excitation system model



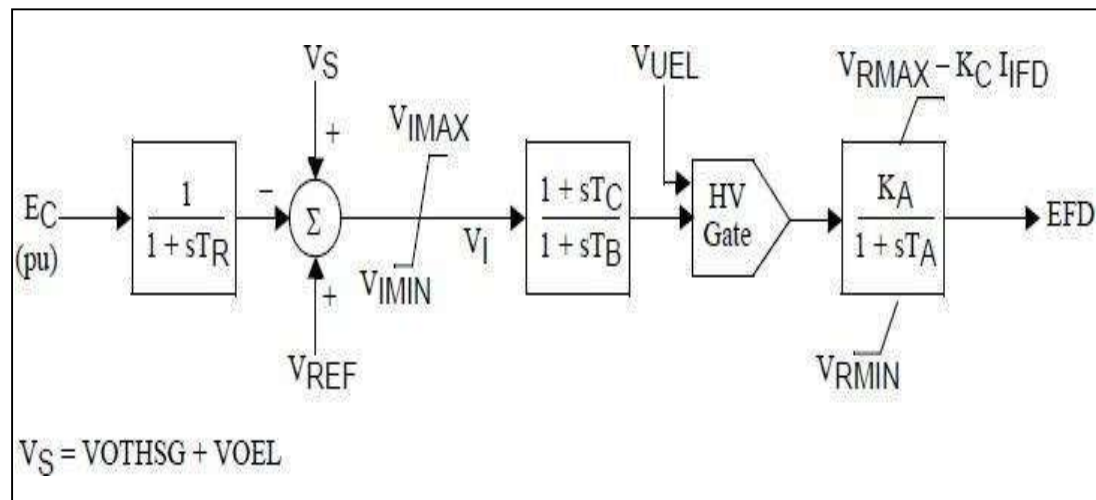
➤ Type AC2A: 1992 IEEE type AC2A excitation system model



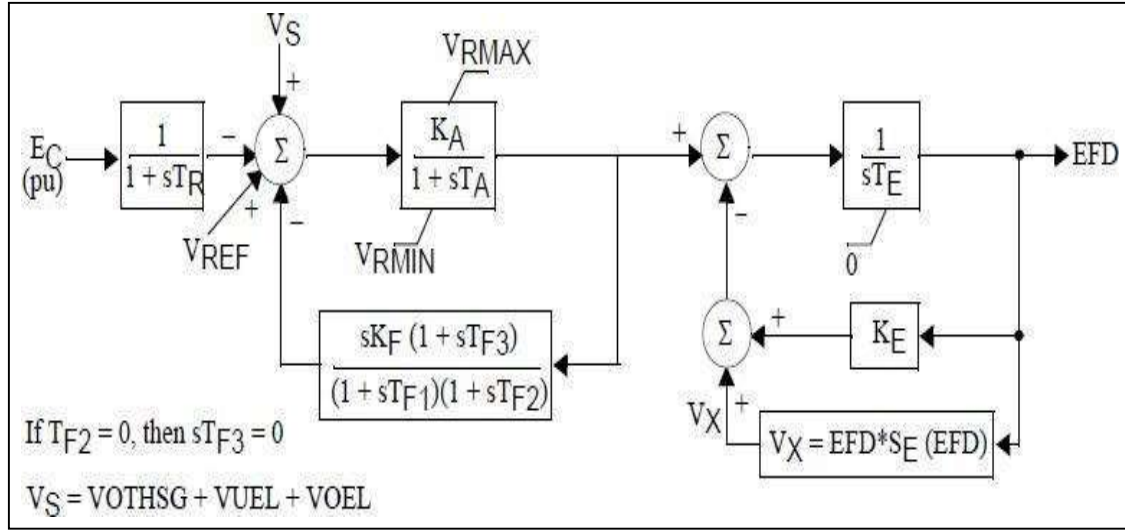
➤ Type AC3A: 1992 IEEE type AC3A excitation system model



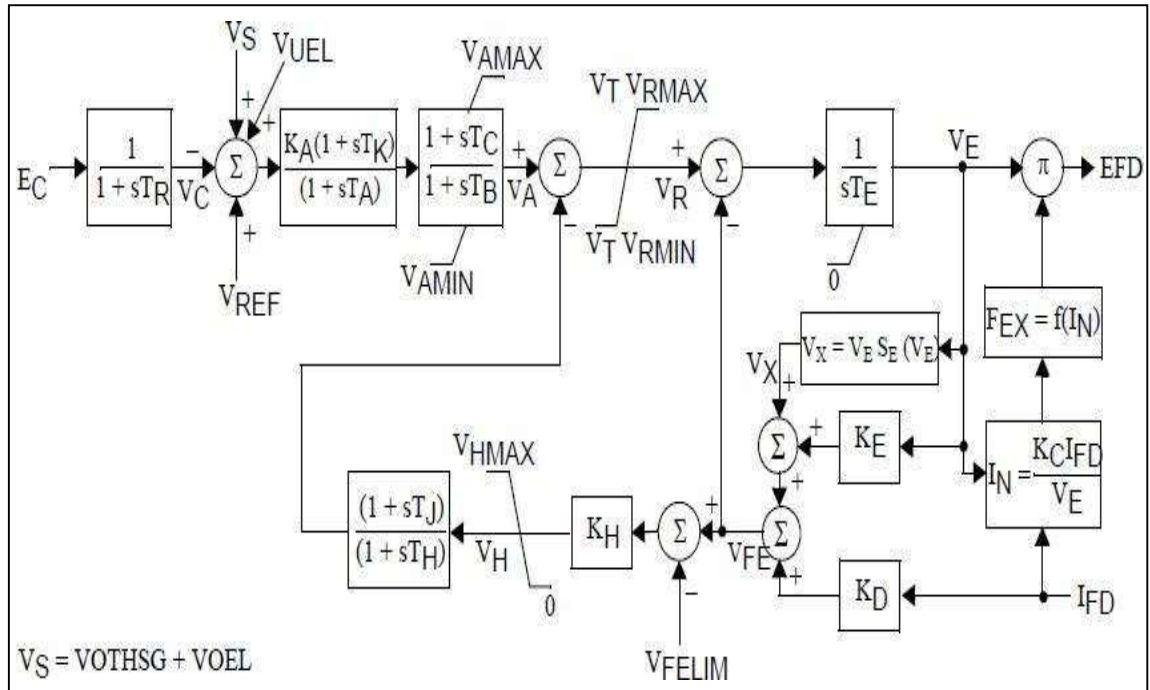
➤ **Type AC4A: 1992 IEEE type AC4A excitation system model**



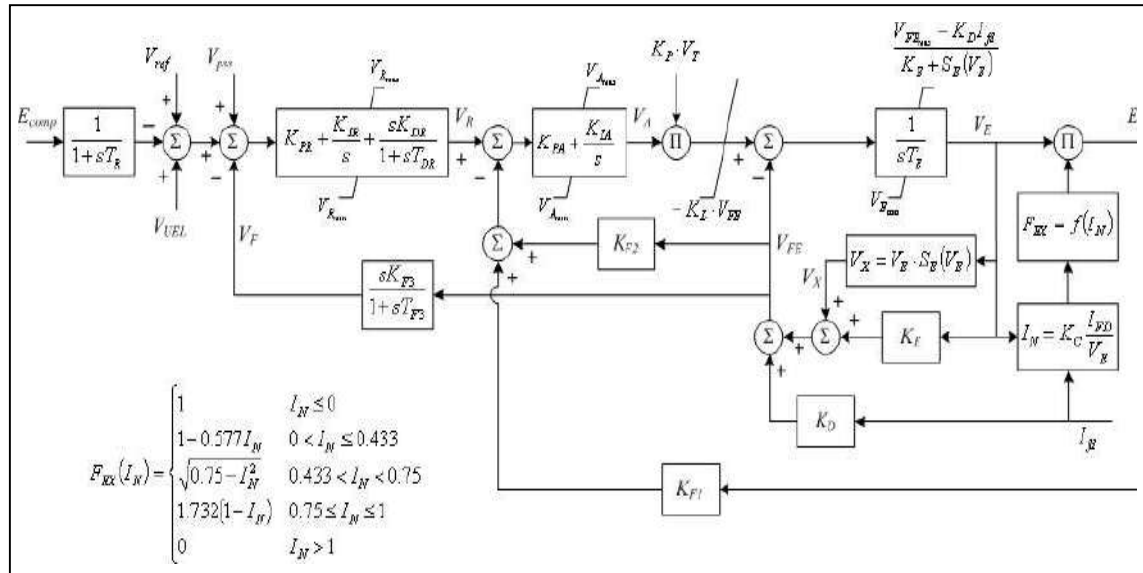
➤ **Type AC5A: 1992 IEEE type AC5A excitation system model**



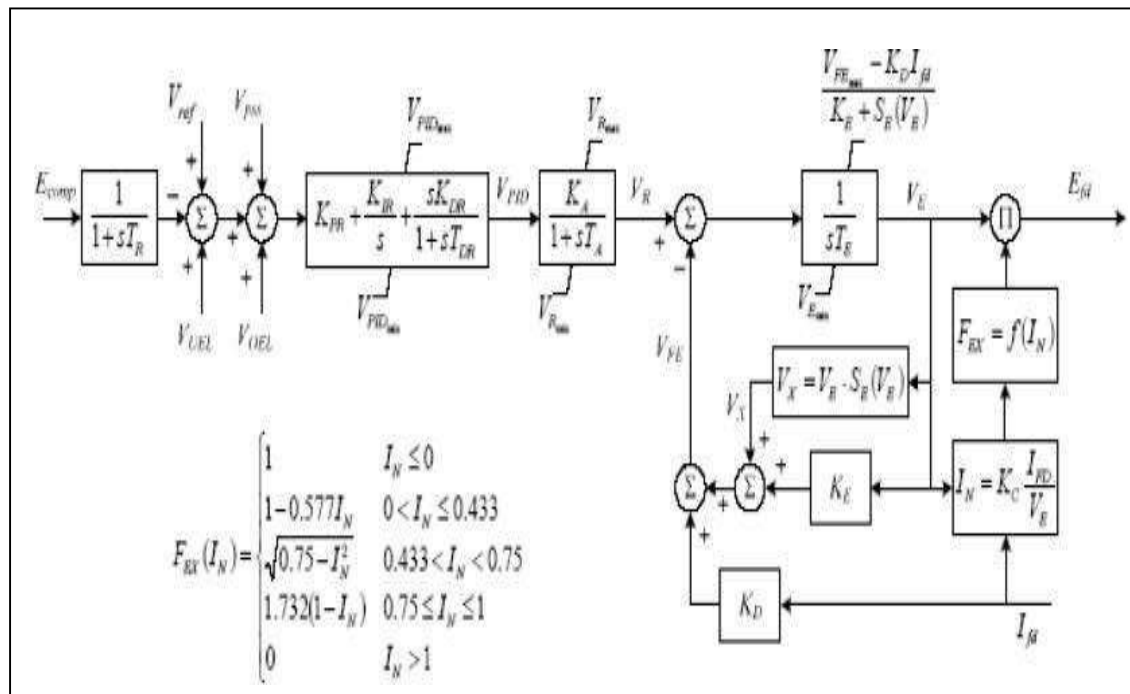
➤ **Type AC6A: IEEE 421.5 excitation system model**



➤ **Type AC7B: IEEE 421.5 2005 AC7B excitation system**

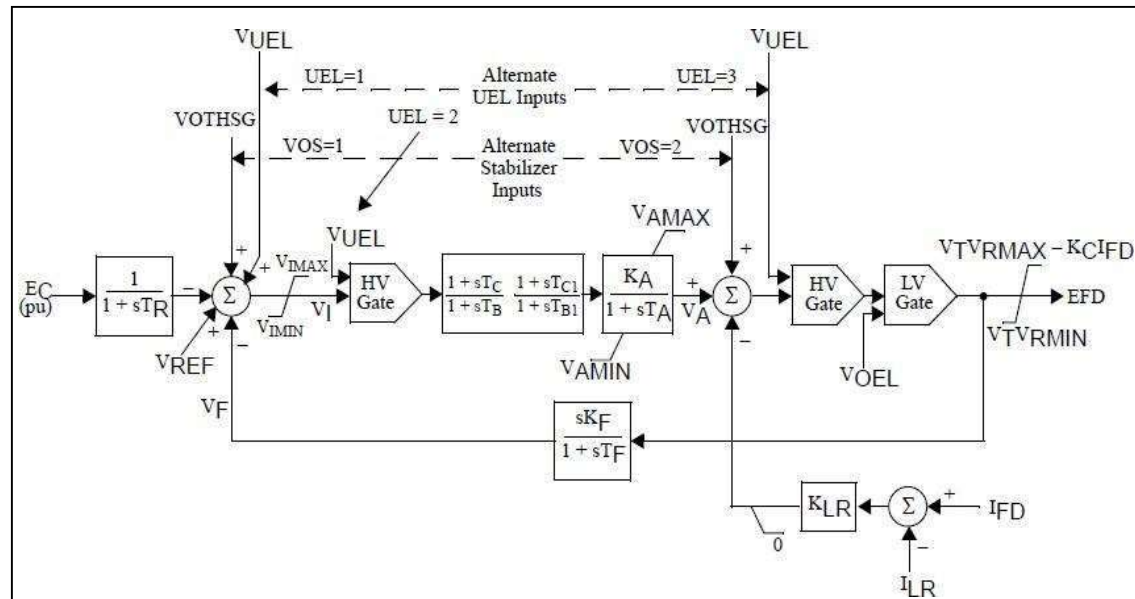


➤ **Type AC8B: IEEE 421.5 2005 AC8B excitation system**

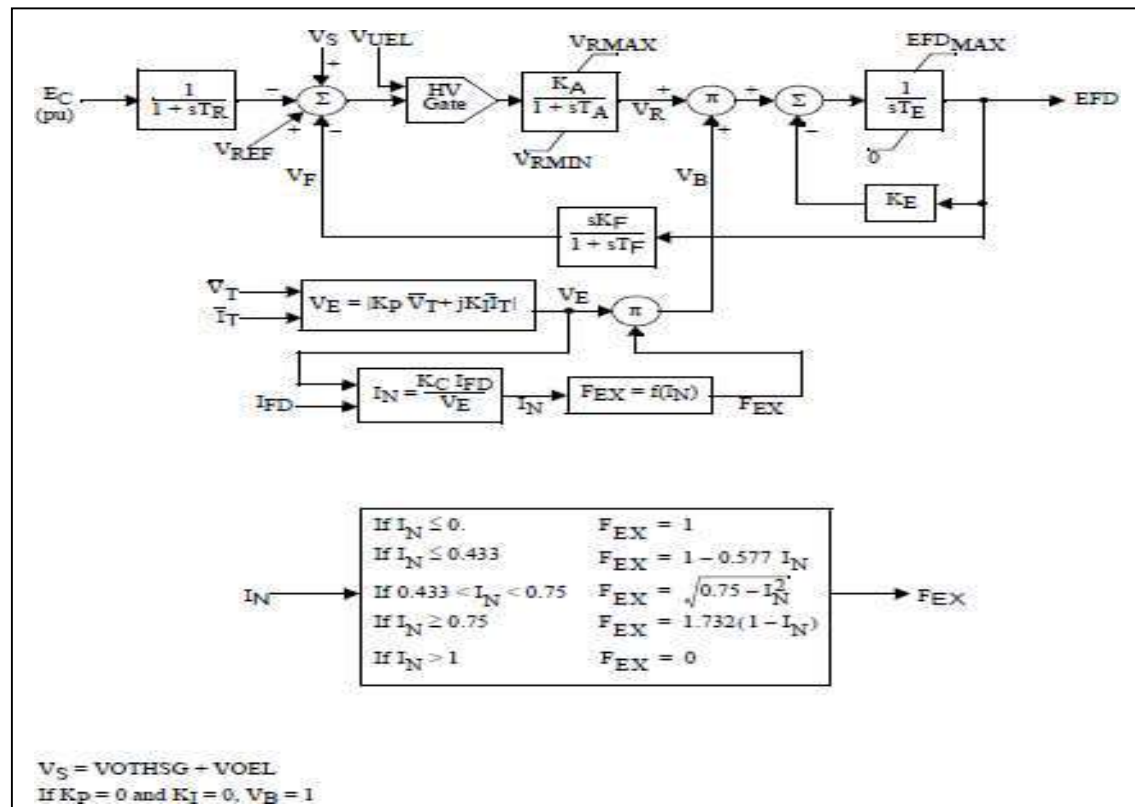


3. Commonly Used Static Exciters Generic Models block diagrams:

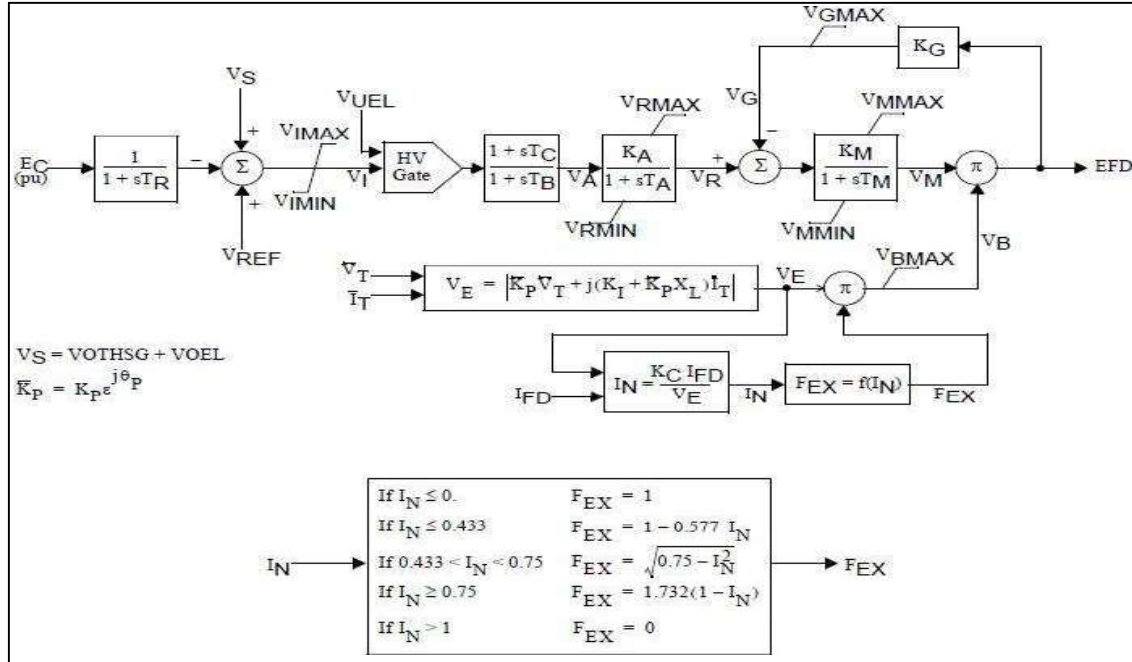
- **Type ST1A: 1992 IEEE type ST1A excitation system model**



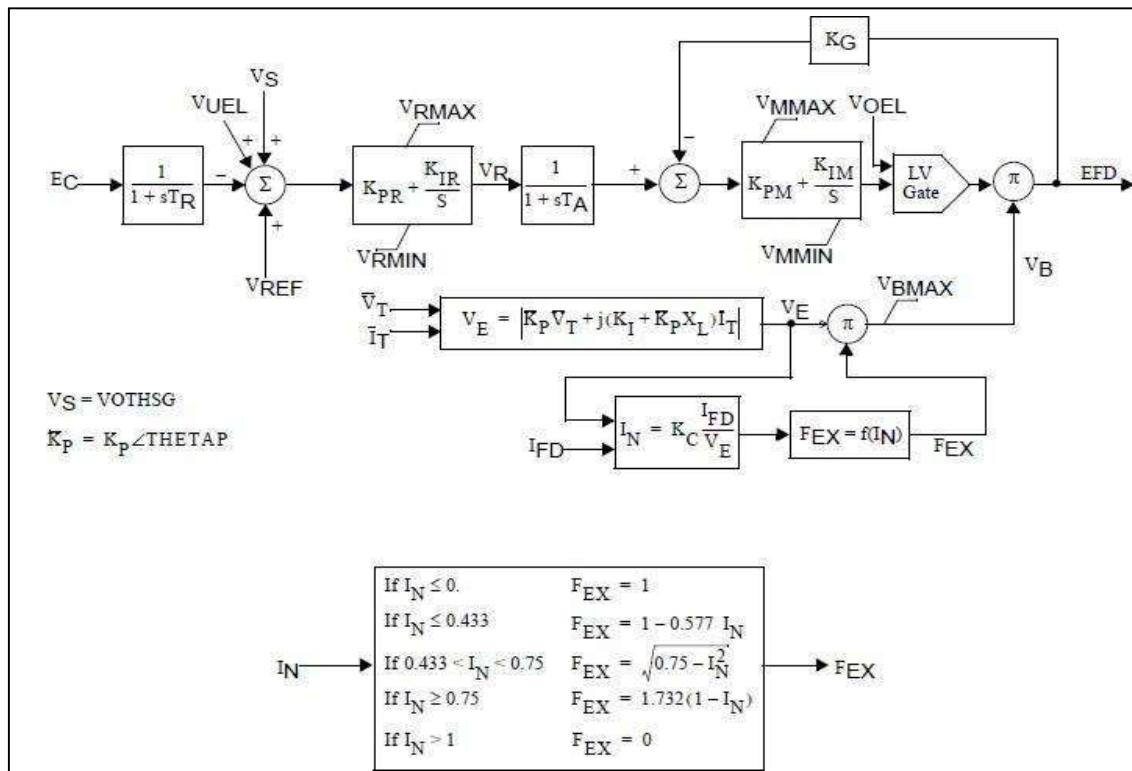
➤ **Type ST2A: 1992 IEEE type ST2A excitation system model**



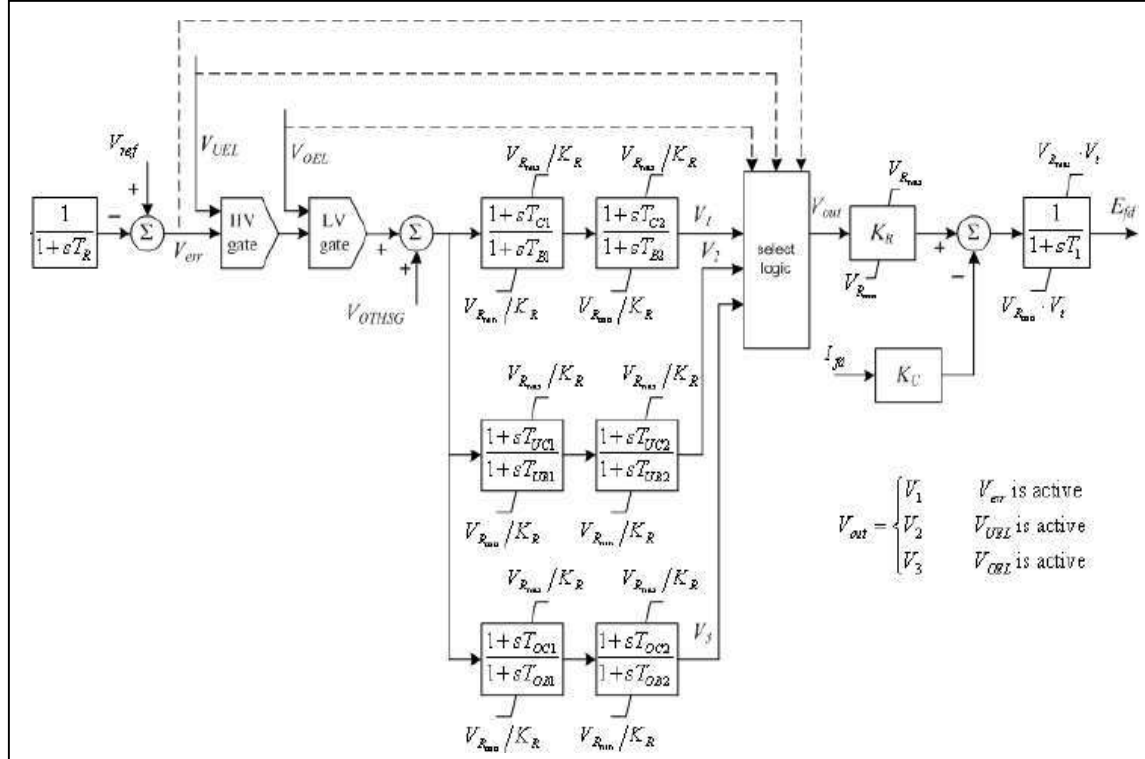
➤ **Type ST3A: 1992 IEEE type ST3A excitation system model**



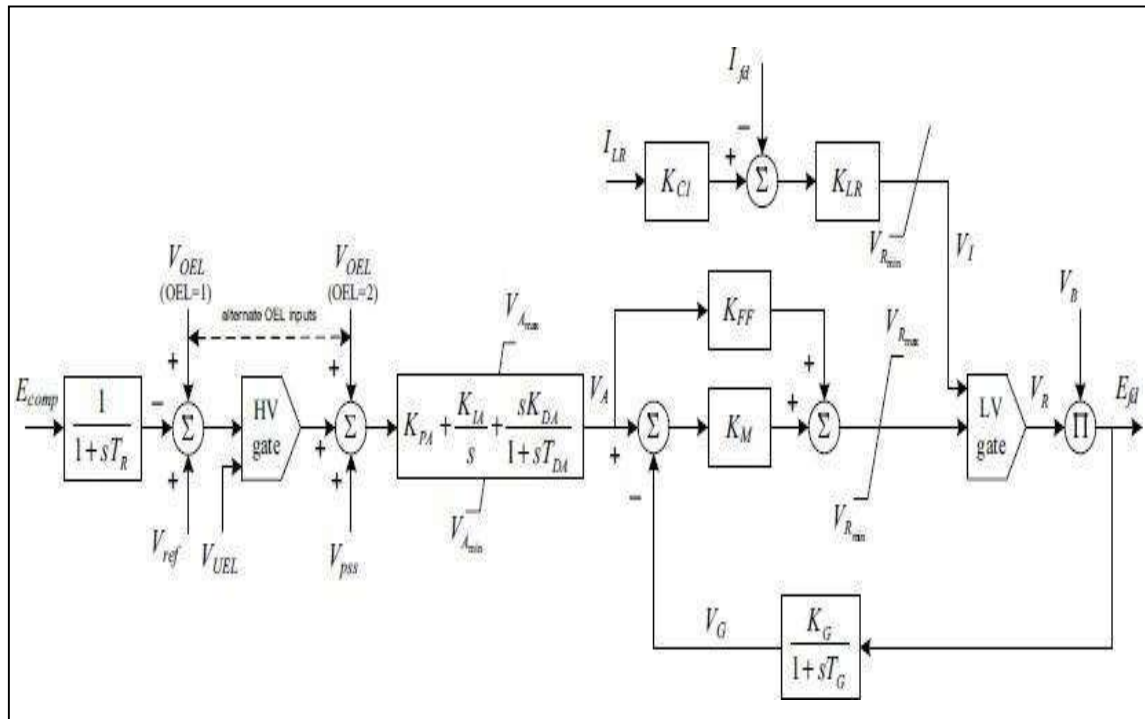
➤ **Type ST4B: IEEE type ST4B potential or compounded source-controlled rectifier exciter**



➤ **Type ST5B: IEEE 421.5 2005 ST5B excitation system**

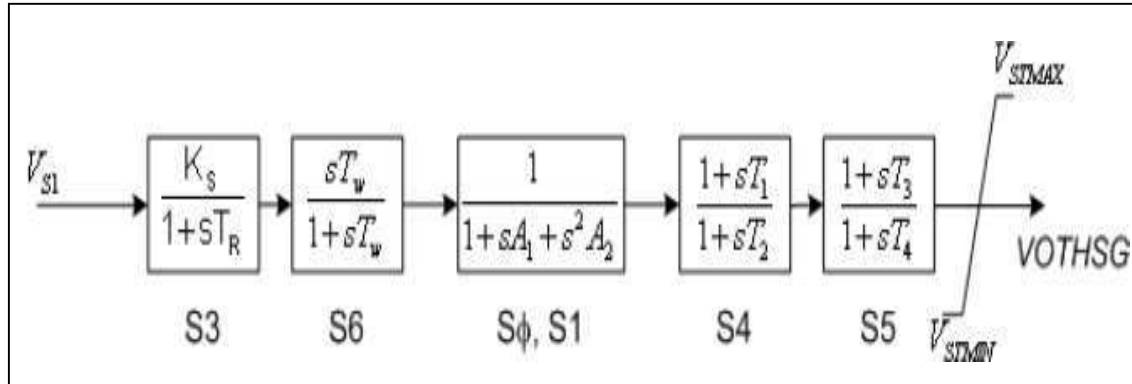


➤ **Type ST6B: IEEE 421.5 2005 ST6B excitation system**

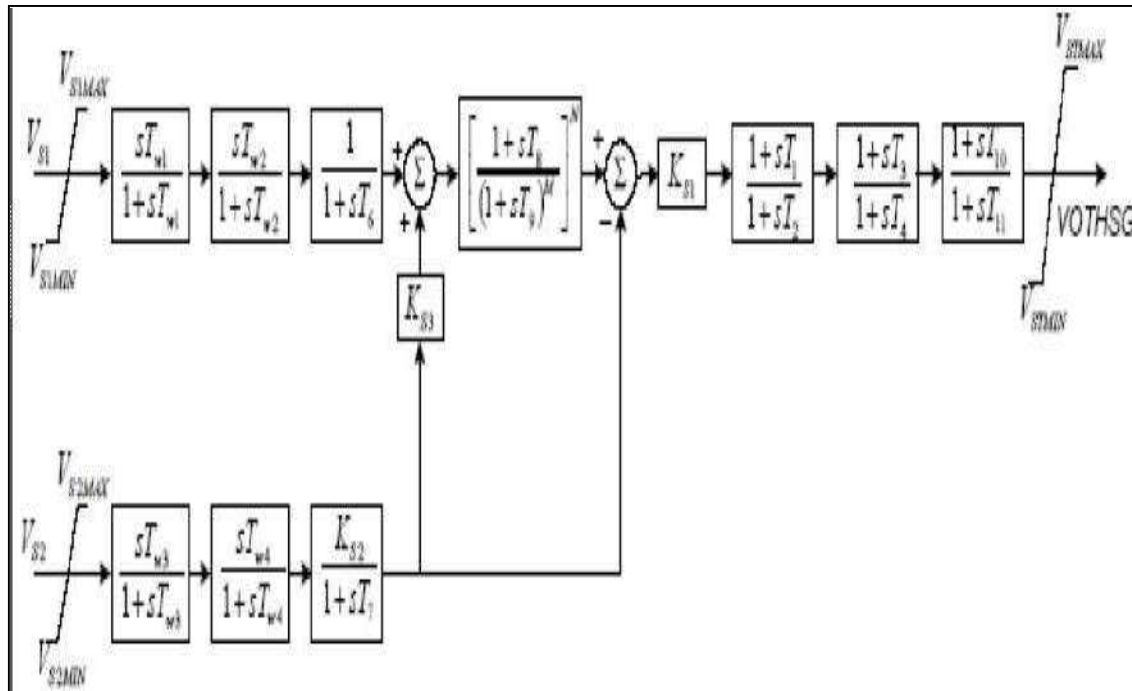


4. Commonly Used Power System Stabilizer generic models block diagrams:

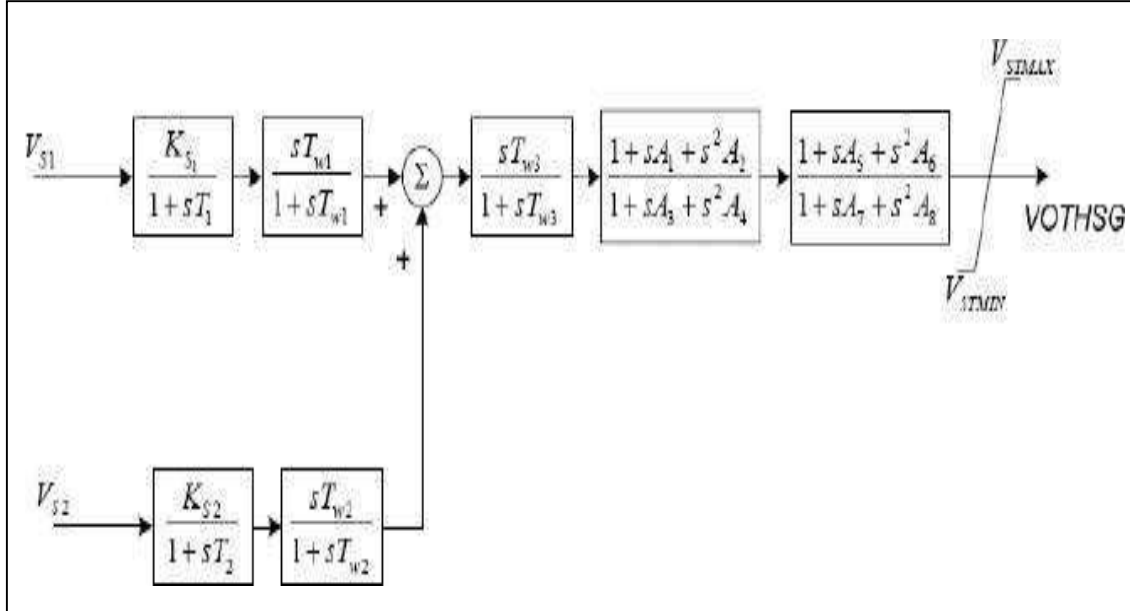
➤ PSS1A: IEEE Std. 421.5-2005 PSS1A Single-Input Stabilizer model



➤ PSS2B: IEEE 421.5 2005 PSS2B IEEE dual-input stabilizer model

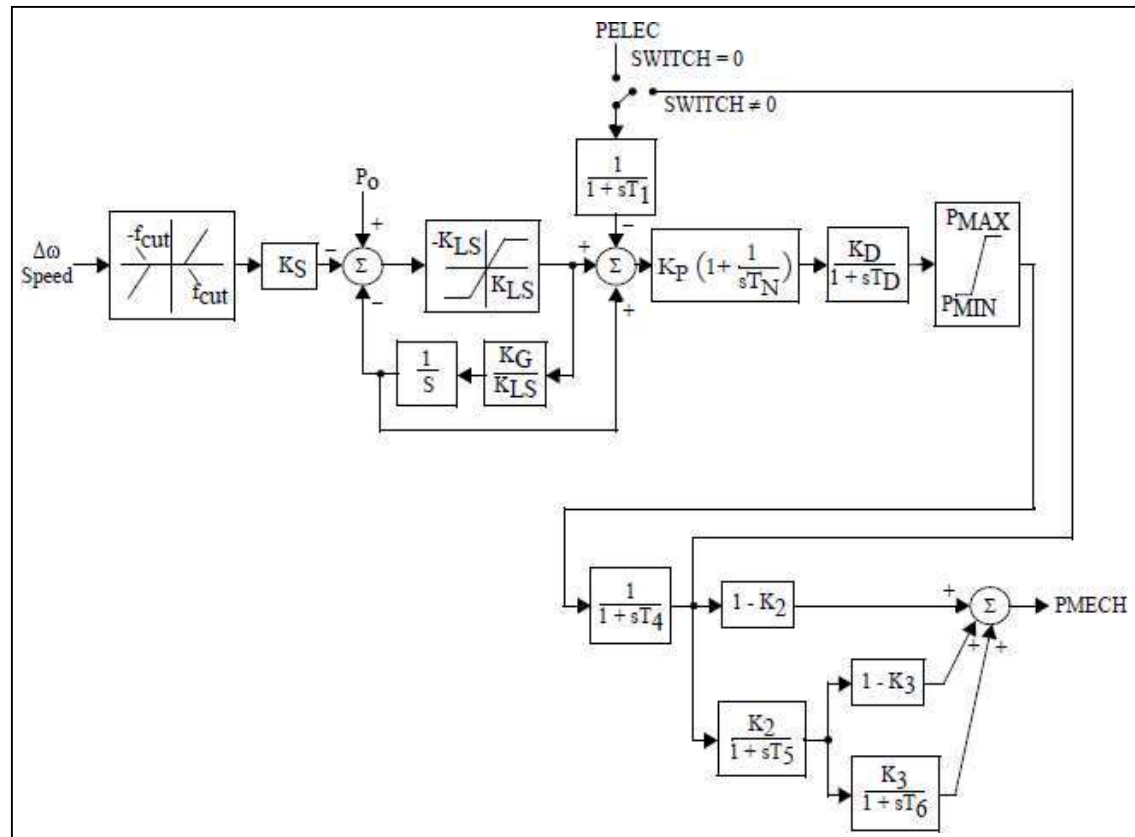


➤ **PSS3B: IEEE Std. 421.5 2005 PSS3B IEEE dual-input stabilizer model**

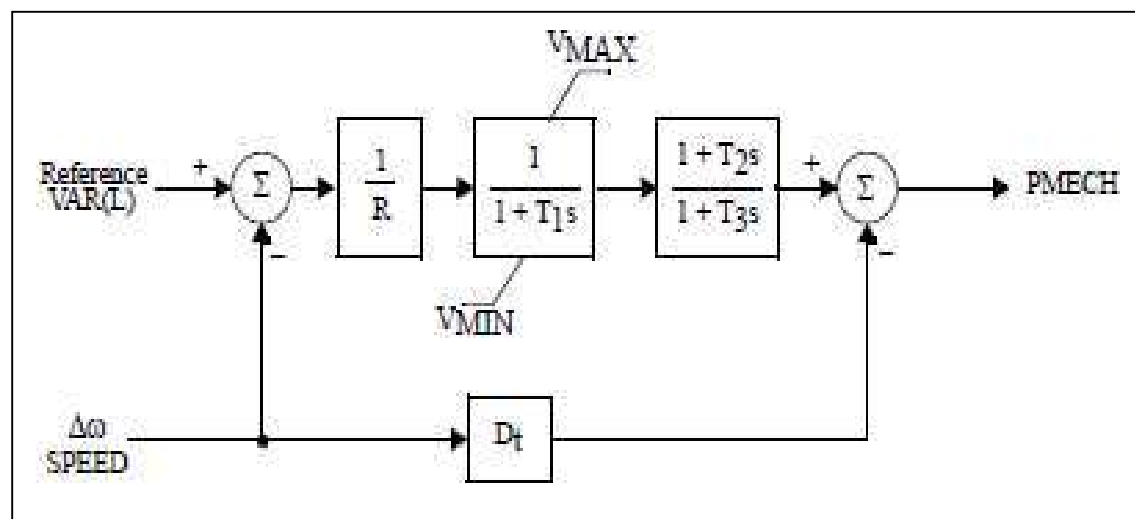


5. Commonly Used Steam Turbine Generic Models Block Diagrams:

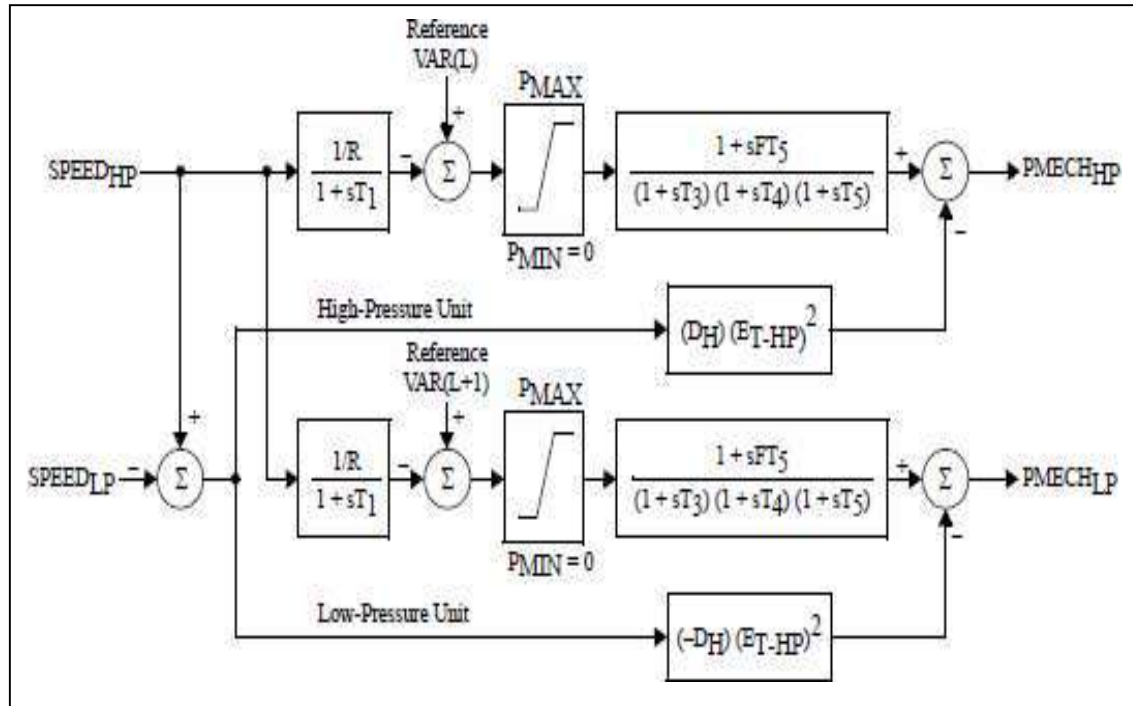
➤ BBGOV1: Brown-Boveri turbine-governor model



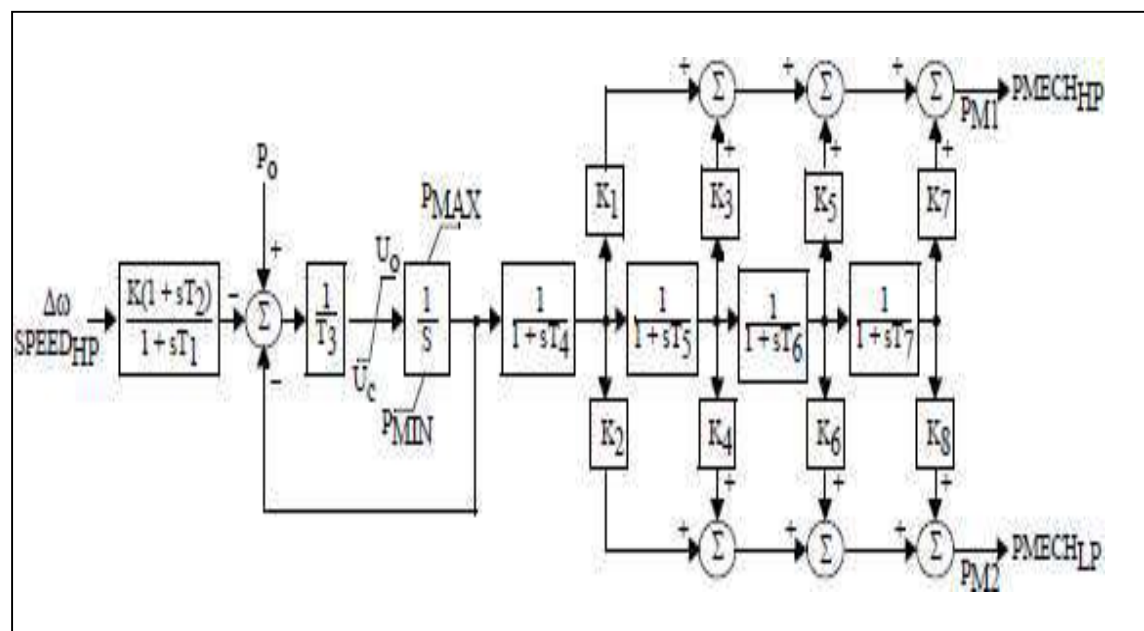
➤ TGOV1: Steam turbine-governor model



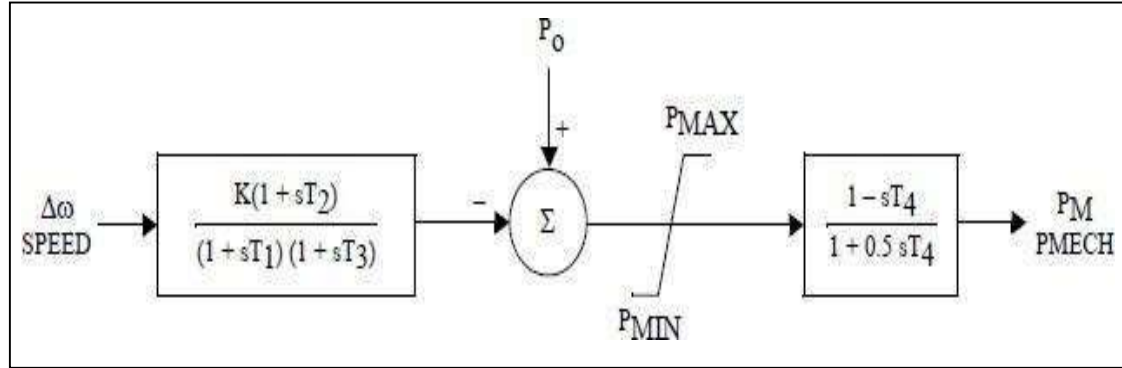
➤ **CRCMGV: Cross compound turbine-governor model**



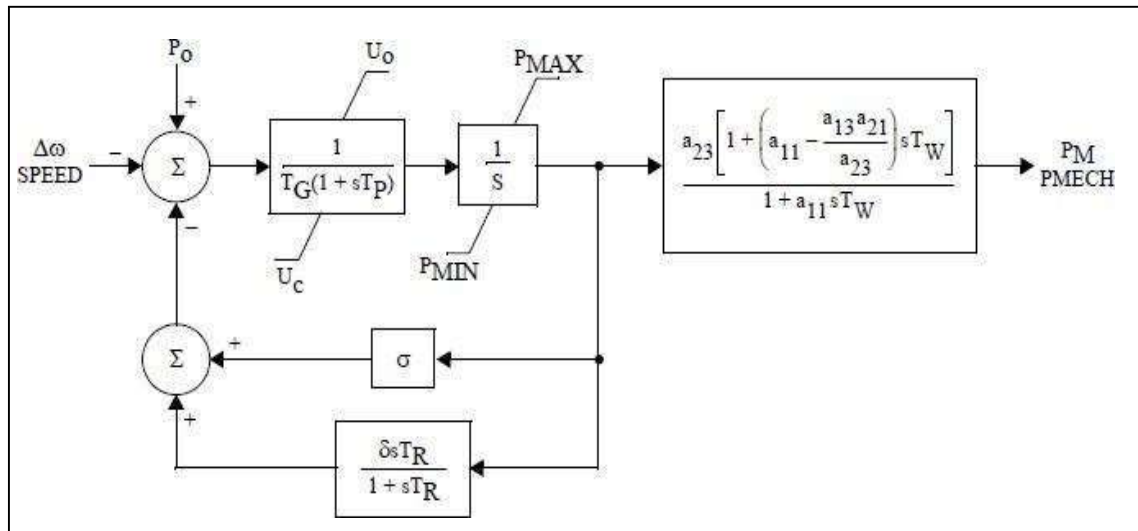
➤ **IEEEG1: 1981 IEEE type 1 turbine-governor model**



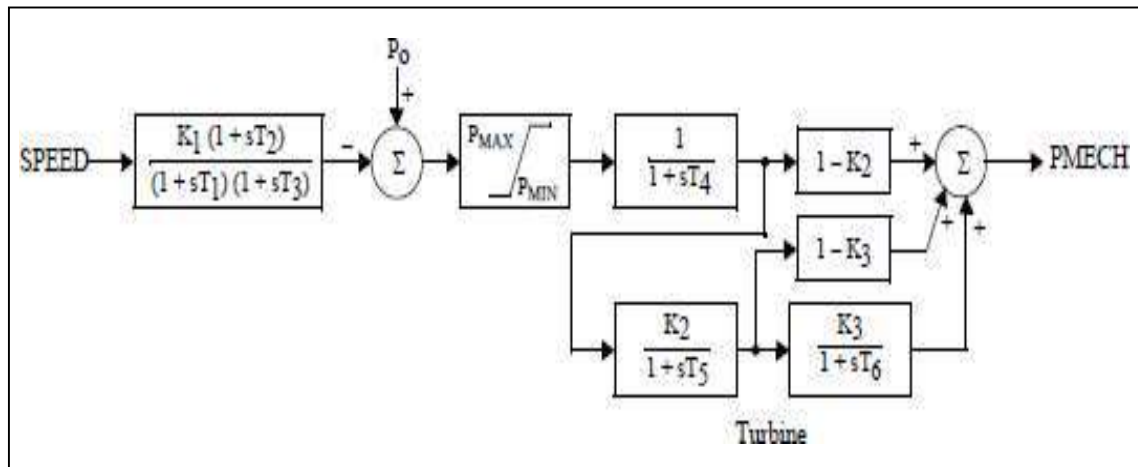
➤ **IEEEG2: 1981 IEEE Type 2 Speed-Governing Model**



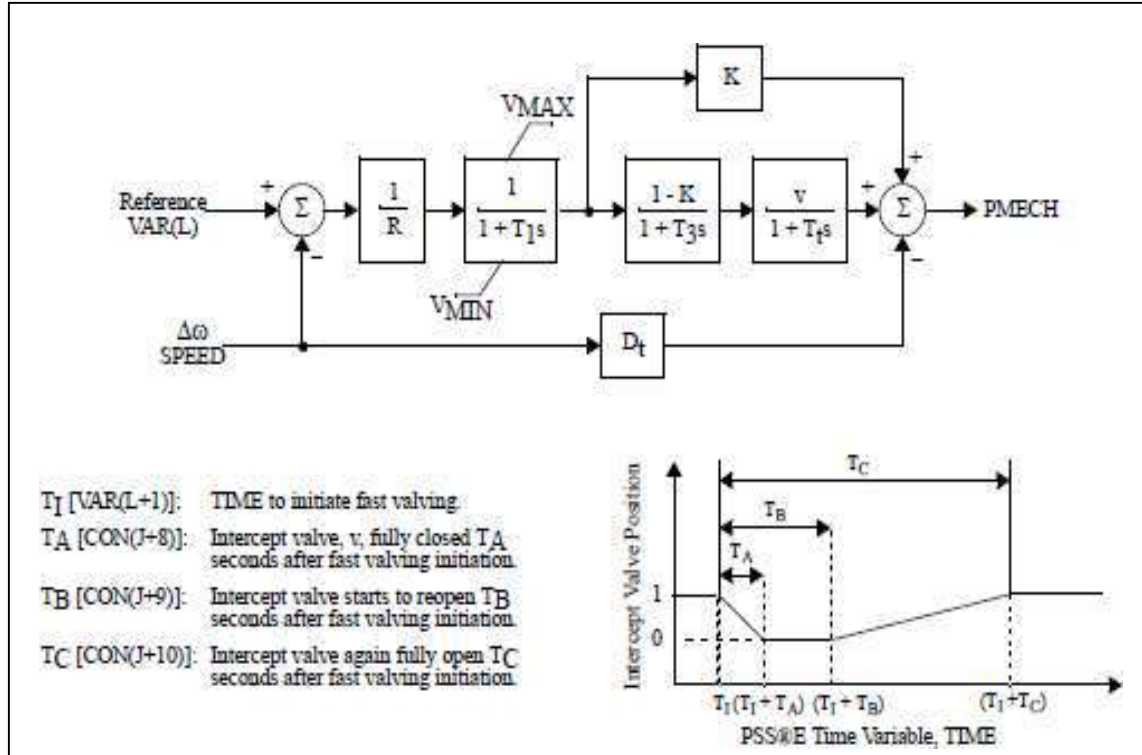
➤ **IEEEG3: 1981 IEEE Type 3 Speed-Governing Model**



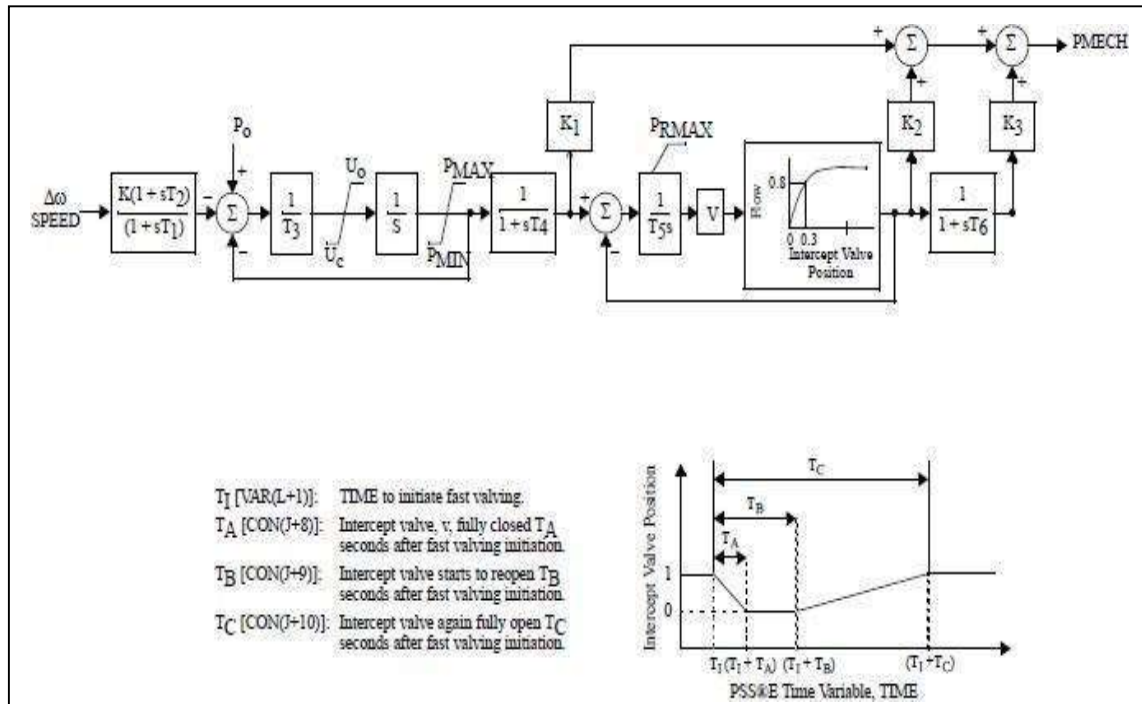
➤ **IEESGO: 1973 IEEE standard turbine-governor model**



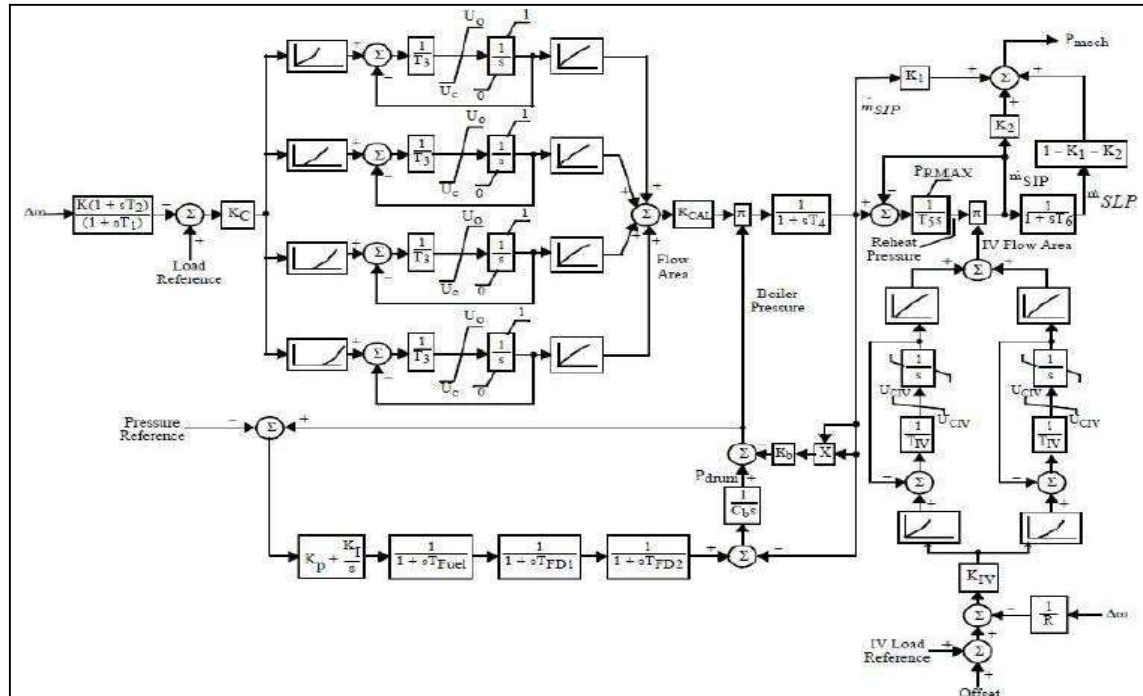
➤ **TGOV2: Steam turbine-governor model with fast valving**



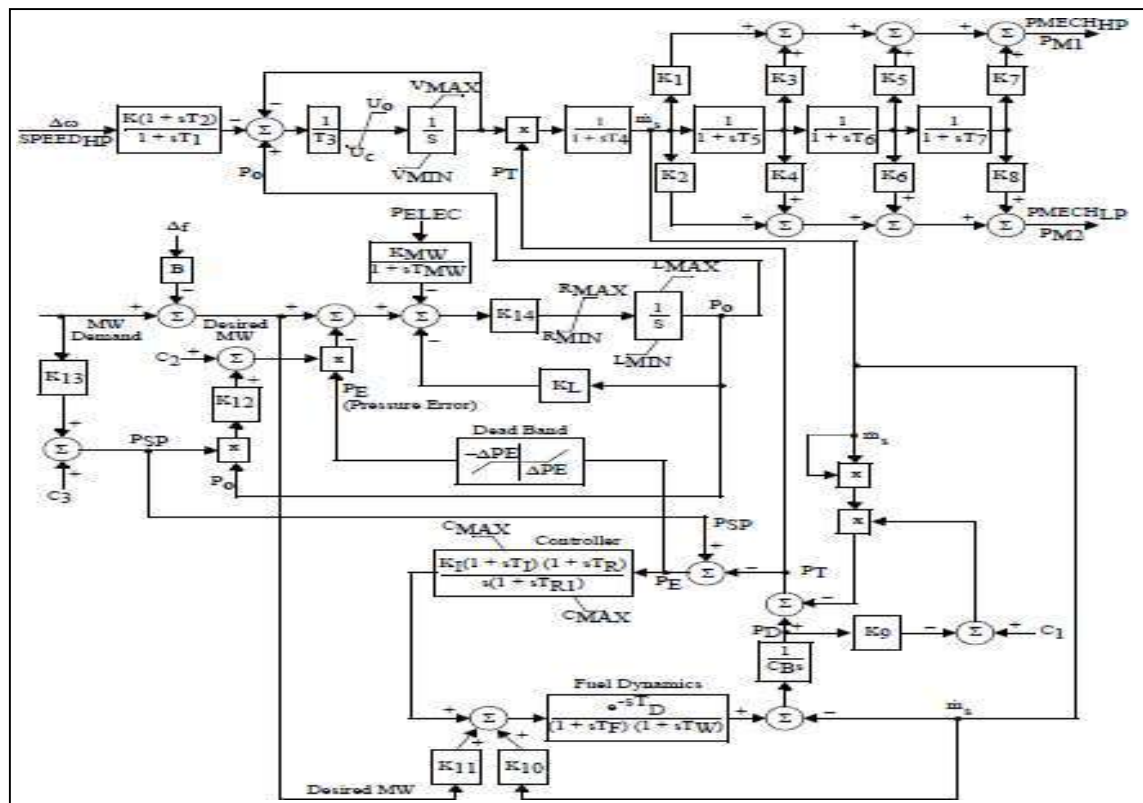
➤ **TGOV3: Modified IEEE type 1 turbine-governor model with fast valving**



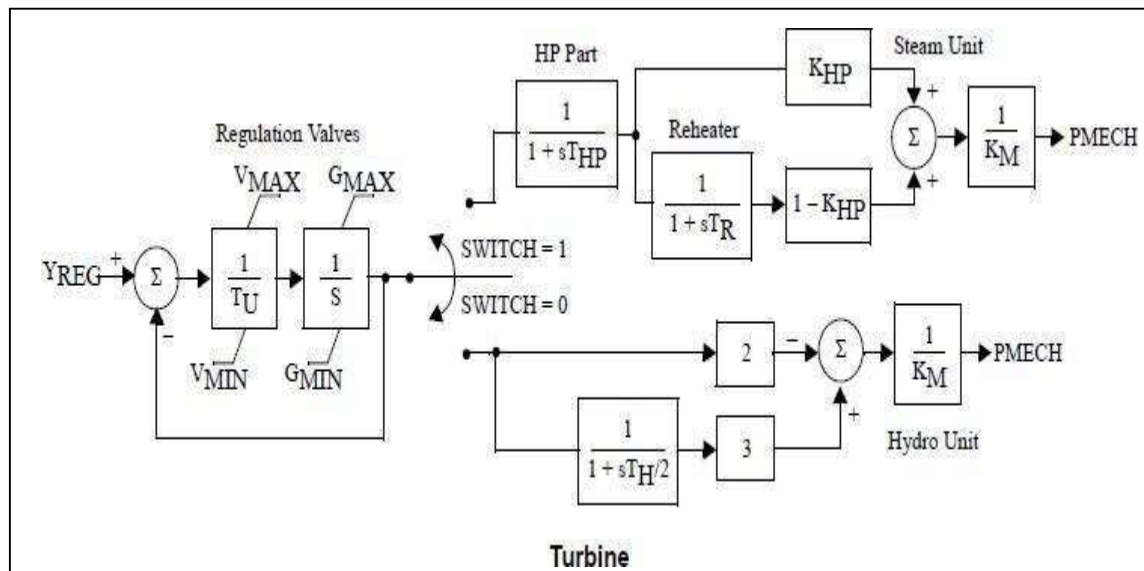
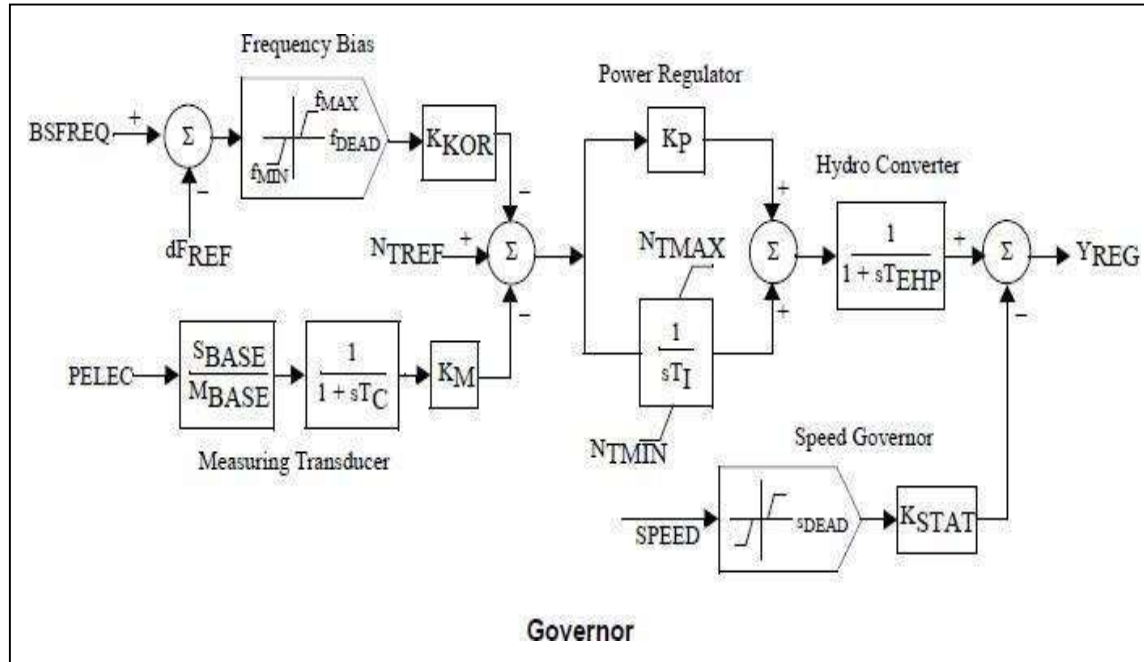
➤ **TGOV4: Modified IEEE type 1 speed governing model with PLU and EVA**



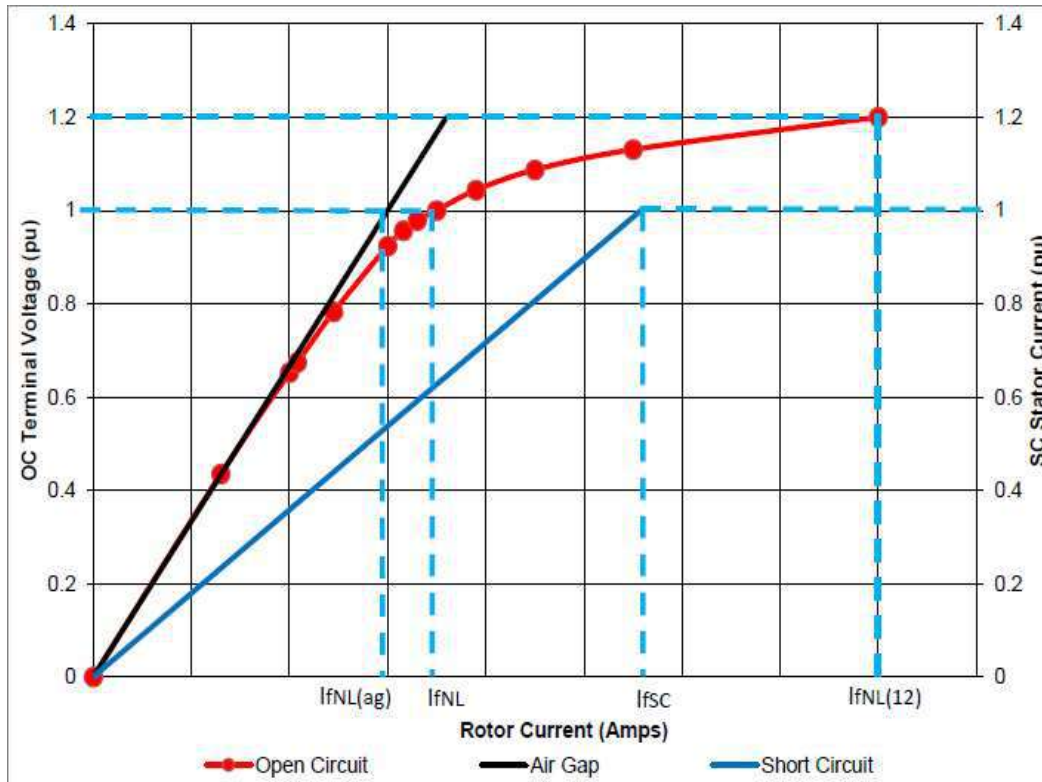
- **TGOV5: Modified IEEE type 1 turbine-governor model with boiler controls**



➤ **TURCZT: Czech Hydro and Steam Governor**



➤ **Calculation of saturation parameters:**



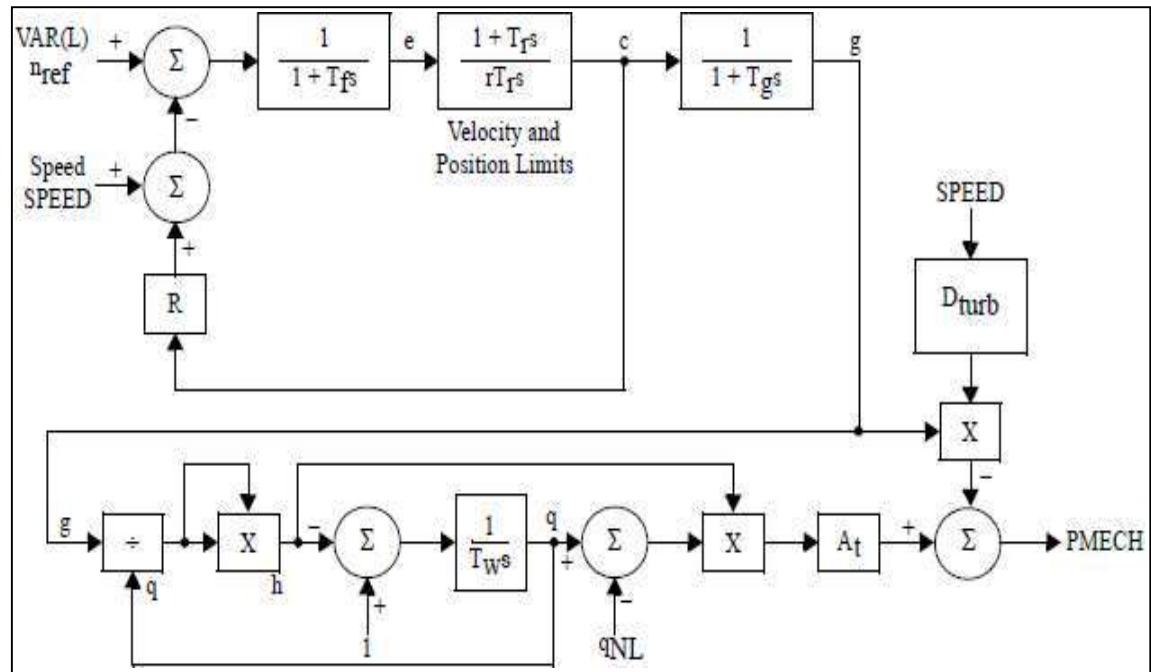
The saturation can be calculated using the following calculation:

$$S(1.0) = \frac{I_{fNL} - I_{fNL(AG)}}{I_{fNL(AG)}}$$

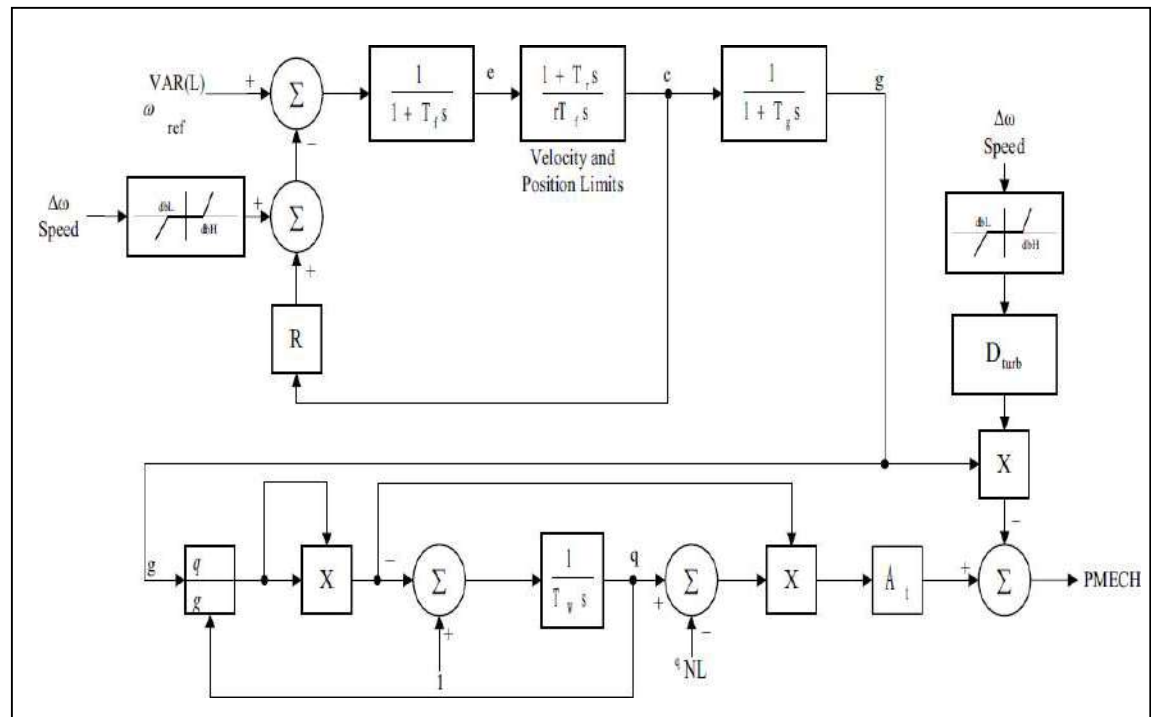
$$S(1.2) = \frac{I_{fNL(12)} - 1.2 \times I_{fNL(AG)}}{1.2 \times I_{fNL(AG)}}$$

6. Commonly Used Hydro Turbine Generic Model Block Diagrams:

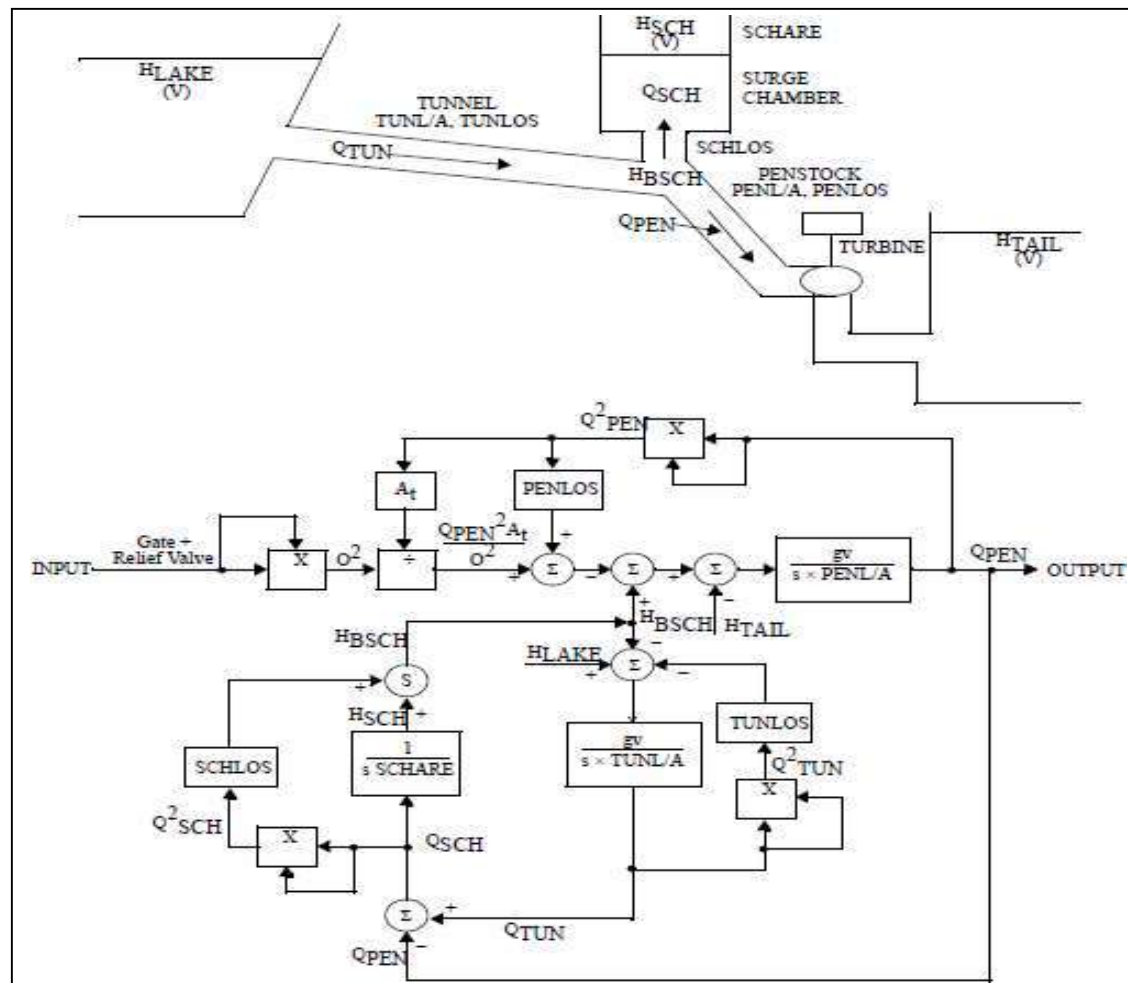
➤ HYGOV: Hydro Turbine-Governor



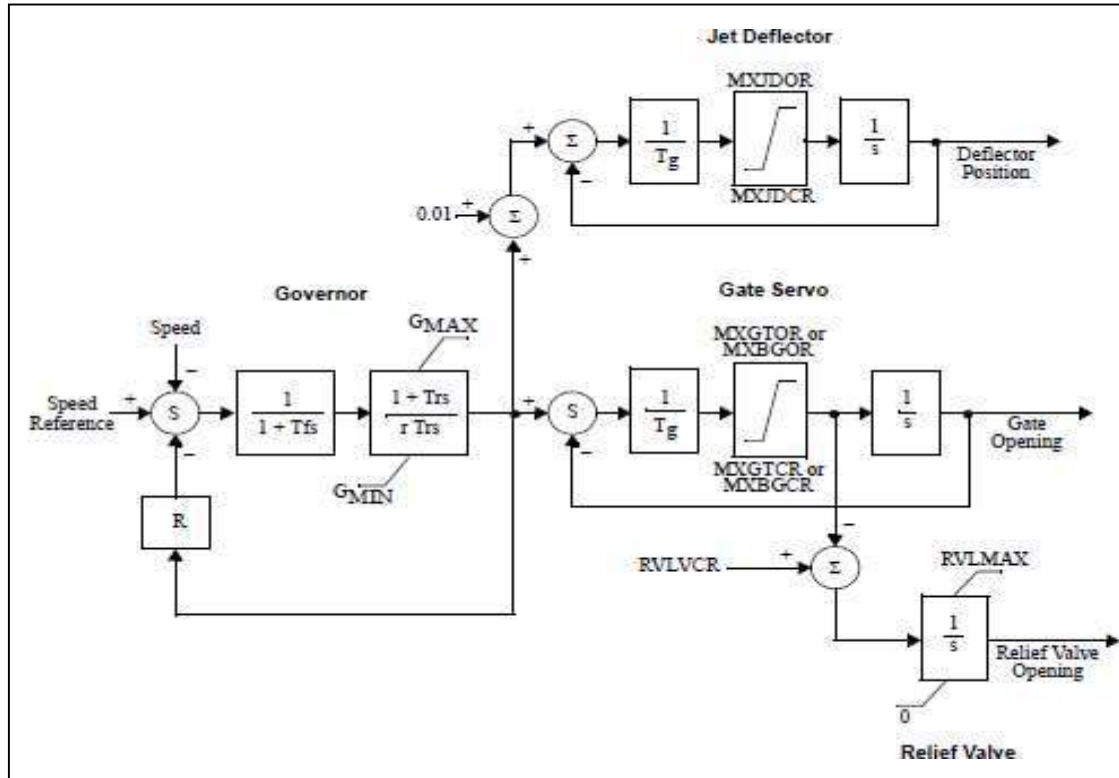
➤ HYGOVDU: Hydro Turbine-Governor



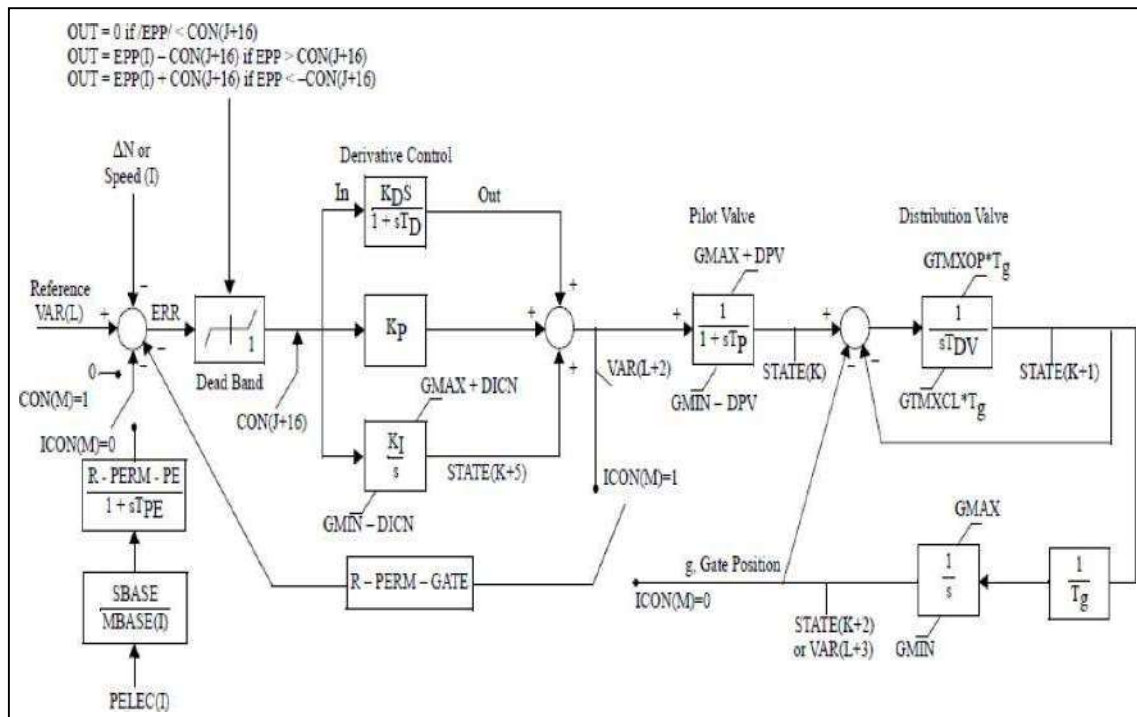
➤ **HYGOVM: Hydro Turbine-Governor Lumped Parameter Model**



gv	Gravitational acceleration	A_t	Turbine flow gain
TUNL/A	Summation of length/cross section of tunnel	O	Gate + relief valve opening
SCHARE	Surge chamber cross section	HSCH	Water level in surge chamber
PENLOS	Penstock head loss coefficient	QPEN	Penstock flow
TUNLOS	Tunnel head loss coefficient	QTUN	Tunnel flow
FSCH	Surge chamber orifice head loss coefficient	QSCH	Surge chamber flow
PENL/A	Summation of length/cross section of penstock, scroll case and draft tube		

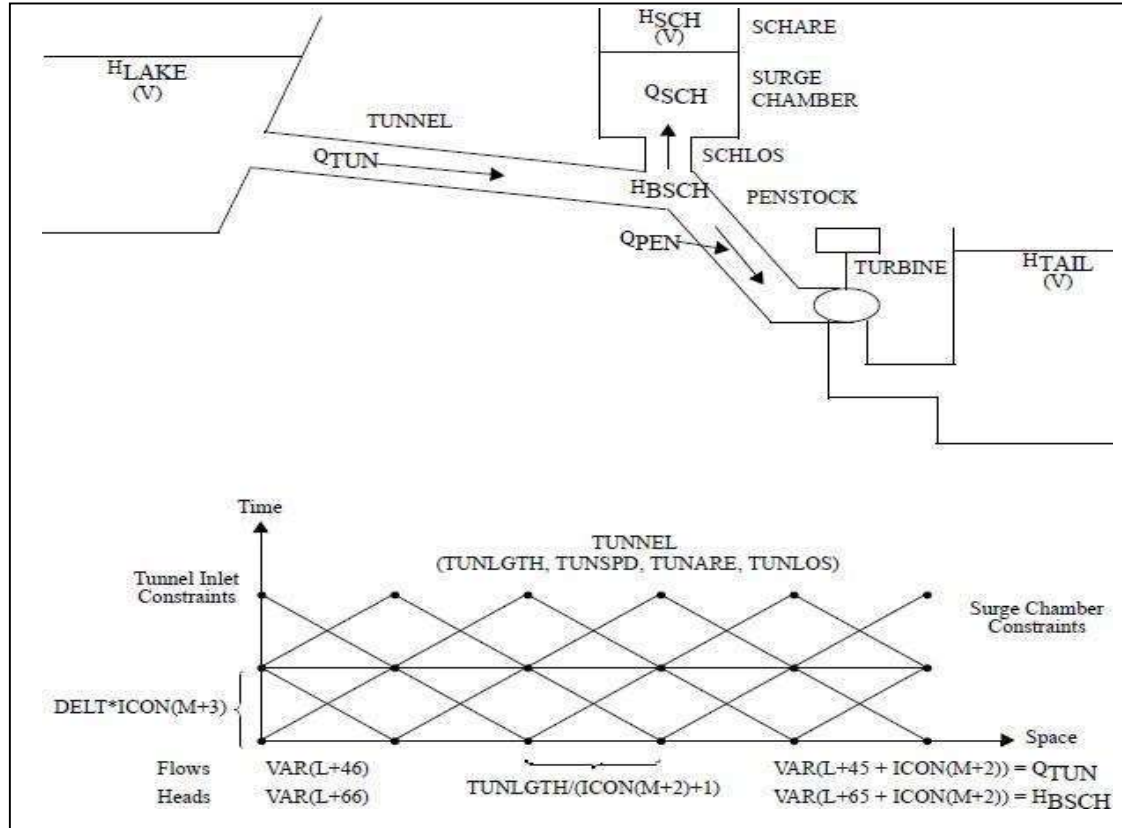
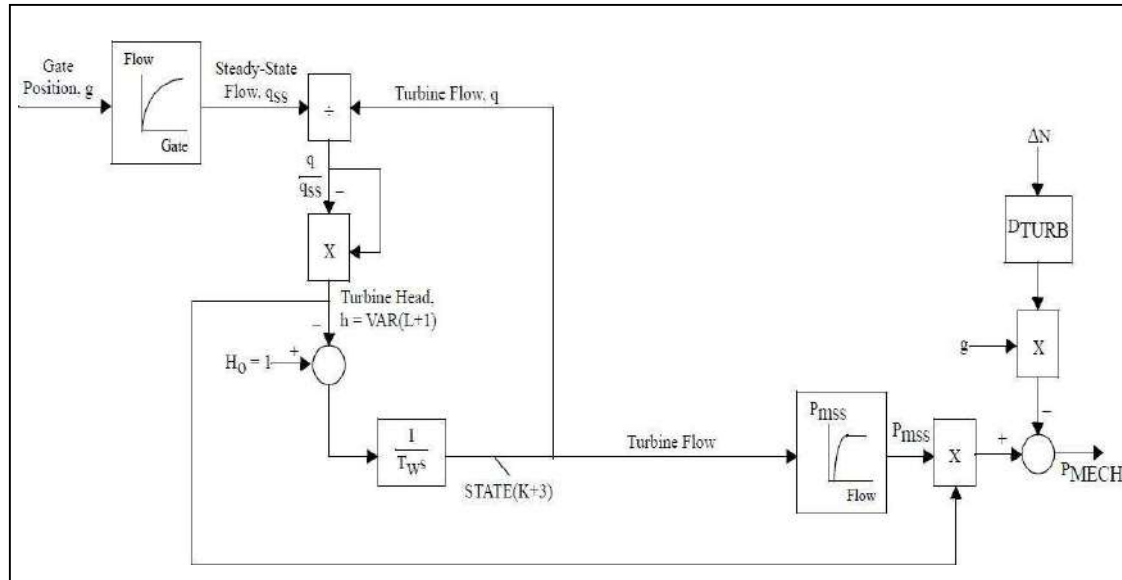


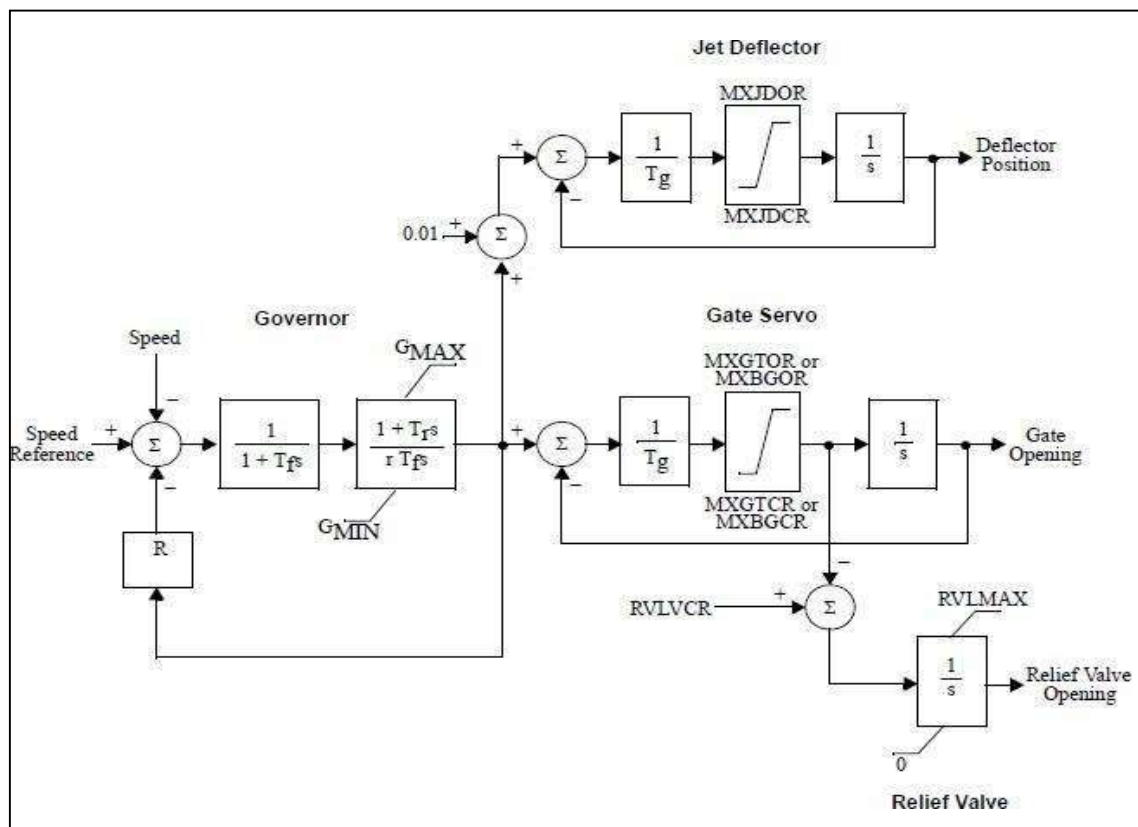
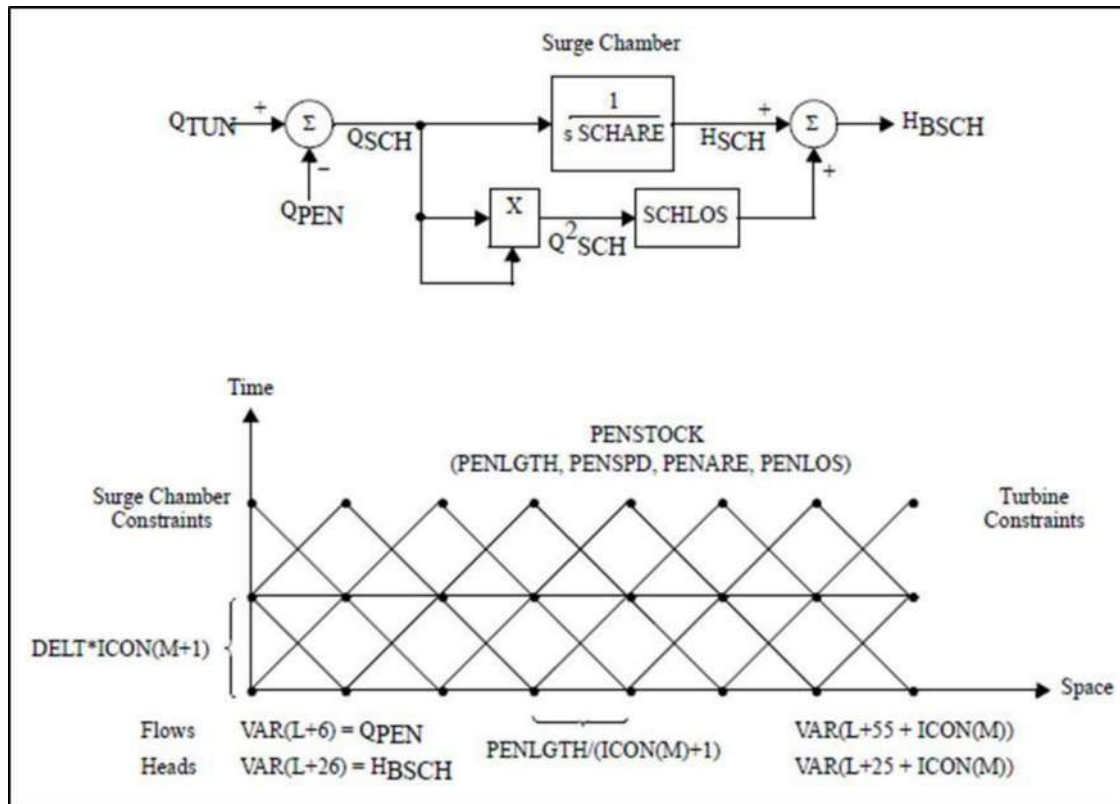
➤ **WEHGOV: Woodward Electric Hydro Governor Model**



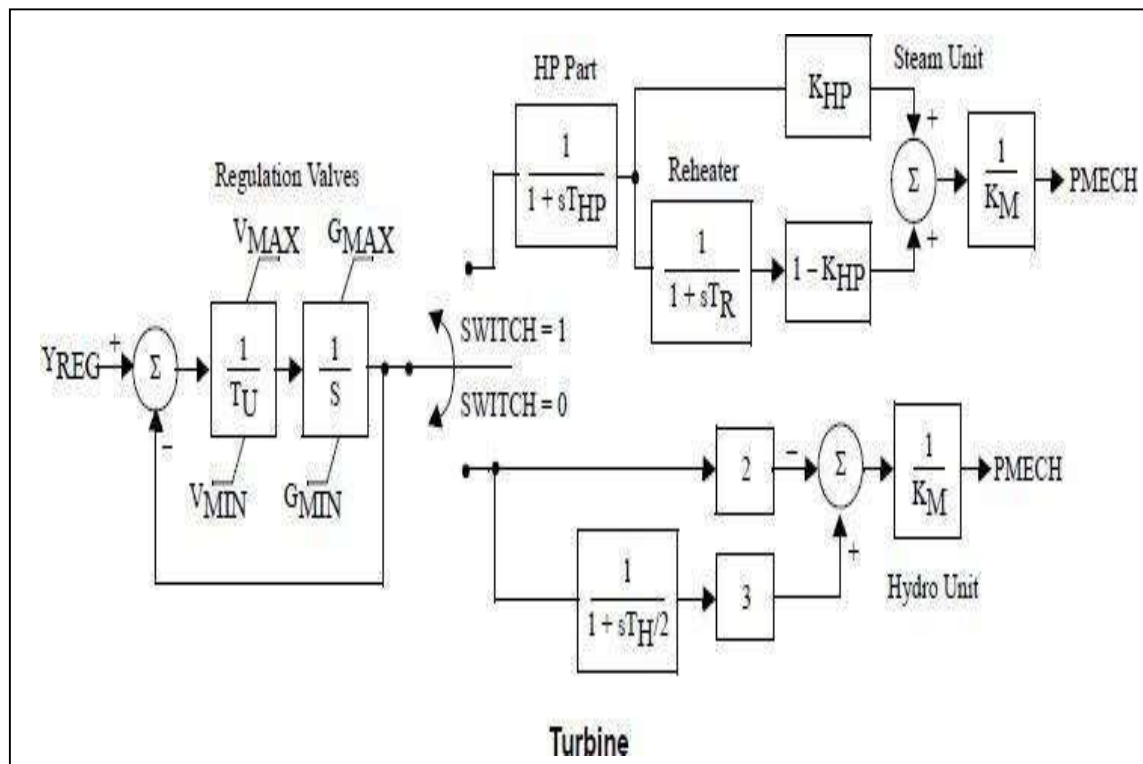
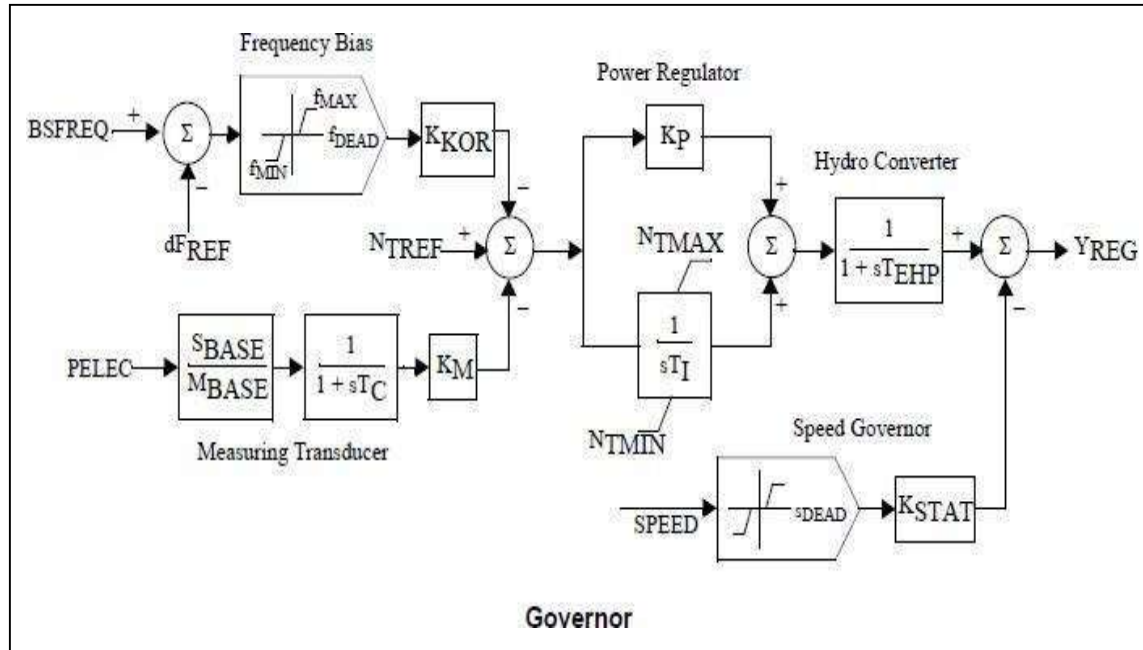
Governor and Hydraulic Actuators

➤ HYGOVT: Hydro Turbine-Governor Traveling Wave Model

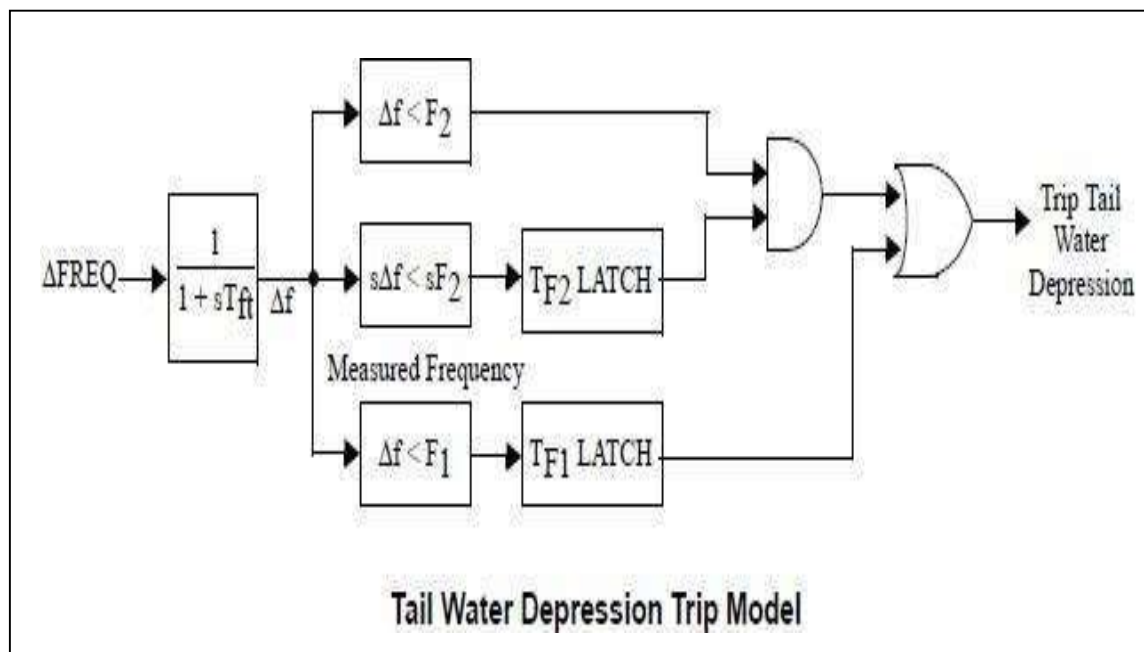
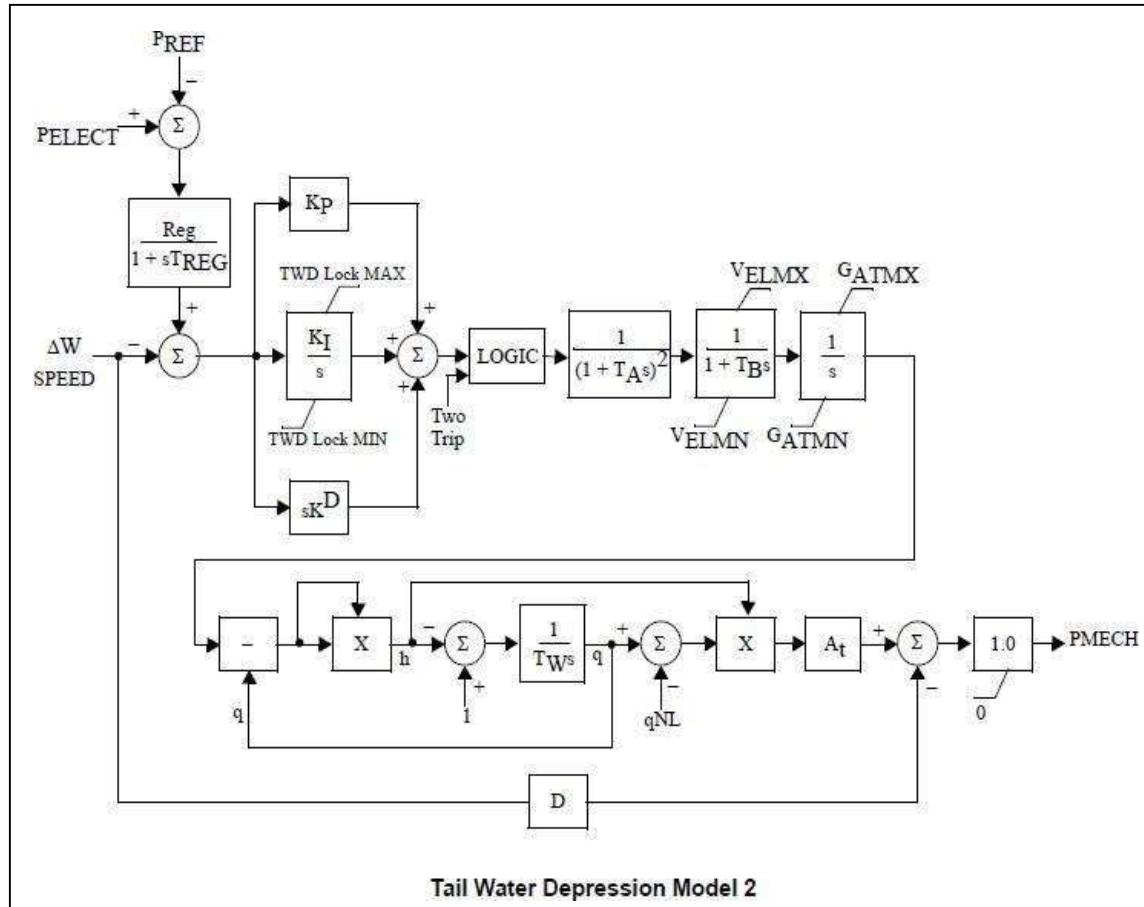




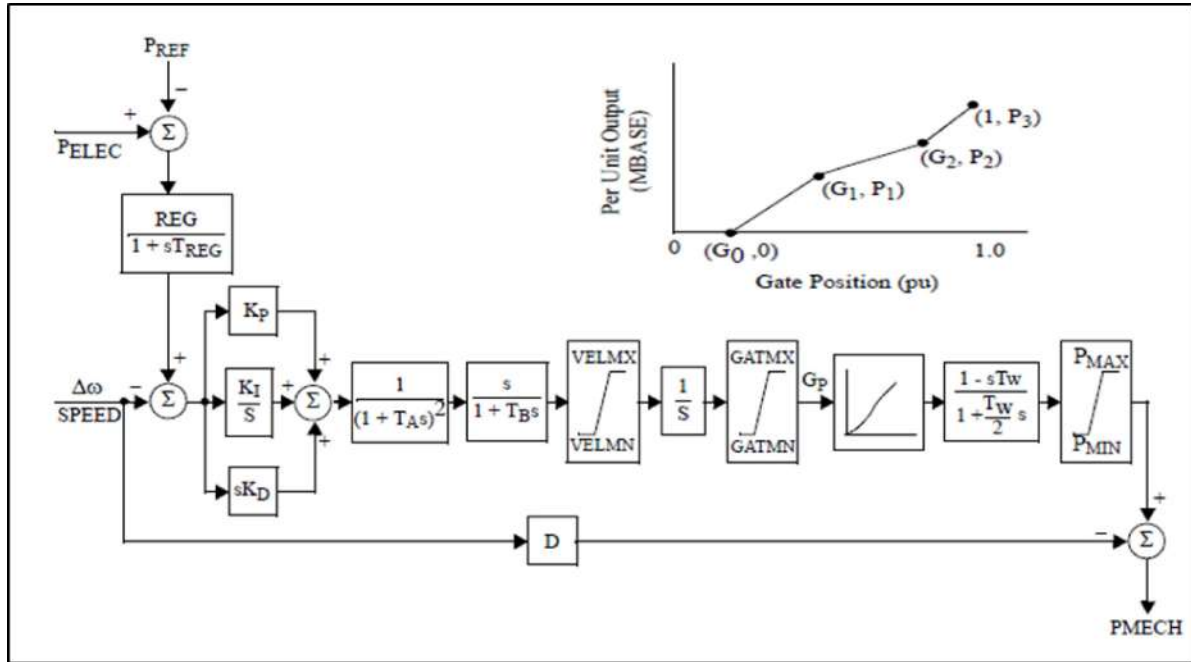
➤ **TURCZT: Czech Hydro and Steam Governor**



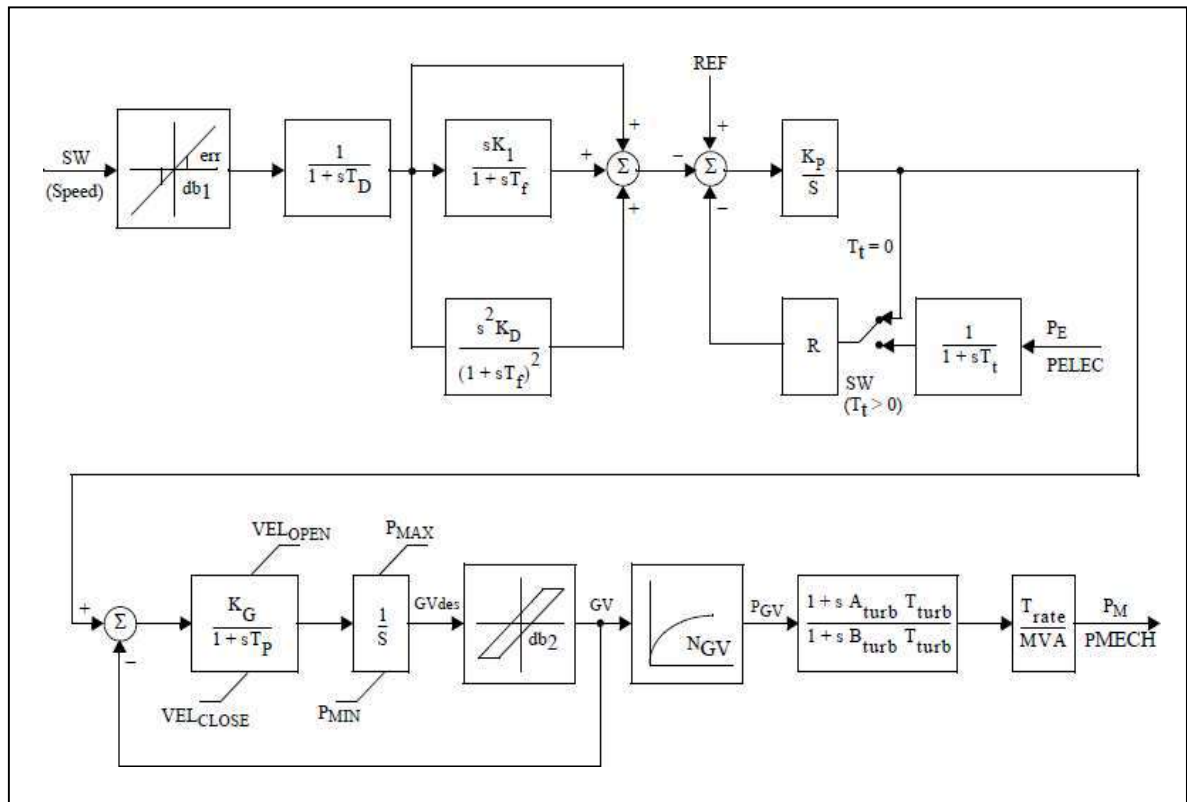
➤ **TWDM2T: Tail Water Depression Hydro Governor Model 2**



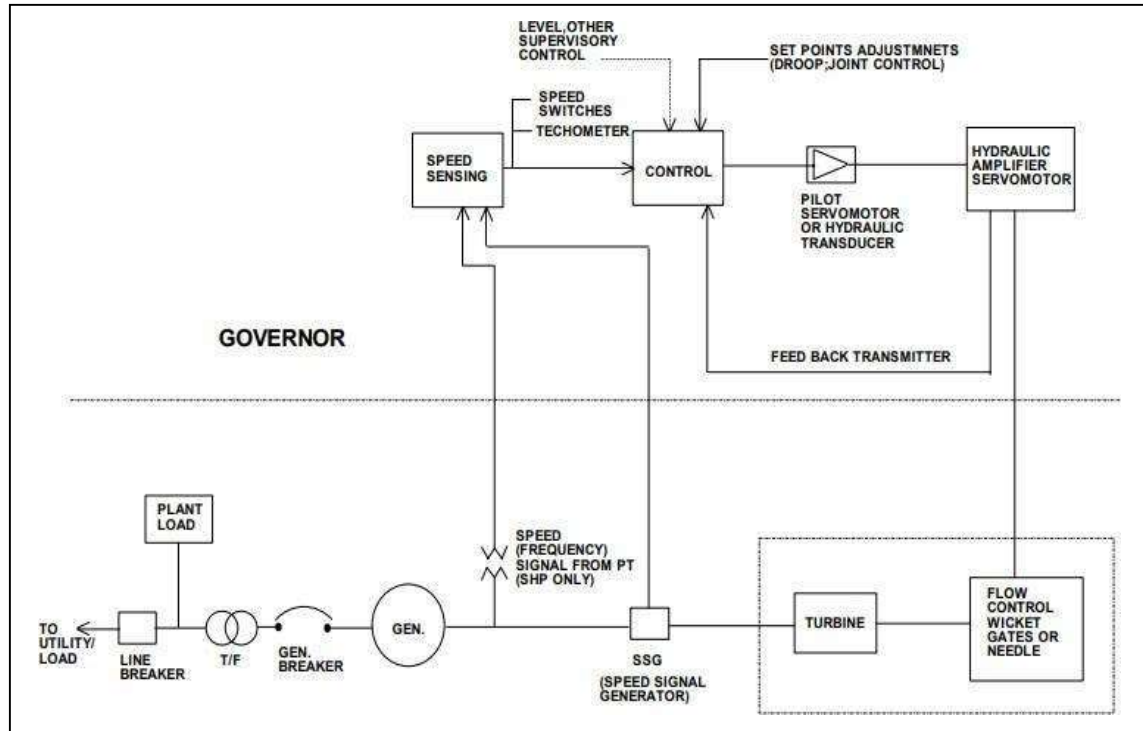
➤ **WPIDHY: Woodward PID Hydro Governor**



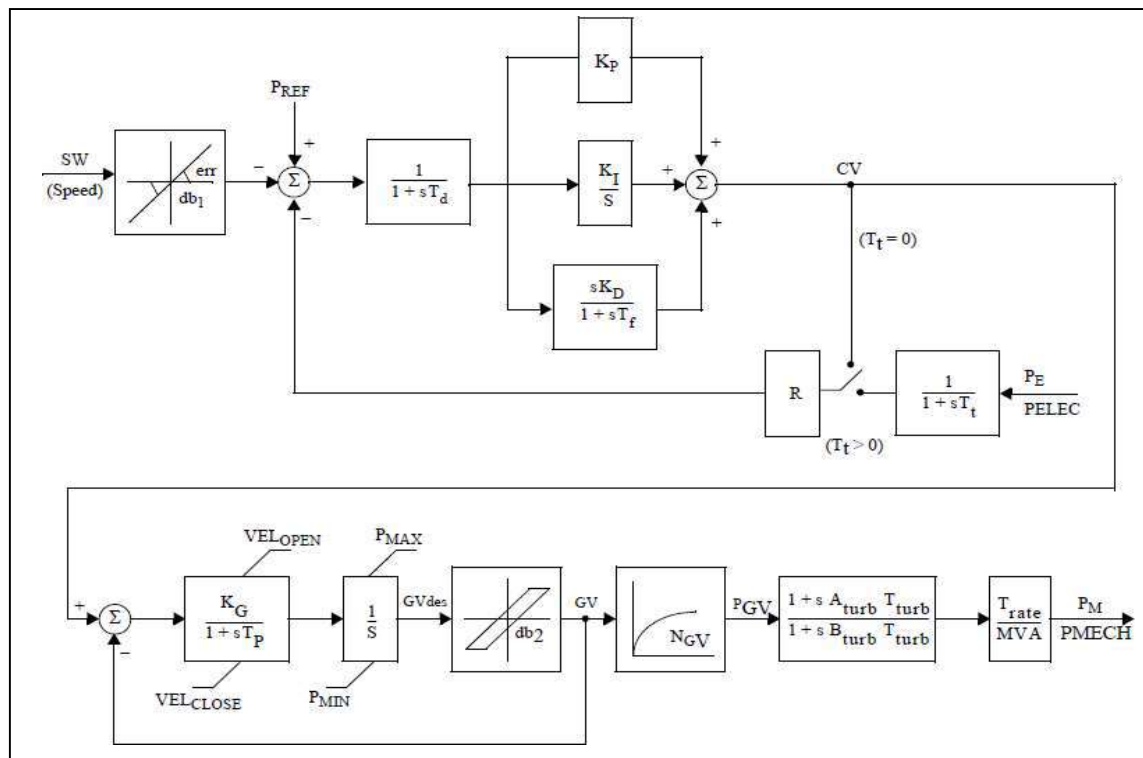
➤ **WSHYDD: WECC Double-Derivative Hydro Governor**



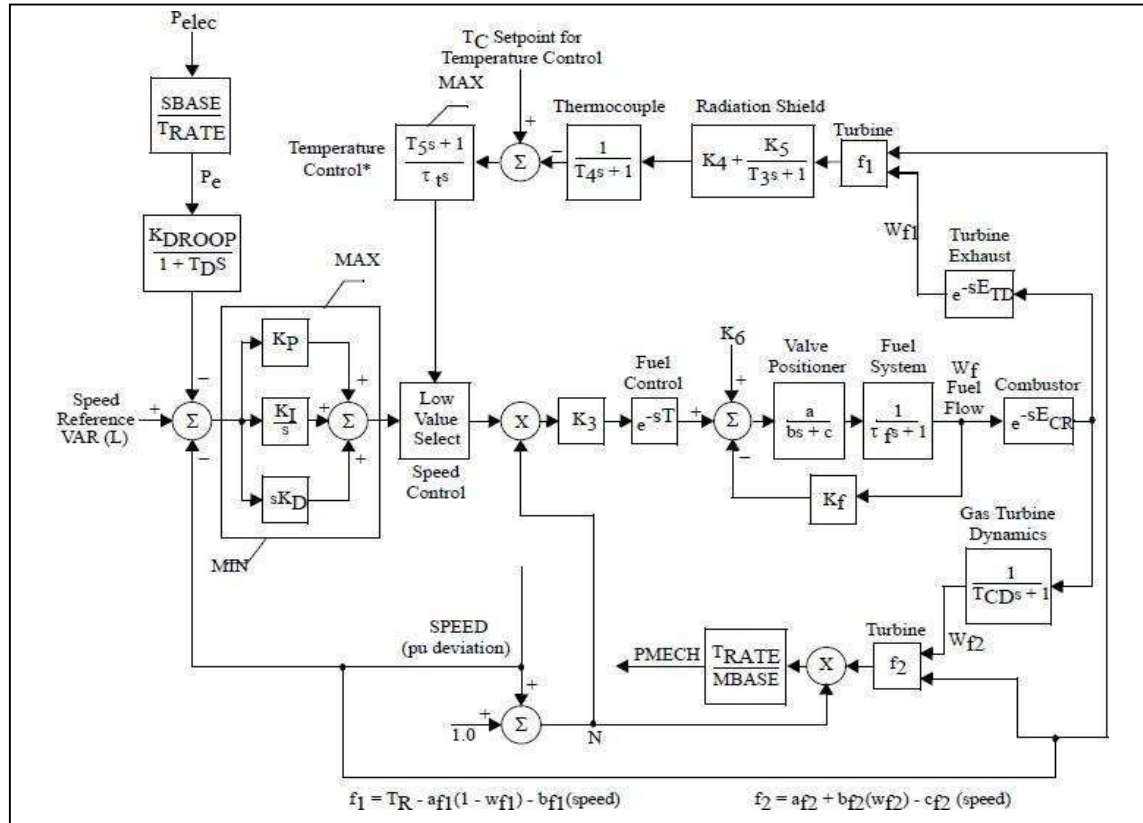
➤ **WSHYGP: WECC GP Hydro Governor Plus Turbine**



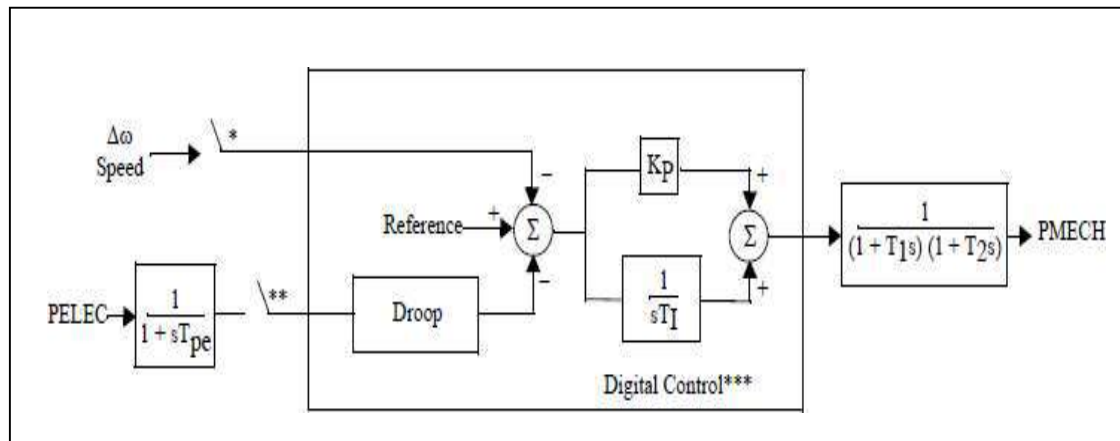
➤ **Governing system - Block Diagram (Typical) as per IEEE std. -75**



➤ **GASTWD: Woodward Gas Turbine-Governor Model**



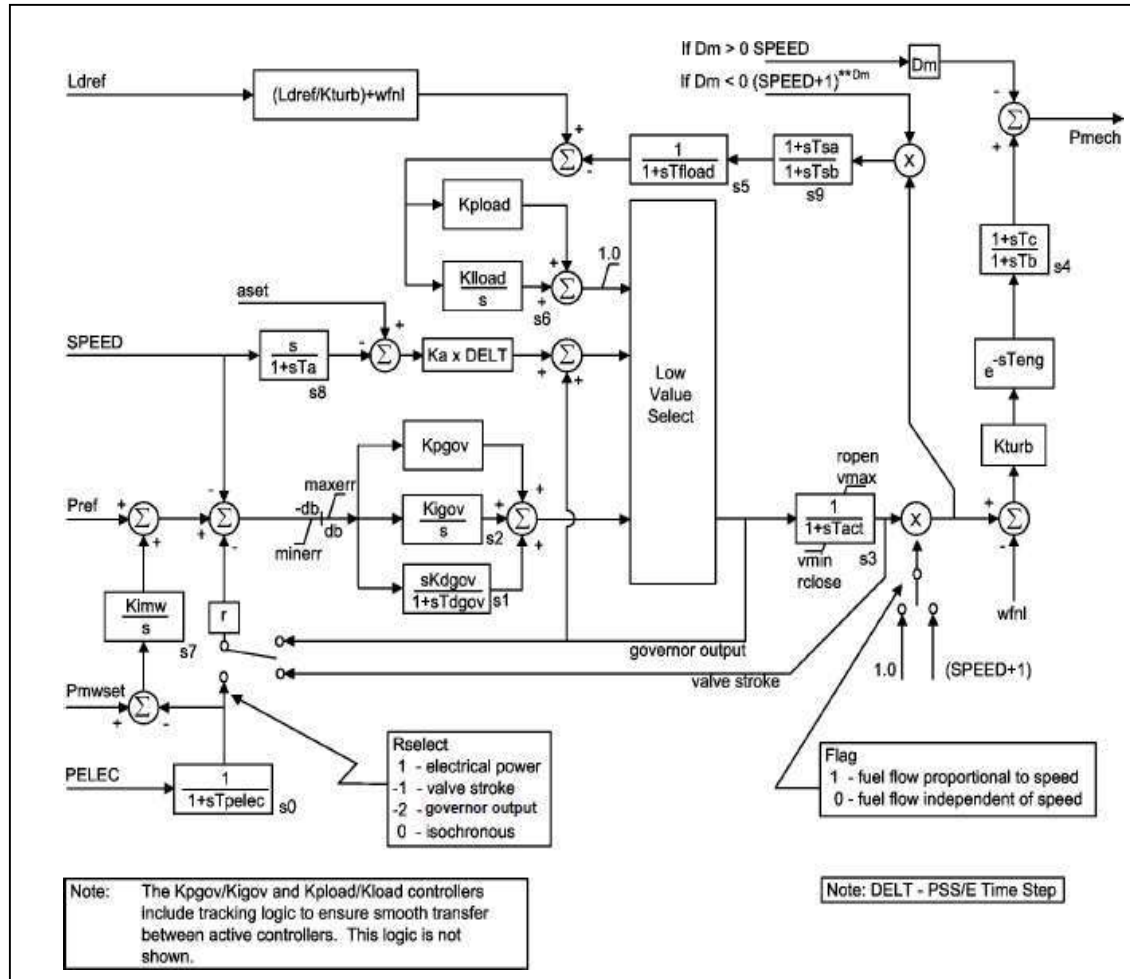
➤ **WESGOV: Westinghouse Digital Governor for Gas Turbine**



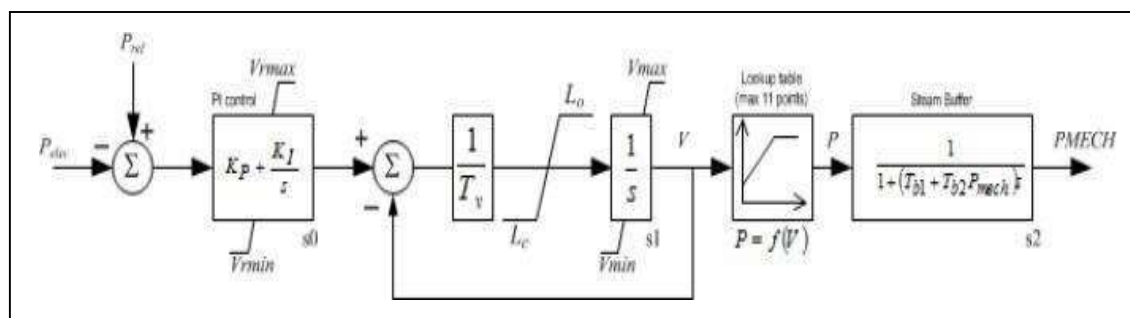
**Sample hold with sample period defined by ΔTC . **Sample hold with sample period defined by ΔTP .*

***Maximum change is limited to ALIM between sampling times.

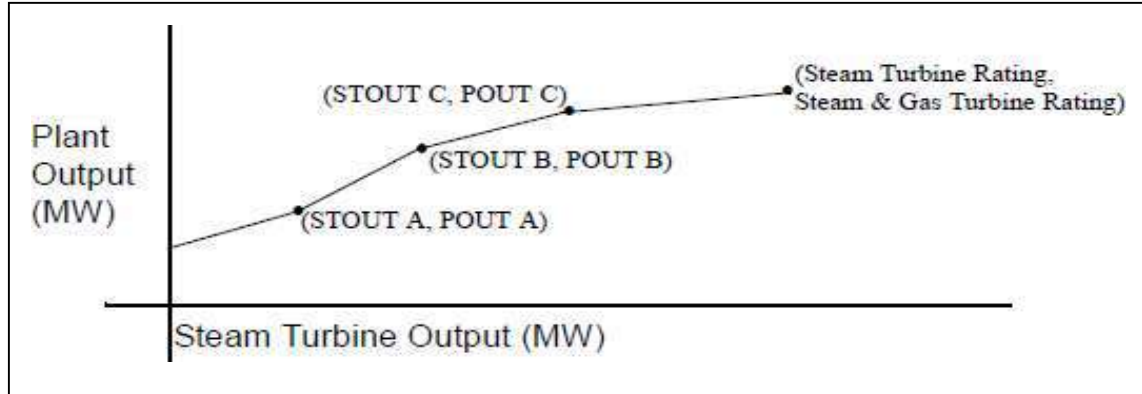
➤ **GGOV1: GE General Governor/Turbine Model**



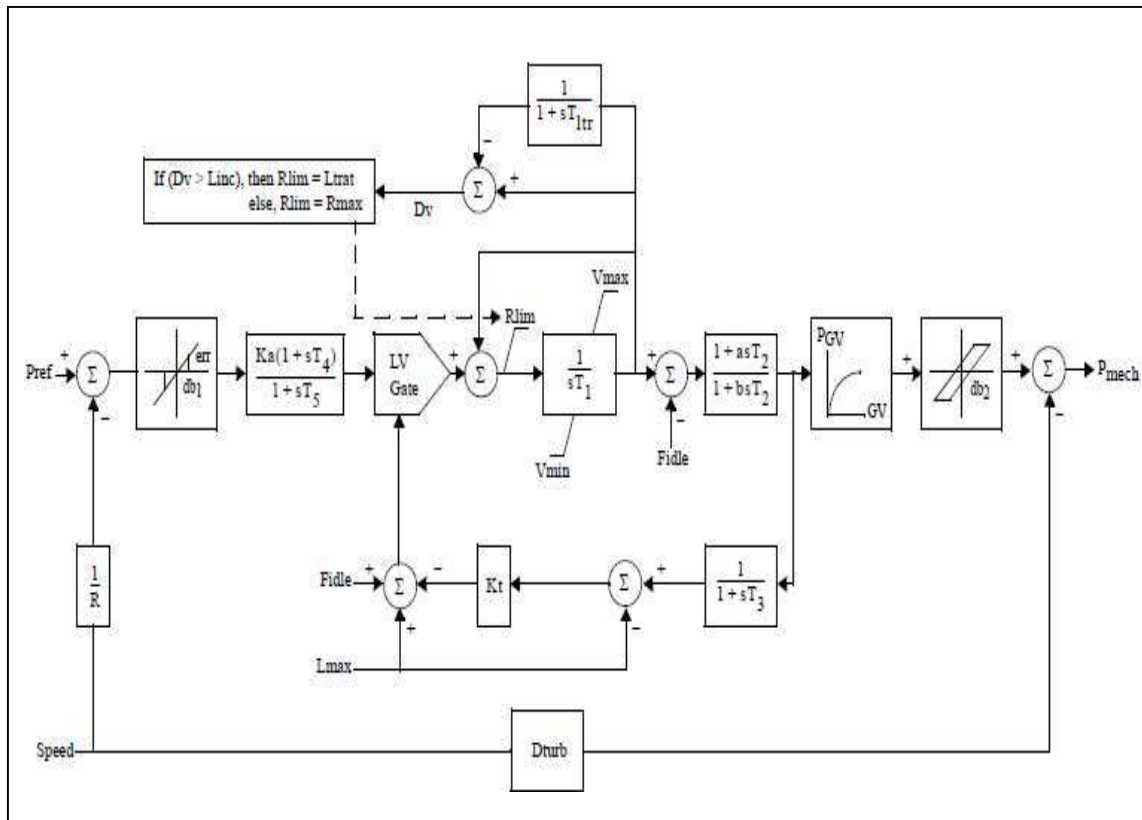
➤ **PWTBD1: Pratt & Whitney Turboden Turbine-Governor Model**



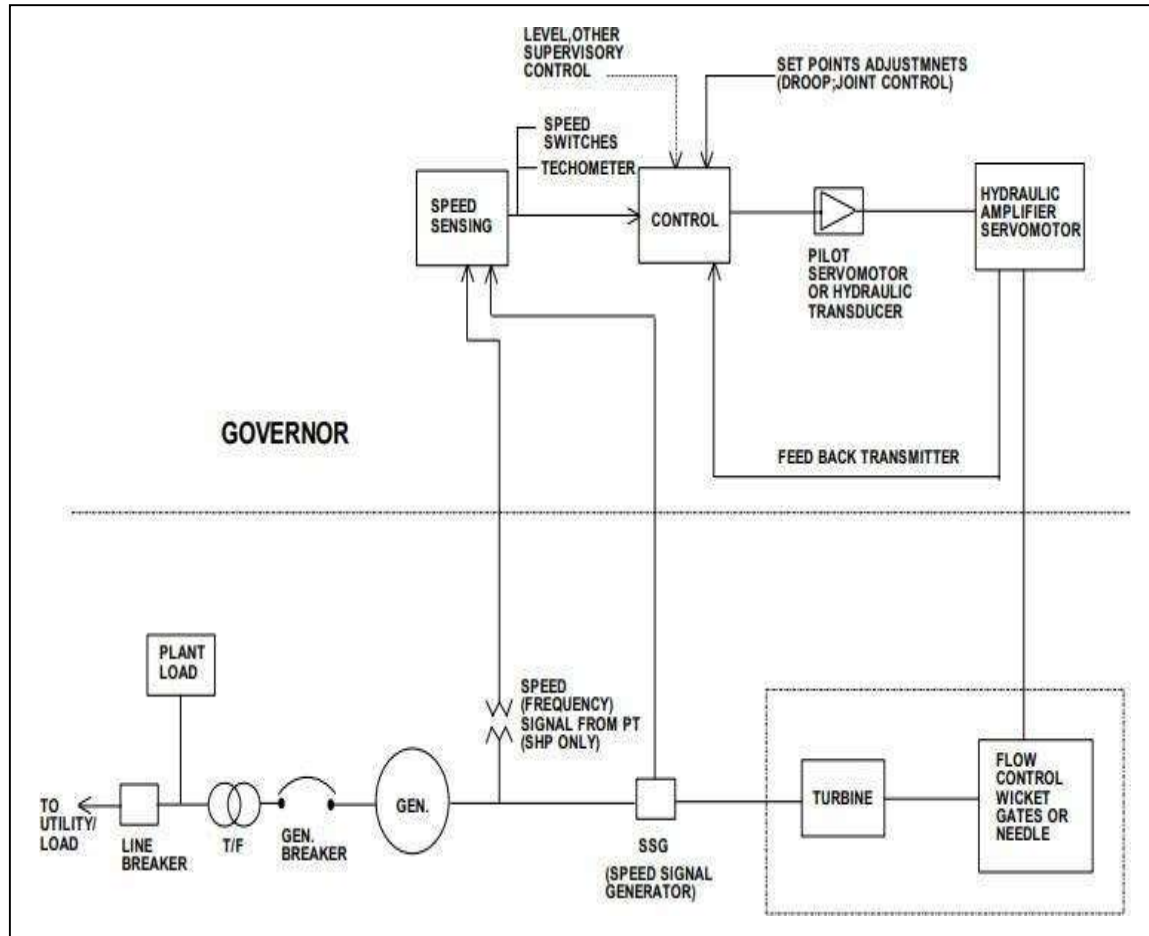
➤ **URCSCT: Combined Cycle on Single Shaft**



➤ **URGS3T: WECC Gas Turbine Model**



➤ **Governing system - Block Diagram (Typical) as per IEEE std. -75**





SUB-SECTION–IIC

CONTROL AND INSTRUMENTATION

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES 		
	CONTROL AND INSTRUMENTATION SYSTEM 1.00.00 GENERAL 1.01.00 The Contractor shall provide all required Control & Instrumentation system for control, monitoring and operation of entire plant including all the systems, equipments etc. covered under various sections of these specification(like Mechanical sections for SG/TG/Auxiliaries/Offsite etc., Electrical sections for Generator/MCC/SWGR/ Transformer etc.), in all regimes of operation in safe and most efficient manner. The Contractor shall also provide all material, equipment and services which may not be specifically stated in the specifications but are required for completeness of the equipment/systems furnished by the Contractor and for meeting the intent and requirements of these specifications. The work shall be consistent with modern power plant practices and shall be in compliance with all applicable codes, standards, guidelines and safety requirements in force on the date of award of the contract. The requirements of statutory Authorities (e.g. MOEF, Inspector of Factories, IBR, TAC, CPCB/SPCB/CERC etc. with regard to various plant areas like main plant, Fuel Oil Plant/System, Chlorinating Plant, Fire-fighting system, Emission & effluent measurements etc.) shall be complied even if not actually spelt out. 1.01.01 Implementation of primary and secondary reserve ancillary services such as FGMO, RGMO, Automatic Generation Control (AGC) or any other requirement stipulated as per the latest Indian Electricity Grid Code (IEGC) issued by Central Electricity Regulatory Commission (CERC) shall be in the scope of contractor. Contractor shall provide all the hardware & software required towards implementation and functioning of primary and secondary reserve ancillary services in consultation with employer. Further, in case CERC issues new guidelines with regards to primary and secondary reserve ancillary services, after detailed engineering and before completion of warranty period of control system, the same shall also be implemented by the Contractor in consultation with employer. Provision of injecting external frequency test signal in control system for primary frequency response testing shall be in the contractor's scope. 1.02.00 The detailed technical specifications are stipulated under various Control and Instrumentation Sub-sections, Part - B, Section-VI of the specification as well as in various other Parts of the Technical Specifications including all annexure, appendixes etc. 1.03.00 Further, Bidder shall also include in his proposal and shall furnish all equipment, devices and services which may not be specifically stated in the specification but are needed for completeness of the equipment/systems furnished by the bidder and for meeting the intent and requirements of the specification. 1.04.00 Where ever in the specification, Bidder's offering as per his "standard and proven practice" are identified to be acceptable, the same shall be accepted(with project/plant specific customisation as necessary) based on the documentary evidence of the reference project/plant indicated in the bid document. Any other reference project, if proposed by the bidder during detailed engineering, shall be strictly as agreed by the employer during detailed engineering. 1.05.00 All electrical devices like switches/ transmitters/ controller/ analyzer/ solenoid valves which are located in the in hazardous areas like hydrogen gas area, seal oil area etc. shall be made		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-II-C CONTROL & INSTRUMENTATION SYSTEM	PAGE 1 OF 19

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES											
1.06.00	intrinsically safe by providing suitable type of transformer isolated barrier / Zener barrier of standard make & shall be provided with explosion proof enclosure suitable for hazardous areas described in National Electric Code (USA), Article 500, Class-I, Division-I or EN60079-14 or shall comply with the essential requirements of ATEX directives.											
	In this package fieldbus-based controls and conventional controls (hardwired 4-20mA/DI/DO) are envisaged. The usage of these two types of controls and devices is indicated below. The distribution of equipment/ devices for both conventional and fieldbus-based controls shall be in various FGs of Control System, complying with Functional Grouping guidelines (Annexure C to this section).											
	1.06.01											
Close Loop controls: For close loop control of following applications of main plant SG/TG/BOP (Auxiliaries of SG and TG), conventional i.e. 4-20 mA / (HART) based actuators along with 4-20 mA(HART) based electronic transmitters (which are directly used in control of final control element), shall be provided. For balance measurements for even these areas/ applications fieldbus-based PT/DPT/TT shall be provided.												
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For balance applications of main plant and for all applications of other areas including offsite areas fieldbus-based control system, fieldbus-based actuators and fieldbus based PT/DPT/TT shall be provided.												
1.06.02	Open loop controls: For open loop control of complete main plant and offsite areas fieldbus-based control system, fieldbus based actuators, Profibus DP based IMC in LV SWGR/MCC and fieldbus based PT/DPT/TT shall be provided excluding applications given in Note-A. Contractor to note that Solenoid operated pneumatic open close actuators, HT/LV SWGR/MCC where IMC is not envisaged and instruments other than PT/DPT/TT envisaged under this package are conventional, i.e. not based on fieldbus system. Hence, in most of the FGs of DDCMIS mix of conventional and fieldbus-based control system is envisaged.											
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES 		
	Notes: A. The control system and devices (Actuators, instruments) shall be conventional for following areas/ application: I. MFT / BPS / BMS comprising of MFT block, Boiler common function block. (Detailed out in clause no 2.01.01, Annexure C to IIC Contract quantity, Part-A) II. TG Integral: a. Steam Turbine and Generator (STG) C&I system as outlined in clause no 2.02.01, Annexure C to IIC Contract quantity, Part-A). b. Protection, governing controls, OLCS and CLCS of Complete TDBFP and its auxiliaries. c. HP/LP Bypass system controls and protection. III. Instruments used for PG test. B. For fieldbus-based instruments, actuators, Profibus DP based IMCs following guidelines shall be followed: a. Actuators which are in main and standby line shall be wired to separate host/ master of FF/Profibus respectively. b. Dual/ Triple redundant PT/DPT/TT shall be wired to separate segments. c. IMCs for redundant (main and standby) equipments shall be wired to separate Profibus DP master. C. Loop Reaction Time (time between field acquisition to field output in control system): a. For Fast Closed loop controls of conventional system (Refer above table), loop reaction time shall be 250ms or better as per process requirement. b. For other Closed loop controls, conventional/ fieldbus based/ mixed, loop reaction time shall be 500 ms or better as per process requirement. c. For Fast Open loop controls of conventional system (synchronization related breakers and Tie/ trip selection), loop reaction time shall be 100ms or better. d. For other Open loop controls, conventional/ fieldbus based/ mixed, loop reaction time shall be 1 Second or better as per process requirement. e. For applications indicated at Note A above, loop reaction time shall be as per process requirement. The above shall be suitably demonstrated by the contractor. D. For Foundation Fieldbus & Profibus PA chicken foot/ branch/ or combination of both topologies shall be provided. For Profibus DP, Bus/ Line topology in Redundant mode shall be provided. That is, for Profibus DP redundant cables connected to redundant ports of devices shall be provided. For IMC redundant cable shall be provided up to Y Link.		
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	Specific approval of Employer shall be taken before finalization of protocol of Fieldbus for each DDCMIS and for the fieldbus based equipments being connected to each DDCMIS like PT/DPT/TT, actuators and positioner. Further, the grounding scheme of fieldbus system shall be as recommended by FF/ Profibus standards and Contractor shall submit the detailed scheme at the start of engineering for Employer's approval. E. The design of control system cabinets with fieldbus components shall be finalized during detailed engineering stage and various requirements specified for DDCMIS cabinets in Part-B of this specification will not apply. Also refer Annexure IIIC-02F for fieldbus components. F. Contractor shall provide Configuration/ Diagnostic tools for fieldbus (FF/ Profibus) network/ devices as below: • Configuration/ diagnostic tool (if applicable) for non-intrusive actuators - 5 Nos. or 5% of total quantity of actuator whichever is more. • Configuration/ diagnostic tool for all Foundation Fieldbus based instruments – 2 Nos of each make. • Configuration/ diagnostic tool for Profibus network like Profitrace/ Profibus modem – 2 nos. per DDCMIS. Contractor shall provide all required software (lifetime licensed) and hardware (cables/ connectors, Tablet/ Laptop etc.) along with these tools. G. Twisted pair with round steel wired armour (SWA), Type A fieldbus cable complying to IEC 61158 (detailed Specification as per PART-B), SS JB's with IP-66 and accessories for fieldbus based instruments and actuators shall be provided by the contractor under this package. H. In this project Profibus DP based IMC is envisaged (refer Electrical Section) which is to be interfaced to the fieldbus based DDCMIS on Profibus DP protocol. The complete monitoring and control along with detailed diagnostics of IMC shall be provided by the contractor. Detailed technical design guidelines have been included in IIIC-02K: Guidelines for Fieldbus System. I. For IMC interface with DDCMIS, redundant master with redundant trunk cable up to Y Link shall be provided. From Y link, IMC modules shall be connected with single cable in daisy chain. All the Profibus DP cables (trunk cable from the Profibus DP masters to Y-link and the looping cables from the Y-links to the IMC modules) are in the scope of Contractor. The Profibus cables shall be neatly dressed & connected on MCC Modules in MCC/SWGR rooms. J. Y link along with OLM modules shall be installed in separate cabinet(s) in in MCC room (Non-AC) for main plant. For other areas where RIO rooms are envisaged, Y-link along with OLM modules shall be installed either in DDCMIS cabinets or in separate cabinets, located in RIO room. K. In case Y links are installed in MCC room, then redundant Fiber optic links using OLMs (Optical Link Modules) in redundant bus configuration shall be provided. L. A standalone DDCMIS cabinet shall be supplied, installed and commissioned by the vendor in CER (One no. for each Unit) for Training and Testing purpose which shall			
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	include a minimalistic configuration representative of the comprehensive fieldbus (Profibus and Foundation fieldbus both) based system being supplied by the vendor. The panel shall be complete in itself enabling the Employer to perform testing, hands on training and offline configuration of related fieldbus system modules. M. For High torque (> 1000 Nm) electric actuators: Contractor may propose non-intrusive fieldbus electrical actuators without SIL2 certification. The detailed reasoning and justification for proposed type of actuators shall be furnished by Contractor at the start of detailed engineering. This shall be reviewed & discussed with Contractor and after Employer's approval, the alternate type of non-intrusive actuators can be provided by the Contractor.			
1.06.03	The redundancy in sensor, cable, control system component, power supply system component shall be designed by the Contractor to ensure that malfunction of any single sensor/ cable / Control system component/ power supply system component etc. shall not lead to loss of any Major Auxiliary (all HT Drives and Critical LT drives) or loss of Generation or loss of control function or loss of protection function.			
1.07.00	System Software Requirements 1. The Contractor shall provide licensed softwares for all the systems envisaged under this package for meeting the intent, functional, parametric and performance requirements of the specification. 2. All licenses shall be valid for the continuous service life of the plant. The software licenses shall be provided for the project (e.g., organization or site license) and shall not be hardware /machine-specific, except the operating system licenses, in the event of non-machine specific license not being supported by the operating system supplier. Necessary documentary evidence to establish the same shall be submitted by the Contractor. 3. As a customer support, the Contractor shall periodically inform and upgrade the Anti-Virus/ software of the workstations/servers/switches/firewall till completion of the warranty period and till completion of the AMS period. Contractor shall also periodically provide list of qualified operating system patches/ service packs and software patches of other third-party software (Like Office, Adobe etc. as applicable, except antivirus) for use on its system during the continuous service life of the plant, subject to availability of the same by the manufacturer of the software. 4. As a customer support, the Contractor should periodically inform and provide Software /firmware fixes/patches for bugs, deficiencies, security vulnerability (including those reported in US-CERT, CERT of the country of origin of software, CERT of respective software OEM), till continuous service life of the plant.			
2.00.00	DISTRIBUTED DIGITAL CONTROL, MONITORING & INFORMATION SYSTEM (DDCMIS)			
2.01.00	Latest state of the art microprocessor based Distributed Digital Control, Monitoring & Information System (DDCMIS) shall be provided comprising of the following as a minimum and meeting all requirements specified under Sub-section IIIC-02 DDCMIS of Part -B, Section-VI of Technical Specification and the following annexure of this subsection: For Messaging system, wireless link and Remote Service Centre connectivity (for each type of DDCMIS) the fixed cost (e.g. service provider charges & its equipment etc.) and running cost till warranty period shall be included in the Quoted Price. The running cost thereafter shall be included in the AMS price for the total duration of AMS, i.e. three years.			
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2.02.00	The DDCMIS system to be provided for this project shall be as follows: <table border="1"> <thead> <tr> <th>S.No.</th><th>DDCMIS</th><th>Quantity</th><th>Location of Control system Panels & HMI Servers</th><th>Operating location</th></tr> </thead> <tbody> <tr> <td>1</td><td>Unit DDCMIS consisting of SG, TG & BOP</td><td>1 Set/Unit</td><td>Unit CER / Programmer room</td><td>CCR</td></tr> <tr> <td>2</td><td>Standalone DDCMIS</td><td>1 Set common for all Units</td><td>Respective CER/RIOS</td><td>Centralized Offsite CR</td></tr> <tr> <td>3</td><td>Water system DDCMIS</td><td>1 Set common for all Units</td><td>Respective CER/RIOS</td><td>Centralized Offsite CR</td></tr> <tr> <td>4</td><td>AHP DDCMIS</td><td>1 Set common for all Units</td><td>Respective CER/RIOS</td><td>Centralized Offsite CR</td></tr> <tr> <td>5</td><td>FGD DDCMIS</td><td>1 Set common for all Units</td><td>Respective CER/RIOS</td><td>Centralized Offsite CR & FGD CR</td></tr> <tr> <td>6</td><td>CHP DDCMIS</td><td>1 Set common for all Units</td><td>Respective CER/RIOS</td><td>CHP CR</td></tr> <tr> <td>7</td><td>FOPH DDCMIS</td><td>1 Set common for all Units</td><td>FOPH CR</td><td>FOPH CR & CCR</td></tr> <tr> <td>9</td><td>Switchgear DDCMIS</td><td>1 Set common for all Units</td><td>Unit CER</td><td>Monitoring in all DDCMIS</td></tr> </tbody> </table> Remote IO's (RIOS) are envisaged for systems (2) to (8) above, which will be finalized during detailed engineering stage. Exact location of CER/RIOS for respective areas shall be finalized during detailed engineering. For CHP DDCMIS, necessary signal exchange with Employer's existing stage-I CHP DDCMIS system shall also be in Contractor's scope. For this signal exchange, the number of I/Os shall be considered as DI: 32 DO: 16 AI:8 AO:8. The exact scheme shall be finalized during detail engineering. Employer's stage-I CHP DCS/RIO panel shall be the terminal point. All necessary hardware/ logic modifications/ upgradation, as required at Employer's existing system shall be in Employer's scope. Also refer clause no 9.00.00 of this subsection for systems not covered above.				S.No.	DDCMIS	Quantity	Location of Control system Panels & HMI Servers	Operating location	1	Unit DDCMIS consisting of SG, TG & BOP	1 Set/Unit	Unit CER / Programmer room	CCR	2	Standalone DDCMIS	1 Set common for all Units	Respective CER/RIOS	Centralized Offsite CR	3	Water system DDCMIS	1 Set common for all Units	Respective CER/RIOS	Centralized Offsite CR	4	AHP DDCMIS	1 Set common for all Units	Respective CER/RIOS	Centralized Offsite CR	5	FGD DDCMIS	1 Set common for all Units	Respective CER/RIOS	Centralized Offsite CR & FGD CR	6	CHP DDCMIS	1 Set common for all Units	Respective CER/RIOS	CHP CR	7	FOPH DDCMIS	1 Set common for all Units	FOPH CR	FOPH CR & CCR	9	Switchgear DDCMIS	1 Set common for all Units	Unit CER	Monitoring in all DDCMIS
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9	Switchgear DDCMIS	1 Set common for all Units	Unit CER	Monitoring in all DDCMIS																																													
2.03.02	Same make DDCMIS is to be provided for all DDCMIS systems indicated above including control system for SG, TG & BOP systems of Unit DDCMIS defined above.																																																
2.03.03	The functional grouping of the above systems shall be as per the guidelines given in Annexures of this sub section, part A																																																
2.03.05	The Contractor shall provide integrated HART system for all DDCMIS for centralized configuration, maintenance, diagnosis & recordkeeping for all electronic transmitters, control valves & analyzers with HART protocol. DDCMIS AI (4-20 mA) cards shall be HART enabled. Separate HART system is not acceptable. In case on line programming HART Management System is not allowed for the Instruments/Devices that are being offered as a part of standard and proven instrumentation system for STG Integral control System and BFPT Protection and Governing system, as defined in ANNEXURE TO this sub section, IIC, Part A , Section VI, then contractor's standard and proven practice shall be acceptable.																																																
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES			
2.03.06	Advanced Process Control solution for Flexible Operation, Combustion Optimization and Soot Blowing Optimization 1. The APC solution to include as a minimum following solution. Further, any other advanced process control software solution required to meet the functional requirements of specification (specified elsewhere) are also to be provided. i. Combustion Optimization –Combustion optimization of boiler while maintaining flame stability, CO limits and rated parameters of SH steam temperature, RH steam temperature and avoiding metal temperature excursions. ii. Soot Blowing Optimization – Optimization of operation of Soot blowers (wall blower, long range and APH). iii. Faster load Ramp up/Ramp Down – To achieve faster ramp rates, through the development of advanced models of the Boiler response characteristics, while maintaining the rated parameters of MS pressure, SH steam temperature and RH steam temperature. APC for main steam pressure control loop for achieving tighter throttle pressure and temperature control during load changes iv. SH/RH Temperature Excursion Reduction - Temperature variations during load change and unit disturbances shall be regulated through the development of advanced models of the steam temperature processes while maintaining limits on SH & RH metal temperatures. APC for SH/RH spray control loop for achieving tighter steam temperature controls during unit disturbances. Advanced Process Control (APC) shall mean the set of techniques which use a multiple input multiple output state space predictive model in time domain for improving the performance of the control loops w.r.t the desired objective (i.e. efficiency improvement or emissions reduction etc.). The actual process model can be first principles based, empirical or ANN (artificial neural network) or machine learning or fuzzy logic based, or fast and robust dynamic matrix control based considering large non-linearities in the power plant processes. APC shall create a highly-fidelity actual process model which would learn the trend of fluctuations in the installation process by applying different values to multiple parameters. The APC shall use the actual process model ,estimation methodology with iterative and finite horizon optimization of plant model and current plant measurements to calculate the real-time prediction of process values utilizing the pre-trained process model reducing the prediction error and shall work in the feedforward mode with the classical P/PI/PID controllers			
2.04.00	Human - Machine Interface & Plant Information System (HMIPIS)			
2.04.01	HMIPIS based on latest supported operating system (OS) platform and configured around latest state-of-the art servers/Workstations with open architecture supporting OPC/TCP/IP protocols, etc. shall be provided.			
2.04.02	Cross HMI operation is applicable. Drives of a particular DDCMIS system shall also be possible to be operated from any other DDCMIS system via Station LAN as per requirement, including display of switchgear DDCMIS data in all other DDCMIS systems, using cross HMI operation through authorized access.			
2.04.03	The HMIPIS shall include			
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	i. OWS: 6 Operator Workstations (OWS) per unit (1 SG, 1 TG, 3 BOP, 1 UID), 17 OWS for common (1 SAC, 4 WS in centralized offsite CR, 6 AHP (4 in centralized offsite CR, 1 in ASH SILO, 1 in AWRS), 2 CHP, 2 FGD in centralized offsite CR, 2 FGD in FGD CR) ii. LVS and LVS workstation: 8 LVS OWS per unit, 16 LVS OWS for common (4 AHP, 4 WS, 4 CHP, 4 FGD), 26 LVS (10 per Unit, 4 AHP, 4 WS, 4 CHP, 4 FGD) iii. Server: 2 no. Server cum Information workstation in redundant mode for each DDCMIS domain iv. Programmer cum documentation station: 13 Programmer cum documentation station (3 per unit, 10 for common (1 SAC, 2 WS (1 centralized offsite CR & 1 local), 2 AHP (1 centralized offsite CR & 1 local), 1 CHP, 1 FOPH, 2 FGD (1 centralized offsite CR & 1 local), 1 SWGR)) v. GIU: 28 Graphical interface units (GIU) (1 per unit, 11 SAC, 13 WS, 2 AHP, 1 FOPH, exact location to be decided during detail engineering) vi. Printer: heavy duty printers (A4 printer (1 per unit, 1 CHP, 1 FGD), Line impact printer (1 per unit, 1 CHP), A3 printer (1 unit, 1 CHP)), associated network devices vii. PC station: 8 No. PC stations (3 per unit (Programmer, HART, C&I shift maintenance), 2 for SWAS, 1 for O&E, 2 for Head of station) The LVS OWS and OWS Keyboard and Mouse are to be multiplexed through KVM switches in Control Rooms. Additionally, 6 nos. Keyboard, Mouse and Monitor are to be provided with Redundant KVM Matrix Switch solution for Programmer rooms. The above item and quantity are minimum. Additional HMI/PC items / quantity if any required, other than those indicated above, for achieving the complete DDCMIS functionality, shall also be in the scope of the Contractor. 2.04.04 Redundant LAN for communication between various OWS, between OWS and processing stations and OWS/PC. A redundant station-wide LAN for connecting the unit and other sub systems of DDCMIS, PLCs (as applicable), PC stations etc. as well for connecting to the other off-line services of the Station & connecting to IT LAN. This shall include all cables and accessories required for connecting Contractor's system up to the Employer's systems such as ERP etc. Alternatively, Bidder's standard & proven solution, which is functionally equivalent to redundant system bus and single fault tolerant, shall be acceptable. This shall also include all cables and accessories required for connecting Switchgear DDCMIS to Switch Gear Relay Network L3 Switches. 2.04.05 Wireless Link: For the following system identified below, Bidder shall consider wireless link: 1. Between CHP stacker reclaimer PLC and station LAN (In case during detail engineering it is found that Line of sight is not available for direct connectivity of CHP stacker reclaimer system & Station LAN on wireless, Stacker reclaimer shall be connected on wireless to a standalone switch (not connected to CHP DCS) in CHP control room & from there a separate link (other than link for CHP DCS to Station LAN for HMI/DCS connectivity) based on OFC connectivity to Station LAN shall be provided. Wireless connectivity between Stacker Reclaimer PLC and Station LAN is to be redundant. Other wireless links are non-redundant. The Wireless connectivity solution shall be based upon WPA3 security/AES 256 encryption complying with the requirements related to the used of wireless in the automation solution as per IEC 62443-2-4. Bidder shall include all necessary equipments including towers and its foundation on both sides and all licenses, statutory clearances in his scope. The fixed charge and the running cost till		
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2.04.06	warranty period shall be included in the quoted price. The running cost thereafter shall be included in the AMS price for the duration of AMS. If it is required that the licenses are in the name of Employer, being the owner of the premises, still all coordination, clearances and applicable fees shall be in Bidder's scope. Requirements of Station LAN architecture For interconnection of DDCMIS to Employer's enterprise LAN, a completely redundant fault tolerant high availability cyber secured architecture is to be designed and implemented by the bidder. This secured architecture shall apply multiple countermeasures in a layered or stepwise manner through defense in depth approach. It shall consider physical security, policy and procedures, zones and conduits, malware prevention, access control, monitoring & detection, and patching. The architecture shall have several zones and conduits based upon logical, physical boundaries, safety designation and accountability. The DDCMIS data shall be made available to enterprise LAN through two sets of different make redundant firewall pair in fail-safe configuration with Intrusion prevention system (IPS) (with one pair of firewall) via redundant Station LAN servers placed in the De-militarized zone (DMZ). The architecture shall comprise of redundant layer-3 and secondary switches as per the requirement of networking and security features. All DDCMIS domains shall be connected to a station wide Ethernet Redundant LAN (Station LAN). No traffic shall pass directly between the Enterprise network & the DDCMIS network, even though the firewall. All such traffic must be terminated or initiated at the DMZ. i.e. Data required for all external applications including plant PC network, PLCs (as applicable) and other external systems shall be provided from the DMZ zone through the firewalls & such data shall be populated in the DMZ servers from the different DDCMIS systems again through the firewalls. The traffic from DMZ to Enterprise LAN should be uni-directional. The cyber secured remote service center connectivity for DDCMIS shall also be considered within this architecture. Time synchronization shall also be done through this redundant architecture for all network components, DMZ and external devices (if applicable). Refer Annexure C to this subsection for signal interface to Station LAN. For monitoring of DDCMIS network traffic, Intrusion Detection system (IDS) (in redundant mode) of a make different from that of the IPS shall be provided to guard against possible misuse/attacks from within the LAN. For monitoring the overall architecture traffic flow, all network activities, network devices, dashboarding (as specified in Part-B NMS specification) a management LAN with NMS server is to be provided by the bidder. The cyber secured architecture for the above requirement shall be designed complying all the requirements of IEC 62443-2-1, IEC 62443-2-4 and IEC 62443-3-3 standards. In order to test the Operating system patches/hot fixes & also other periodic software upgrades, a test server of the same configuration as the servers provided in HMI will be provided. All periodic upgrades/hot fixes/patches are intended to be checked on the test server before its installation in the main machines.		
2.04.07	DDCMIS vendor shall upgrade/ update all DDCMIS system along with Station LAN to the latest version/ release of DDCMIS system software/ patches, meeting the system software requirements as mentioned in Part-B, SUB-SECTION-IIIC-02 DDCMIS. This shall include the latest OS and its corresponding latest version/ release of DDCMIS system software/ patches. The upgrade/update shall be checked for and carried out six months before the completion of AMS of last DDCMIS (whose AMS started last). Any change in hardware and the requisite services (Engineering/Erection/Commissioning/Documentation) required for the same shall also be carried out by the contractor within the contract price.		
2.04.08	DDCMIS vendor has to implement centralized Cyber Security suite comprising of centralized policy-based Account Management with Active Directory (AD) & Role based Access control (RBAC), Windows server update service (WSUS), System Hardening, Patch management with remote service, antivirus and malware protection, Asset Inventory and Anomaly Analysis		
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	dashboard, gap analysis with respect to latest Cyber security standards and Security Information/ incident and Event Management (SIEM) functionality & dashboard. Contractor has to implement log repository solution for native DDCMIS network architecture and its underlying ICS components (including System logs, Security logs, Windows event logs, Error logs, Network logs, End points logs) for all domains having capacity of storage for a minimum period of one Year. The solution shall also include a backup server which will maintain the integrity and availability of all backups including logs even in case of non-availability or compromise of the main system. The hardware resources for indicated functionalities shall be as per DDCMIS vendor's validation. The cyber security suite is to be designed and implemented in a separate DMZ (other than the Station LAN DMZ) identified as I-DMZ (Industrial DMZ). The I-DMZ shall comply to defense-in depth architecture with secured internal connectivity to DDCMIS over Station LAN switch through redundant firewall pair in failsafe configuration with Intrusion prevention system (IPS). The I-DMZ will have no external connection. Subscription, whitelist/Antivirus, system hardening, patches or any other periodic updates shall be acquired in a centralized station connected to Employer's enterprise internet gateway. The updates will be stored in a dedicated, sanitised storage media and manually deployed in concerned resources of I-DMZ. The centralized station, storage media and sanitization kiosk shall be in the scope of contractor. The coverage of the solution shall be Station LAN and HMIPIS of the DDCMIS. Yearly subscription charges for cyber security suite till warranty period and 3 years after warranty shall be included in the quoted price. 2.04.09 The system shall comply with the latest versions of the following standards and specifications as a minimum: 1. IEC-62443-4-2 Security for industrial automation and control systems - Part 4-2: Technical security requirements for IACS components. 2. IEC 62443-2-4:2015 Security for industrial automation and control systems - Part 2-4: Security program requirements for IACS service providers. 2.04.10 The DDCMIS OEM shall ensure sanctity of the application software & firmware before the same is dispatch to site. The intent is to have a mechanism to verify that the application software & firmware (excluding third party software) does not contain any malicious code or otherwise is not operating contrary to its stated purpose. The verification needs to be carried out electronically using one of the following methods: (i) Digital Certificates (ii) Digital Signatures (iii) Dongle based authentication/verification - Software licenses provided through dongles shall not be accepted as verification for the purpose. (iv) Other electronics means of verification as agreed and accepted by the Employer during detailed engineering. The same shall be carried out at the time of FAT of each DDCMIS and on every software & firmware upgrade, update and patch application. This shall be applicable and performed for all types of application software & firmware applicable for a particular DDCMIS. Other details/procedure/modalities, as applicable, shall be finalized during detailed engineering. The DDCMIS OEM shall also be required to certify that no backdoor has been engineered in the application software and firmware (including the control hardware excluding Bought outs) being supplied for the project. Such certificate shall be furnished for all batches of hardware (including firmware)/software manufactured and supplied for the project by the DDCMIS OEM.		
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2.04.11	The connectivity of Switchgear Relay Network (as detailed in Section VI, Part-B Sub Section B-05(b) MV SWGR-Protections, Control & Metering) with Switchgear DDCMIS, via Firewall with IDS (as mentioned above)-		
2.05.00	Master & Slave Clock System		
2.05.01	One Geo-positionary satellite (GPS) based Master Clock in redundant configuration and slave clocks for unit and offsite areas shall be provided with suitable equipment including antenna, receiver and associated electronics to receive synchronization signals from GPS. The master clock shall synchronize DDCMIS of all the units and stand-alone common system and other DDCMIS subsystems at suitable intervals to maintain uniform time throughout the power station. The clock system shall be date insensitive. The system should have 10% additional spare ports of each type being used for time synchronization of contractor's system. Eleven (11) no. of slave clocks per unit and twelve (12) no. slave clock for common area shall be provided.		
2.06.00	Contractor to provide 5 nos. Fine pitch LED display (1 for Main plant gate & 4 for locations to be finalized during detail engineering) for outdoor application and 5 nos. Indoor LED television (locations to be finalized during detail engineering). These displays shall communicate information & guidance about environment, Advisory from Management, Generation data (station wise/unit wise), Business Diversification Information, CSR Activities, safety advisories, Movie on Company's Journey & Awards and Recognitions etc. Additionally, 3 nos. Interactive display board shall also be provided for conference rooms. The exact location of these displays will be finalized during detail engineering. These display units shall be connected to Employer's Enterprise LAN and shall have no connection with DDCMIS network/Station LAN.		
3.00.00	MAIN EQUIPMENT RELATED CONTROL & INSTRUMENTATION SYSTEM		
3.01.00	Special C&I systems shall be provided by bidder including but not limited to the following as a minimum. The detail specification shall be as per QSGM's / QSTGM's / Bidder's standard and proven practice. All these systems shall be connected to respective DDCMIS system for control and monitoring purpose. Flame Monitoring System and flame detector testing kit, Microprocessor based control system for Coal Feeder, Coal Bunker Level Monitoring System, Electromatic Safety Relief Valve (ERV)/ Electromatic Safety Ball Valve (EBV), Furnace temperature probes (Two numbers per boiler), Acoustic Steam Leak Detection System (Thirty number of sensors per boiler), Furnace and Flame Viewing System (Two numbers of cameras per boiler shall be connected to LVS), Driplegs Level measurement employing conductivity type probes, Mill & Air heater Fire Detection System. Turbine supervisory system (TSS) along with Vibration Analysis system for main turbine, BFP Drive turbine & Turbine Driven BFP, TSE, Auto synchronizer for Turbo-Generator, Load Transducers. Integrated monitoring of bottom ash evacuation system: 1) Contractor shall develop and implement a mimic in UNIT-BOP DDCMIS and AHP DDCMIS for integrated monitoring of bottom ash evacuation system including deashing status and relevant alarms as minimum.		
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES			
3.02.00	2) Cameras (as specified in clause F 3.00.00, Annexure C to this Sub section) shall be used to monitor ash accumulation above furnace S-panel area and in bottom ash hoppers.			
	Ash Dashboard Contractor shall provide Ash dashboard in AHP DDCMIS for the complete ash handling system which displays the following, using sensors/instruments specified in tender drawings/ elsewhere in this specification. For details contractor to refer part-B.			
3.03.00	Water Balance Dashboard Suitable displays/dash boards are to be generated in WS DDCMIS for indicating total water consumption of the plant and for indicating further break down of this total water consumption into consumption of various plant areas. Additional flow measurements (other than those indicated in the tender P&IDs/water balance diagram), if any required, for achieving the above functionality shall also be in the scope of the Contractor.			
4.00.00	MEASURING INSTRUMENTS (PRIMARY AND SECONDARY) The Following Shall Be Provided as Minimum Meeting Specification Requirements Of Sub-Section – Measuring Instruments Of Part-B, Section-VI Of Technical Specification.			
	(a)	All the primary Instruments shall be provided on as required basis meeting functional redundancy, availability and reliability requirements of the specification subject to minimum quantities as indicated in enclosed tender drawings/ BOQ, corresponding Mechanical / Electrical sections.		
	(b)	All Instruments which are Integral to equipment like pumps, motors etc. / skid mounted instruments and are not indicated in enclosed drawings (as applicable) or in BOQ etc. included in relevant sub-sections, but are required for control, monitoring and operation of the equipment/plant/ Systems are to be provided by the Contractor to meet actual system requirements. Specification / type of instruments shall be as per standard and proven practice of equipment supplier.		
	(c)	Contractor to provide triple redundant sensors (Limit switches) for the status of manual Gates/ Valves to be implemented in 2oo3 configuration being used in protection of critical drives (BFP and CEP).		
	(d)	Temperature transmitters		
		Rail mounted/ Rack mounted (Dual input Field mounted temperature transmitters)/ Field Bus Compatible temperature transmitters for temperature elements (for all the temperature elements being procured by the contractor) are to be provided by the contractor as per the followings		
	i	In case of multiple measurements of temperature for any application, resulting in trip / protection, where logic implementation tolerates failure of one TE (e.g. 2v3, 2v4 etc.), for only one of the TE, dual TT is to be provided- For other applications, if usages of dual input TTs is recommended by the equipment manufacturers, the same shall also be acceptable. The exact applications for which this type of transmitter to be provided shall be finalized during detail engineering. Remaining temperature transmitters in main plant and auxiliary plant areas are to be Single Input field mounted type. These TTs shall be mounted as defined in subsection IIC-04, PART-B & tender drawing part-E of the specifications. The selection of type of TT (4-20mA or Fieldbus) shall be as per clause no. 1.06.00, Sub Section IIC, Part-A Section VI.		
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES			
		ii	For monitoring signals of Boiler SH/RH metal temperature & Generator Core/ Slot temperature measurements Profibus / Foundation Field Bus Compatible temperature transmitters / Wireless temperature transmitters are acceptable. For Generator Core/ Slot temperature measurements, Modbus connectivity to DDCMIS is also acceptable. In case Wireless temperature transmitters are provided, the requirements specified at Sub Section – IIIC-18, Wireless Instruments & System including fieldbus instruments, Part-B, Sec-VI and corresponding clauses in Part-A, F & C will be applicable. For Boiler SH/RH metal temperature & Generator Core/ Slot temperature measurement signals which shall be wired to boiler protection system or turbine protection systems, 4-20mA HART based DIN rail mounted temperature transmitters shall be provided as per clause 3.07.00 of Measuring Instruments chapter of PART B,	
		(e)	Redundancy requirements	
		i	For Binary and analog inputs required for protection of boiler, turbine and major auxiliaries of main plant whose non-availability may result in loss of generation triple-sensing devices shall be provided. Binary and analog inputs, which are, required for protection of more than one equipment as well as protection signals for important auxiliaries and HT Drives of main plant (fed by a supply feeder of ratings 3.3 kV onwards) etc., triple sensing devices shall be provided. However, for bearing / winding temperature of HT motor, refer Electrical subsections.	
		ii	In addition to above other binary and analog inputs required for closed loop control system (CLCS), dual-sensing devices shall be provided.	
		(f)	Current measurement (4-20mA) of all HT/MV and critical LT (minimum 20 no LT drive) drives shall be connected hardwired in respective DDCMIS.	
		(g)	CEMS, Effluent quality Monitoring System (EQMS), Vibration monitoring system: For quantity refer Annexure C to IIC, Part A.	
		(h)	ANALYSER INSTRUMENTS OF DM / PT, LET, CHLORINATION (CIO2), CWT AND CPU PLANT: All weather Local Panel fitted with integral Air Conditioner shall be provided for housing analyzers etc. if the same are not kept in AC rooms.	
			Notes: -	
		1	For measuring instruments type, specification, redundancy and quantities that are connected to Skid Mounted systems, Integral to Equipment Bidder's standard and proven practice can be accepted.	
		2	Guided wave radar type level transmitters shall be provided for measurement of Condenser / Hotwell level, LP Heaters level, Deaerator level, ID/FD/PA Fans lube oil tanks level, Mills lube oil tanks level, Main Turbine main oil tank level, BFP Drive Turbine main oil tank level, Main Turbine control fluid tank level, BFP Drive Turbine control fluid tank level (if applicable) and HP/LP bypass oil tank level.	
		3	The instruments for CHP and AHP ash conveyor system shall be provided as per standard and proven practice of respective supplier. However, for temp elements, DIN rail type temp transmitters mounted in JB's shall be provided.	
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	4.	CEMS and EQMS analysers / instruments shall be provided with provision for bidirectional connectivity over Modbus/RS-232/RS-485 with Employer's central cloud server for real time data monitoring, remote diagnostics & remote calibration checks, etc., complying with CPCB IT Division document "Protocol for real time (Emission & Effluent) data management from industries version 1.2 (10.6.2015), CPCB Guidelines July-2017 on CEMS or the latest regulatory requirements of CPCB/SPCB/other regulatory/statutory body prevailing at the time of award of the contract. All necessary hardware and software required at instrument end shall be provided by the Contractor. For CEMS and EQMS - In addition to above requirement, 4-20 mA connectivity to DDCMIS shall be provided by the Contractor.		
	5	AAQMS is not envisaged in this package.		
5.00.00	ELECTRICAL POWER SUPPLY SYSTEM			
5.01.00	The 24V DC Power Supply system shall be used for powering the control systems including the network devices and UPS AC Power supply system for powering HMIPIS and other critical loads. Contractor shall provide power supply distribution panels/cabinets/boxes for sub-distribution of DC/Main UPS//utility feeders on as required basis.			
5.02.00	24 V DC POWER SUPPLY SYSTEM shall be of continuous duty and on as required basis meeting the specification requirements. For the main plant SG, TG and BOP systems, the 24 VDC power supply system has to be supplied (for each unit) as per clause 1.03.00(B1), Part-B, IIIC-05 of the specification. Bidder may note that separate unitized 24 V DC Charger system has to be supplied for Main Plant BOP systems. For other offsite common areas configuration as per clause 1.03.00(B2), Part-B, IIIC-05 shall be provided. Manual discharge resistance bank of adequate capacity shall be provided for Main Plant BOP(C&I), Stand-Alone Common System, Water System, AHP, CHP, FGD & RIO system of Max rating. Accessories and devices required for maintenance and testing of batteries shall be supplied on as required basis.			
5.03.00	UNINTERRUPTED POWER SUPPLY SYSTEM of continuous duty shall supply regulated, filtered, and uninterruptible 230V, 50 Hz single phase power within the specified tolerances. UPS System shall be provided on as required basis for various AC loads of HMIPIS, Analyzers, Master Slave clocks, PA System, CCTV System etc. For Main Plant, UPS System has to be supplied on per unit basis as per Cl. No 1.05.00 (A), Part B, IIIC-05 of the Technical Specification. For other offsite common control locations Water System CER, AHP CER (s), CHP Control Room (s) and FGD CER, UPS Configuration shall be as per Cl. No 1.05.00 (B), Part B. For all other operator locations (like FOPH, AWRS & Ash SILO etc.) with OWS/Servers, UPS with configuration as per Cl. No 1.05.00 (C), Part B to be provided. Contractor to note that UPS of configuration C is acceptable only upto 5 KVA. In case the consolidated load requirements for these areas exceeds 5 KVA, Contractor to provide UPS with Configuration B in place of Configuration C. UPS of minimum 5 KVA rating to be provided for powering UPS loads of Air Compressors. Manual discharge resistance bank of adequate capacity shall be provided for Main Plant UPS & offsite common areas (Max rating). Accessories and devices required for maintenance and testing of batteries shall be supplied on as required basis.			
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES 		
6.00.00	PROCESS CONNECTION & PIPING Local Instruments Enclosures (LIE), Local Instrument Racks (LIR), Process connection & piping including all impulse piping, sample piping, pneumatic piping/tubing, valves, valve manifolds, fittings and all other accessories required for proper installation & completeness of impulse piping system, sampling piping system and air supply system shall be provided by the Contractor on as required basis.		
7.00.00	INSTRUMENTATION CABLES, CONTROL & POWER SUPPLY CABLES & CABLES SUB-TRAYS		
7.01.00	All instrumentation cables (twisted & shielded, PVC insulated & sheathed with FRLS properties) thermocouple extension cables (PVC / extruded FEP insulated & sheathed) and prefabricated cables (with plug-in connectors), Control Cables, Power Supply distribution cables, optical fiber cables as applicable for interconnection of all equipment/system/devices DDCMIS/PLC/MCC/LT SWGR/HT SWGR/ etc. shall be supplied, terminated and laid by the contractor on as required basis.		
7.02.00	Separate cables are to be provided for dual / triple redundant instruments used for protection of Unit and HT drives. These cables are also to be laid in separate routes to the extent feasible.		
7.03.00	Instrumentation cables for PA system, AHP conveyor system (if applicable) and Coal Handling plant area shall be armoured.		
7.04.00	Heat resistant instrumentation cable shall be provided for all instruments / equipments / drives / devices located in hot areas such as Burner tilt, Hot air gates, Air Heater areas , Furnace areas , Steam Drain & Vent Valves , Turbine – Generator areas, Oil system, HP/LP BP areas etc.		
8.00.00	CONTROL VALVES & ACTUATORS		
8.01.00	Pneumatically operated Control valves, actuators and accessories, shall be provided meeting requirements specified under Sub-section CONTROL VALVE, Part-B, Section-VI of Technical Specification.		
8.02.00	Contractor's standard and proven practice for Pneumatic operated control valves that are proposed to be connected to the Steam Turbine and Generator (STG) C&I system control system shall also be acceptable.		
8.03.00	Following type of Microprocessor based electronic positioner (as per standard and proven practice of valve/damper OEM) is to be provided with all the pneumatic operated control valves and all control dampers being provided by the contractor: a. 4-20mA HART based smart positioner b. Fieldbus based positioner		
	Positioner selection shall be as defined in clause no. 1.06.00, Sub Section-IIC, Part-A, Section-VI. Remote positioner units shall be provided for high temperature and dust prone applications like Burner tilt. However, for SADC dampers contractor's standard and proven practice is also acceptable.		
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES 		
9.00.00	CONTROL AND INSTRUMENTATION FOR MAIN PLANT AUXILIARY SYSTEMS For certain auxiliary plants, viz. Coal Sampling Units, Stacker Reclaimer, Wagon Tippler and Automatic Sprinkler System PLC based control system shall be provided as per Sub-Section IIIC-09 Programmable Logic Controller (PLC), Part-B of Technical Specification. Suitable hardware/software for interfacing of PLC based control systems as External connections to Station LAN architecture is to be provided by the bidder. For certain systems where PLC is integrally mounted on the equipment, Contractor's standard and proven practice shall be acceptable. This shall be finalized during detailed engineering.		
10.00.00	TYPE TEST REQUIREMENT		
10.01.00	The type tests to be conducted for C&I systems & equipments shall be as detailed out in Sub-Section C&I TYPE TEST, Part-B, Section-VI of Technical Specification.		
11.00.00	CONTROL DESK, PANELS & FURNITURES		
11.01.00	The contract quantity shall be as per Contract Quantities for UCD and Panels, Annexure C to this sub section.		
11.02.00	Minimum amount of back up instrumentation to be mounted on draw out portion of UCD shall be provided as per Contract Quantities for UCD and Panels in Annexure C to this sub section.		
12.00.00	STEAM & WATER ANALYSIS SYSTEM (SWAS)		
12.01.00	Complete SWAS including sample handling and conditioning system, Analysers, Sample piping, primary & secondary coolers, chillers, sampling pumps, gauges, switches, valves etc shall be provided as a minimum meeting specification requirements stipulated under Sub-section SWAS, IIIC-13, Part-B of Section-VI of Technical Specification.		
12.02.00	All analysers are to be supplied on as required basis subject to the minimum requirement as indicated in Contract Quantities, Part A of technical specification to make the system complete in line with the intent of this specification. However, any other analyzer, as required and recommended by Contractor or Qualified steam Generator Manufacturer (QSGM) / Qualified steam Turbine Generator manufacturer (QSTGM) shall also be supplied by the contractor within the quoted contract price.		
12.03.00	All the chemicals and reagents required for initial commissioning and warranty period (18 months operation after successful commissioning) of SWAS is to be supplied in phased manner depending on shelf life, in addition to that indicated under mandatory spares. Contractor shall initially supply reagents for two months operation, further supply shall be based on commissioning schedule of Units and confirmation by site Engineer. Contractor to provide shelf life of all reagents during detail Engineering. All the reagents supplied to site shall have at least 90% of remaining useful life at the time of dispatch.		
13.00.00	PUBLIC ADDRESS SYSTEM		
13.01.00	Public Address system along with software including Call stations, loudspeakers, Network switches, Servers, PA system management Software & other applicable software(s), PC Stations, interconnecting cable etc. for all the units, common plant areas and Coal Handling plant shall be provided by the Contractor		
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES 		
13.02.00	Common IP based network for IP based PA system and IP based CCTV system involving common components viz. network switches, network media and power supplies may be acceptable subject to employer's approval during detail engineering.		
14.00.00	CLOSED CIRCUIT TELEVISION SYSTEM (CCTV) FOR O&M		
14.01.00	IP based Closed Circuit Television System (CCTV) cameras for operation and maintenance (O&M) of plant along with network switches, Camera / Database servers, Video management software, keyboards, joy sticks, monitors, interconnecting cables & interface to the LVS of HMIPIS shall be provided common for all the units (containing some unitized & some common equipment). For quantity refer Annexure C to this sub section.		
15.00.00	Not used		
16.00 .00	Tools & Tackles		
16.01.00	The Contractor shall furnish a complete new set of all special tools and tackles of reputed make and model which are required for erection, ease in maintenance to have minimum down time, testing and calibration of all the equipments and systems to be provided by the Contractor under this specification for C&I systems.		
17.00.00	Wireless Instruments & System		
17.01.00	In case wireless instruments are provided it shall be as per Sub-section-IIIC-18, Wireless Instruments & System including fieldbus instruments, Part -B, Section-VI of Technical Specification.		
18.00.00	Electrical Actuators Electric actuators with integral starters along with associated accessories etc. shall be supplied on as required basis for Valves / Dampers to meet the functional and the other specification requirements. Following types of Electric Actuators are envisaged for the project: a) Non-intrusive Hardwired Electric Actuators b) Non-intrusive Fieldbus based Electric Actuators c) Modulating Duty Electric Actuators Also refer applications defined at Clause no.1.06.00 above.		
19.00.00	TRAINING SIMULATOR An 800 MW operator training simulator is to be supplied along with necessary hardware & software including minimum 5 no. of LASER lit LVS with LVS workstations, 6 no. OWS, redundant servers, 1 no. EWS with engineering software license, control desk & other furniture like workstation furnitures, chairs etc. Type-B UPS system is to be considered for supplying power to the complete system.		
20.00.00	PROJECT MANAGEMENT SYSTEM: The Contractor shall provide Smart Project Management System. For details refer Annexure-A to this subsection.		
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES		
21.00.00	SAFETY CONTROL ROOM AND EQUIPMENT 24/7 Safety Control room is envisaged for monitoring safety in plant area. The Contractor shall provide all hardware and software including IP based CCTV camera, Drone, loudspeakers, Redundant Servers/PC workstations, network switches, furniture, power supply, cables, Joystick etc for meeting the above requirement. For quantity refer Annexure C to this sub section.		
22.00.00	Interoperability of CCTV system. CCTV system for O&M and CCTV system for safety control room shall be interconnected through L3 switch so that feed of any camera can be seen from any of the CCTV system or from Employers' system as per requirement. However, these CCTV systems shall work independently and failure of any of this system shall not affect the other CCTV system. Cameras for O&M and safety control room shall be interchangeable.		
23.00.00	SCOPE OF SERVICES The Contractor shall be fully responsible and accountable for the engineering of the complete C&I system and its compliance to the technical specification requirements.		
23.01.00	Deputation of Experts at Site by the Contractor during erection and commissioning: Deputation of experts at site by the contractor during Erection and Commissioning shall be done under the following heads: a) Contractor's C&I Engineering representative: b) DDCMIS Expert: c) QSGM/QSTGM C&I Expert: d) Certified Fieldbus Expert: e) Actuators Expert:		
23.02.00	Training: Contractor shall provide training for C&I systems as indicated in Part C, Section VI of technical specification.		
24.00.00	Central Control Room Design The contractor shall provide an integrated modern state of the art control room for this project employing a control room designer having necessary skills, expertise complying to health safety environment requirement of operation and ISO 11064. The integrated design shall cover the major aspects like Control Room Design, HVAC, Lighting, Architectural finishes, Acoustics, Color Combination. The Central Control Room design guidelines attached at Part B of specification generally outlines the requirements in designing of CCR and adjoining areas. The detailed design shall be finalized during detail engineering subject to employer's approval.		
25.00.00	Annual Maintenance Services (AMS) Comprehensive Annual Maintenance Services (AMS) for three (03) years after warranty period shall be provided for the following system		
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CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES			
26.00.00	1. Distributed Digital Control, Monitoring & Information System (DDCMIS) 2. Analyser instruments of DM/PT, LET, Chlorination (CIO2), CWT and CPU plant. 3. CEMS and EQMS 4. Public address system (PA) 5. Wireless Instruments & System including fieldbus instruments 6. Closed circuit television system (CCTV) For detail refer relevant section in Part B of Technical specification.			
	Bidder to also refer Annexures to this sub section, part- A, Section-VI of Technical specification which are an integral part of Sub Section IIC.			
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CLAUSE NO.	TECHNICAL SPECIFICATIONS		
1.01.00 A.	PROJECT MANAGEMENT SYSTEM: Project Management System is to be implemented under the scope of the work. It shall encompass activities from project award to project closure. The system shall comprise of a project management team and project management tool. Project Management Team: The vendor shall deploy a dedicated Project Management Team from the date of award. The Team shall comprise of experienced and qualified project professionals and shall be located at bidder's project management office as well as at site. Site team shall coordinate for L3 Level activities at site and put-up daily status and exceptions to the bidder's Project Management Office for enabling them take timely action for critical works. The Project Management Team shall be responsible for following activities: • Implement, Operate, Maintain the Project Management Tool up to COF of last unit. Subsequently, transfer the Tool and associated data to SCCL with appropriate licenses/Subscriptions (if any) valid for one year after COF of last unit. • Training/familiarization of SCCL team with the project management tool. One nodal person to be identified for providing remote (Telephone/e-mail/Internet) or in-Person (wherever required) support. • Development of L2 network. • Development of L3 network (Three months rolling plan) for different packages/works. • Regular updation of L2 networks based on actual progress including scheduling/rescheduling of intermediate activities. • Data Acquisition & Updating the same in Project Management Tool on regular basis: i. Engineering, Ordering, Manufacturing & Fabrication, Inspection, Dispatch and Receipt of Materials on regular basis. ii. Site Activities like Civil & Structural Works, Mechanical, Electrical, C&I Erection and Commissioning activities based on the stage of the project. iii. Deployment of Vendor's Staff, Workers, T&Ps deployment, and their healthiness iv. Statutory wage payment status. v. Stock of consumables like steel, cement, sand, aggregate, imported electrodes and any other critical consumable. vi. Any other information required for the project management purpose. • Interact with Site and Project Management Team of Owner and facilitate exchange of requisite data. • Co-ordinate with SCCL Team for daily, weekly, and monthly reviews. • Generation of Exception Reports through Project Management Tool. • Conduct statistical analysis of historical data (e.g., trend analysis, benchmarking). • Comply to the requirements of SCCL pertaining to statutory obligations and maintenance of Sequence of events/Hindrance register.		
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B.	Project Management Tool: The vendor shall implement a Project Management Tool progressively by four months from the date of award, which shall conform to following requirements: 1. General • Should be implemented as Cloud based solution with web hosting supporting mobile Access/Application. • The access to the tool shall be role based for the security and integrity of the data. Provision for concurrent access by up to 50 users of the owner is to be ensured by the bidder. • Provision for regular back up for all the applications and its data till COF of the last unit. • Provision for monthly data back up to the owner’s server. • Security, Integrity and Confidentiality of the data is to be ensured and the same is to be used exclusively for this project only. • Should support integration with existing SCCL Systems viz C-Folder, Dreams, Pradip, Windsor, Team-up etc. with proposed software solution. (APIs will be provided by SCCL, subject to security authentication by SCCL IT team). • The project management tool should be compatible with Microsoft Project. • Online Manuals and documentation for Project Management Tool progressively. • All hardware and software required for the Project Management Tool shall be in the scope of bidder. • Regulatory clearances / licenses (as applicable) shall be in the scope of the bidder. 2. Project Planning Activities: • Online availability of the all the contractual documents including L1, L2 networks with baseline tracking and version control (as applicable). • L3 networks (3 months rolling plan) of the packages/works. • Erection / Construction Methodology and Schedule of T&Ps and manpower deployment. • All the review meetings (Daily/Weekly/Monthly) shall be conducted on this platform and should support upload/generation of record notes. The format for the same should be customizable. 3. Project Monitoring Activities: • Engineering, Ordering, Manufacturing & Fabrication, Inspection, Dispatch and Receipt of Materials and Consumables on regular basis. • Front handover monitoring based on finalized L2 / L3 schedule. • Mechanical, Electrical and C&I erection works along with pre-commissioning & commissioning activities.			
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CLAUSE NO.	TECHNICAL SPECIFICATIONS			
C.	• Generation of Daily/Weekly/Monthly Progress reports. • Status of Actual progress w.r.t L2 schedule and generation of exceptions. • Exception Reports on dispatch/Receipt/Erection w.r.t BBU. • Exception Reports on Pre-Commissioning/Commissioning activities. • S Curves for project progress and CAPEX with package wise payment status (APIs will be provided by SCCL, subject to security authentication by SCCL IT team). • Completion & Handover of Systems / Sub-Systems. • Forecast about critical activities and projection of overall project at any given point of time. • All Major T&Ps like Cranes, Earth Moving equipment, Induction Heating Machines etc. shall be monitored for deployment and healthiness.			
	4. Report Generation - The tool shall have provision for generation of following reports (Current as well as historical data): i. Standard Reports: • Daily, Weekly, Monthly and Quarterly Progress Reports. • Exception Reports on delays in Engineering, Ordering, Manufacturing & Fabrication, Inspection, Dispatch and Receipt of Materials as per MDL, L2 Network and BBU. • Exception Reports on delays in Front Handover, Civil & Structural Works, Mechanical, Electrical, C&I Erection and Commissioning Activities. • Capital Budgeting, Bills submission & realization and Payment confirmation to sub-vendors. • Deployment and Healthiness of T&Ps. • Current Organizational and site setup of Agency. • Sub-Agency wise, Area wise, Skill wise deployment of workers. • Statutory Wage payment status. • Stock of consumables like steel, cement, sand, aggregate, imported electrodes and any other critical consumable. • Reports related to Safety and Quality as per the requirement of the owner. • Allow users to configure/customize/format views, graphs, and reports. • Any other custom reports as per the requirement and mutual agreement. ii. Dashboards for MIS: • Dashboards based on Business Intelligence Tools. • Customizable Dashboard for Management.			
Drone Based Project Monitoring & visualization system: Supply, installation & commissioning of Drone Based Project Monitoring & visualization system with all associated viewing and monitoring platform & its				
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	integration with Project Management Tool. The setup shall be implemented, operated, maintained by vendor till completion of the facilities of the last unit. Scope: • Construction Progress Monitoring through high resolution (1080p or higher) drone Videography and Photography on monthly basis for the complete project area as per the scope of the work. • Monthly Progress Reports shall include drone Photographs (High resolution Geo-tagged images) with side-by-side comparison of same location/facility on monthly basis. The drone survey, photography, videography, and report submission (by 1st week of every month) is to be completed in a week's time. • The vendor will also provide unit rate for drone-based survey and reports submission. The same shall be used in case owner decides to conduct more than one survey in a month. • Web-based output for visual monitoring on Project Management Tool. • All the reports/Photographs/Videos are to be made available on Project management tool. • Regulatory clearances / licenses (as applicable) shall be in the scope of the bidder. • All hardware and software required to meet above intent shall be in the scope of bidder.	
D.	Smart Material and Manpower Management Objective of such system is sequential and timely availability of Materials, Manpower and T&Ps as well as ensuring quality during erection which is critical for Project success. It shall cover entire lifecycle of project materials (including mandatory spares) i.e., dispatch from vendor/sub-vendor location, receipt at SCCL Project, in plant material management and status till installation at site with the use of smart material management system and smart monitoring and tracking of construction manpower. The whole system must result in controlling project costs, compressing schedules, improving risk management, ensuring quality during erection and to avoid delay in project execution due to non-traceability of material. Supply Chain Management Contractor shall ensure implementation of smart material tracking system for all dispatches (SMI/BOIs) including mandatory spares and to the same shall be integrated bidders site inventory management system. Material Information system should be from Shop to Erection. • Each item identifiable with KKS / PGMA-DU / any other identification scheme of the bidder/OEM/OES shall be tracked.	
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	• Items which are interchangeable and dispatched together (e.g. Foundation bolts in a box, Identical beams in a single consignment), the entire consignment can be tagged with a single tracking code till receipt at site. • GPS tracking for Over Dimension Consignment (ODC): Contractor shall install GPS trackers (with inbuilt GPRS module) in ODC consignments vehicles and manage the tracking of such vehicles on real time basis. The tracking shall be real time and web based. Entire set of applications and their features shall allow secure web based online access to obtain real time information. • All the data regarding material movement shall be updated in the Project Management Tool and data updation is to be automated. Workflow: • Contractor shall enter the details of material shipment in a Project Management Tool / Web portal / Mobile Application and will generate a unique code before the material is dispatched & affix the same to material package & configure the same with tracking system. • The storage area shall be divided into zones and materials tracking IDs shall be accurately mapped / geotagged with the storage zones. • Contractor will use the same tracking ID to store the material at site. The status will be updated in project management tool regarding storage location at site. • For above functionality vendor shall use RFID, QR Tracker or BLE based beacon solution or any other improved version. • All hardware and software required to meet above intent shall be in the scope of bidder. E. Construction Manpower Tracking: • The vendor should implement mechanism to track daily movement of its workers inside the plant area. • Data regarding mobilization of manpower (agency wise, skill wise and area wise) is to be acquired using appropriate tool and is to be updated in Project Management Tool on daily basis. • Additionally, the vendor shall keep a provision of RTLS (Real Time Location Tracking system) along with the supply of associated wearable tags/ RFID tags affixed to helmet/ID badges/ band or Smart watches for 100 Nos. of workers and 50 Nos for employer's use. The data is to be made available in the project management tool. • Contractor is required to supply Real Time Location Tracking System (RTLS) to track the near real time location of operator/worker in the plant based on 802.11 active RFID tags or similar other technology e.g., LPWAN LoRa that serves the intent of the specifications here. The system can also make use of the wireless mesh network. All required hardware along with fixed & running charges e.g., RFID readers, BLE beacons & LoRa backhaul shall be in scope of bidder only. • The RTLS is to be implemented anywhere inside the plant as per the instructions of the owner. Provision is to be kept for implementation in up to 04 zones. • Vendor shall provide the price for deployment of a single tracking device along with		
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	the bid, in case SCCL decides to implement additional tracking devices as per requirements of the project. • All hardware and software required to meet above intent shall be in the scope of bidder. XXX		
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CLAUSE NO.	SCOPE OF SUPPLY				
A	<i>Contract quantities indicated below is the minimum requirements. Additional items / quantity if required, other than those indicated below, for meeting the intent of specification of this EPC package shall also be in the scope of the Contractor.</i>				
	1.00.00	<u>DISTRIBUTED DIGITAL CONTROL MONITORING & INFORMATION SYSTEM (DDCMIS)</u> The Bidder shall provide DDCMIS complying with requirements specified in Subsection III C-02, Part-B, other sub sections and enclosed drawings. The Contractor shall provide functional groups as per guidelines defined in clause no 2.00.00. Quantity of Process I/Os, Drives, HART signals, Various types of cabinets / equipments, ECP (for mounting synchronizing relays, aux. PTs, other relays etc. shall be provided on as required basis. A minimum of 9 nos. hand-held HART calibrators are to be provided. SOE is to be provided in UNIT DDCMIS for critical conditions like each of the protection condition of HT drives, MFT, TG protection, trip of HT & critical drive and status of some important electrical breakers.			
	1.01.00	Redundancy in analog & binary outputs for OLCS & CLCS drives: Unit DDCMIS SG System: For all drives of following systems ERV, Oil System, coal/mill system, scanner air & seal air system, SADC system, control valves of FOPH & Oil system. TG System: As per the standard practice of TG supplier BOP System: For 10% of drives distributed in various functional groups (Exact application shall be finalized during detailed Engg. For Other DDCMIS Binary outputs of HT and HTCHP drives			
	1.02.00	Notes for “Drive I/Os The on/off status of HT drives of Unit DDCMIS will be wired to DI modules in parallel. The open/ close status of sync type electrical breakers of Unit DDCMIS will be connected in parallel to DI and DISOE modules. For these types of drives in other DDCMIS systems the status will be connected to only one DI module. Status of remaining signals(other than On/Off as defined above) of HT drives & sync type electrical breakers of Unit DDCMIS are to be connected to DISOE module; for HT drives & sync type electrical breakers in other DDCMIS these will be connected to DI module. Contact type output through relay is to be provided for few types of drives(e.g. solenoids, ILMS, SM,MD, ignitor etc.). These relays shall be driven by 24V DC command outputs through DO modules. In case of redundancy in outputs for drives, redundancy shall be provided only in DO modules, but not for the relays. Power supply for energizing such drives in the field shall be routed through contacts of the above mentioned relays using control cable (minimum core dia of 1.5sq.mm).The monitoring of power supply extended to field shall be done in DDCMIS for such drives. In case of Unit system- there shall be separate monitoring for each drive. However, in case of Other systems /offsite systems monitoring can be done for group of drives as finalized during detailed Engg. Fieldbus compatible actuators will be interfaced with DDCMIS with Foundation Fieldbus/ Profibus interface modules. Accordingly, the command and feedbacks from these actuators shall be exchanged through these fieldbus interface network and the corresponding signals in control system shall be used for interlock, protection, information. In View of above reference of discrete/ hardwired limit switch/ other feedbacks / commands will not be applicable, wherever referred in this specification.			
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1.03.00	Control System Spare Capacity				
1.03.01	10 % spare channel shall be provided in each functional group for each type of input / output fully wired up to the marshalling/ termination TBs.				
1.03.02	Wired-in "usable" space for 20% modules along with Field Terminal assemblies, PCB/Connectors (if any in the offered system) in each of the system cabinets for mounting electronic modules shall be provided by the Contractor for future use. For STG Integral Controls, Bidder's standard & Proven practice for keeping usable space is also acceptable.				
1.03.03	Each controller shall have 20% spare functional capacity to implement additional function blocks, over and above implemented logic/ loops. Further, each controller shall have spare capacity to handle minimum 30% additional inputs/ outputs of each type mentioned in clause 1.03.01 & 1.03.02 above, over and above implemented capacity. Each of the corresponding communication controllers shall also have same spare capacity as that of controller.				
1.03.04	Contactor to provide thirty (30) percent spare relays for 1 COC Slim Relay (< 7mm) and ten (10) percent spare relays for 2 COC Heavy Duty relays. These relays shall be mounted and wired in relay cabinets. All contacts of relays shall be terminated in terminal blocks of relay cabinets. In each of the relay cabinets, 10 % spare terminal blocks shall also be provided so that additional relays can be mounted and wired.				
1.03.05	Twenty (20) percent spare terminal blocks in each marshalling cabinets.				
1.03.06	The spare capacity as specified above shall be uniformly distributed throughout all functional groups. The system design shall ensure that above mentioned additions shall not require any additional controller/processor/ peripheral drivers/ cabinets in the system delivered at site. Further, these additions shall not deteriorate the system parametric requirements like response time / duty cycle, etc. from those stipulated under this specification and shall meet other redundancy / functional requirement. For fieldbus-based system refer Annexure IIIC-02F of Part-B for spare requirements.				
1.03.07	For some RIO applications where I/Os are very less, the RIO panel can be combined for two RIOs with a partition. However, there shall be no common hardware shared between such RIOs e.g. RIO modules, power supply modules, power supply feeders etc.				
2.00.00	Guidelines for Functional Grouping of Controllers Keeping in view the functions of various systems/ sub-systems/ equipment of various process, systems (main plant, off sites etc.) are divided into various sub-systems. Each sub-system is divided into different process blocks. In some of the process systems, the process blocks and sub-systems will be same. Separate sets of FG(s) are to be provided for each of the process blocks defined below. The functions of two different process blocks cannot be mixed. For some of the process blocks, remote I/Os for some applications is envisaged. Electrical system of Unit DDCMIS will be a separate process block. However, electrical breakers of other DDCMIS shall be distributed along with respective process areas. The exact allocation of areas to different FGs shall be subject to Employer's approval. The process blocks of Control System of various DDCMIS are defined below. It may be noted that in each of the process blocks, the process areas, equipment, logic, loops given below cover major areas of control. The exact areas/ control shall be finalized by Employer during detailed engineering stage.				
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2.01.00	SG System The stream wise process redundancy is to be maintained in SG C&I DDCMIS. That is, if there are more than one main equipment (e.g., A/B/C streams) in a process block, these are to be allocated to different FGs, unless allowed explicitly. In the FGs, thus obtained, main equipments of similar streams are to be allocated. Further, the auxiliaries of main equipment will be allocated in the same FG where corresponding main equipment is allocated. For different streams of process blocks defined below, separate sets of FG(s) are to be provided. Where different streams of process blocks are not defined, separate sets of FG(s) are to be provided for the process blocks. The functions of two different process blocks/ streams cannot be mixed unless explicitly allowed. The information signals of respective process areas will be generally kept along with respective main equipment. The exact allocation of areas to different FGs shall be subject to Employer's approval during detailed engineering stage.			
2.01.01	Burner Management System: MFT block: This block will consist of MFT protection system employing 2V3 controllers. The configuration of this block shall be generally as per Drg.no.0000-999-POI-A-002. Boiler common functions block: Common stream-1: This block will consist of RH Protection Logic, Seal air fan-A control, Scanner air fan-A control, boiler common functions like Furnace purge, HOTV, LOTV, HORV, Scanner air emergency damper control, etc. Common stream-2: This block will consist of Seal air fan-B control, Scanner air fan-B control, Atomizing steam/ air press. control, HFO & LDO press. /flow control, SADC, Aux PRDS controls, Boiler Drain tank level control, etc. Firing system blocks: Maximum two mills and respective oil elevation can be assigned to one FG, e.g., Mill-A, Mill-B & Oil elevation-AB can be kept in one FG. Number of FGs in this block shall depend on actual no. of coal and oil elevations. Other SG system block: This block will consists of Soot blower control including press & drain temp control, Boiler drains/vents including start up drains/vents, Mill reject conveying system, FTP, ERV, MTM, Mill fire protection, SCAPH, Start-up controls including control of Boiler Recirculation Pump, Separator, Flash tank, Minimum Economizer flow etc. NOx system block: This block will consist of control of NH3 unloading, storage and Dosing system, Control and Monitoring of Selective Catalytic Converter (SCR) and associated soot blowing system, etc.			
2.02.00	TG System			
2.02.01	(a) STG integral controls (i.e. Close loop control (CLC), Open loop Control(OLC) and protection pertaining to steam turbine and generator) block:- The contractor shall provide Turbine protection and Turbine EHTC, Automatic Turbine Testing, TSE's, ATRS etc. functionalities in this block. (b) The functionality of Gland steam system controls, Turbine and Generator Auxiliaries including Oil System, Vacuum system, seal oil system, stator water system, Turbine Extraction NRV system etc. can be implemented in the above block or a separate block. (c) The configuration (hardware and software) of the above block(s) shall be as per standard and proven practice of the contractor. The exact implementation methodology shall be strictly as approved by employer during detailed engineering			
2.02.02	Over and above the STG integral control block(s) envisaged above, the Contractor shall also provide functional groups as per the following guidelines. The TG control system is			
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	divided into different process blocks. For different process blocks, separate sets of FG(s) are to be provided. The process blocks of the TG control system are defined below. It may be noted that the process areas, equipment, logic, loops given below cover major areas of control. The exact areas/control shall be subject to employer's approval. BFP Drive Turbine-A block: This block will consist of BFP Drive Turbine-A OLCS and CLCS controls, including EHTC/protection of Drive Turbine-A and auxiliaries of Drive Turbine-A. BFP Drive Turbine-B block: This block will consist of BFP Drive Turbine-B OLCS and CLCS controls, including EHTC/protection of Drive Turbine-B and auxiliaries of Drive Turbine-B. MDBFP block: This block will consist of MDBFP OLCS and CLCS controls, including auxiliaries of MDBFP. If more than one MDBFP is being provided in the scope of the package, then separate FG shall be provided for each of the MDBFP. Balance control implementation: The remaining controls envisaged in the scope of the work such as HP/LP bypass system, condenser on load tube cleaning system (as applicable) , Debris Filter (as applicable) , SCS (as applicable), Turbine lube oil purification control, central lub oil purification control etc. can be implemented in any of the above process blocks(i.e. indicated at clause no.:2.02.01 & 2.02.02) or separately as per the Bidder's standard and proven practice. Central Lub Oil Purification system being a common system can also be included in Standalone DDCMIS. The exact implementation methodology how-ever shall be strictly as approved by Employer. The stream-wise process redundancy is to be maintained in Unit DDCMIS. In the FGs thus obtained, main equipment of similar streams is to be allocated. Further, the auxiliaries of main equipment will be allocated in the same FG where corresponding main equipment is allocated.			
2.03.00	BOP DDCMIS The stream wise process redundancy is to be maintained. That is, if there are more than one main equipment (e.g., A/B/C streams) in a process block, these are to be allocated to different FGs, unless allowed explicitly. In the FGs, thus obtained, main equipments of similar streams are to be allocated. Further, the auxiliaries of main equipment will be allocated in the same FG where corresponding main equipment is allocated			
2.03.01	BOP-SG Secondary air block ID fans A&B, FD fans A&B, Secondary Air Heaters-A&B along with flue gas temp control/ fire detection, Secondary SCAPH-A&B; Stack Path; furnace draft control, air flow control, FGD inlet, FGD outlet and FGD bypass dampers etc. Steam & Water block Main Steam/SH/RH valves along with temp control, ECW pump-SG-A&B along with DP control, Dosing; FW valves, SG misc drives; Coordinated Master Control (CMC), feed water control, Group controls, SWAS etc. Primary air block PA fans-A&B, Mills/feeders-controls for outlet temp, PA flow & feeder speed (alternate mills/feeders are to be kept in separate FGs), PA header pressure control, Primary SCAPH-A & B, Primary air heaters A&B along with temperature control/fire detection, etc.			
2.03.02	BOP-TG BOP-TG block The BOP-TG consists of following major equipment/ control loops:); CEP-A, B & C along with recirculation controls; Gland seal pressure control for condensate; ACW- A, B & C; HP heaters-valves & level control (all HP heaters are to be kept in one FG), LP heaters valves &			
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2.03.03	Electrical block	level control (all LP heaters are to be kept in one FG), hot-well level control, Spill over control, Deaerator level & pressure control, ECW pump-TG-A, B & C along with DP control, TG miscellaneous valves/controls, etc. Electrical breakers – synchronization (sync) and non-synchronization (non-sync) type electrical breakers are covered in this system. The hardwired monitoring signals of power supply (UPS & DC system) will also be connected here.	
2.04.00	Stand-Alone DDCMIS		
2.04.01	Main Plant AC common Block	Common Air conditioning & ventilation system of various areas like CER, SWAS Room etc.	
2.04.02	Main Plant AC Unit#1 Block	Air conditioning & ventilation system of part of CCR/CR, CER, UPS/Battery Charger Room, ESP Control Room of UNIT#1 etc.	
2.04.03	CW System Block	Not more than 2 CW pumps are to be kept in one FG and alternate CW pumps are to be assigned to different FG	
2.04.04	Air Compressor Block and NH3 handling System Block	This block shall include Air compressors (IAC/PAC). If the controller (Microprocessor / PLC based control system) is integral to compressor then suitable operator interface as per vendors practice for individual air compressor shall be provided. However, overall control and monitoring shall be through Stand Alone DDCMIS. This block shall also include control of NH3 unloading, storage, transfer and heating system etc.	
2.04.05	CPU Block	CPU regeneration system, CPU service vessel of each unit.	
2.05.00	Water System DDCMIS	The Control System of Water System DDCMIS has following process blocks. The major equipment/ control loops in each block are indicated below.	
2.05.01	DM plant block	DM plant streams, DM make-up pumps, boiler fill pumps, DM storage tanks, DM neutralization pit, DM regeneration system, degasser system, acid/ alkali storage system, Zero liquid discharge, misc. pumps, air conditioning of water system control room etc.	
2.05.02	PT plant block	PT DM Clarifier, PT DM Gravity filters, chemical house, PT chlorination system, CW clarifier, CW gravity filters, filter water pump systems, filter water pump B/W system, CL water tank, Sludge pit, Treated water tank, condition monitoring basin, air conditioning for water system control room, waste service water pumps, misc. pumps, Coal decanted water, CSSP, Portable water, CW Blow down system, Raw water, effluent treatment plant etc.	
2.05.03	CW Chemical treatment block	CW chemical treatment, CW chlorination Dosing pumps, Misc. pumps etc.	
2.06.00	Ash handling System (AHP) DDCMIS	Ash Handling Control System comprising of binary and modulating controls of dry and wet ash handling system, bottom ash handling system, Fly ash handling system including de-ashing from ESP hoppers, APH hoppers & SCR system hoppers, ash slurry disposal system, high concentration slurry disposal system (if applicable) and associated equipment,	
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2.07.00	Ash water recirculation system (if applicable) and associated equipment, etc. shall be implemented in this DDCMIS. The Control System of AHP DDCMIS has following process blocks. - Unit bottom ash and fly ash block - AHP common system block - Ash Silo Block - High concentration slurry disposal system block (if applicable) Coal handling System (CHP) DDCMIS The Control System of CHP DDCMIS has following process blocks: CHP stream-A block CHP stream-B block Separate RIOs shall be provided for each stream (A & B)			
2.08.00	Flue Gas De-Sulphurisation (FGD) DDCMIS FGD System comprising of binary and modulating controls of complete Flue gas desulphurization system, material handling systems etc. shall be implemented in this DDCMIS. The Control System of FGD DDCMIS has following process blocks. i. Unit FGD			
2.09.00	FOPH DDCMIS This system shall have one block - Fuel oil pump house block consisting of Light oil discharge pressure Control, Controls related to fuel oil unloading system etc. This control block shall be located in the FOPH control room.			
2.11.00	Switchgear DDCMIS This system shall have one block. It comprises of monitoring and data acquisition of 20 Signals (both Analog & Digital) from each relay (MV & LV circuit breakers / MV Vacuum contactors on IEC-61850 protocol). This shall be communicated to Switchgear DDCMIS on IEC 61850 protocol.			
2.12.00	NOT USED			
2.13.00	The Bidder shall provide requisite number of function groups for each Control System considering the guidelines defined above for functional grouping and considering all specification requirements defined in the specification. The major aspects to be considered shall be as follows: 1. Hardware capacity, including spare capacity 2. Software capacity, including spare capacity 3. Response time/ signal acquisition time requirement for Control System 4. Parametric requirements of DDCMIS 5. Functional grouping and associated requirements specified under section III C-02 and notes for Contract Quantities of DDCMIS. The Bidder shall furnish functional grouping diagram for Control System of each DDCMIS, in the bid supported by back-up calculations and reasons for proposed functional grouping, and exact functional grouping shall be finalized during detailed engineering stage, as approved by the Employer.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	Annexure B to IIC Contract quantity	PAGE 6 OF 19

CLAUSE NO.	SCOPE OF SUPPLY 																																																																												
B 1.00.00	SIGNALS FROM OTHER SYSTEMS TO BE CONNECTED TO HMIPIS/STATION LAN <table border="1"> <thead> <tr> <th rowspan="2">SI No.</th><th rowspan="2">SYSTEM</th><th colspan="2" rowspan="2">TOTAL DATA BASE</th><th colspan="2" rowspan="2">PERIODICALLY TRANSMITTED</th><th rowspan="2">UNIT(U)/ COMMON (C)</th></tr> <tr> </tr> <tr> <th></th><th></th><th>ANALOG</th><th>BINARY</th><th>ANALOG</th><th>BINARY</th><th></th></tr> </thead> <tbody> <tr> <td>1.</td><td>ESP</td><td colspan="4" rowspan="6">On as Required Basis</td><td>U</td></tr> <tr> <td>2.</td><td>FIRE DETECTION & PROTECTION</td><td>U</td></tr> <tr> <td>3.</td><td>FIRE WATER PUMP HOUSE (If applicable)</td><td>C</td></tr> <tr> <td>4.</td><td>Wagon Tippler (if applicable)</td><td>C</td></tr> <tr> <td>5.</td><td>Stacker Reclaimer PLC</td><td>C</td></tr> <tr> <td>6.</td><td>GRP</td><td>U</td></tr> <tr> <td>7.</td><td>PI (ERP)</td><td colspan="4">2000</td><td>C</td></tr> <tr> <td>8.</td><td>3 Spare links (For Future Use)</td><td>500 each</td><td>500 each</td><td>500 each</td><td>500 each</td><td>C</td></tr> <tr> <td>9.</td><td>APH PLC-1 & 2 (if applicable)</td><td colspan="4">On as Required Basis</td><td>U</td></tr> <tr> <td>10.</td><td>HYDRAULIC CONTROL VALVE PLC-1 & 2</td><td colspan="4">On as Required Basis</td><td>U</td></tr> <tr> <td>11.</td><td>Vibration Monitoring and Analysis System VMAS</td><td colspan="4">On as Required Basis</td><td>U</td></tr> </tbody> </table> Note: - For Signals from HMIPIS to Station LAN, the total database size is to be estimated by Contractor to meet the spec. requirements. The requirement of periodic transmission shall be as finalized during detailed engineering stage. - Protocol for data transfer for above systems shall be OPC. It is preferable to provide OPC UA based communication.						SI No.	SYSTEM	TOTAL DATA BASE		PERIODICALLY TRANSMITTED		UNIT(U)/ COMMON (C)			ANALOG	BINARY	ANALOG	BINARY		1.	ESP	On as Required Basis				U	2.	FIRE DETECTION & PROTECTION	U	3.	FIRE WATER PUMP HOUSE (If applicable)	C	4.	Wagon Tippler (if applicable)	C	5.	Stacker Reclaimer PLC	C	6.	GRP	U	7.	PI (ERP)	2000				C	8.	3 Spare links (For Future Use)	500 each	500 each	500 each	500 each	C	9.	APH PLC-1 & 2 (if applicable)	On as Required Basis				U	10.	HYDRAULIC CONTROL VALVE PLC-1 & 2	On as Required Basis				U	11.	Vibration Monitoring and Analysis System VMAS	On as Required Basis				U
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CLAUSE NO.	SCOPE OF SUPPLY			
2.00.00	LIST OF AREAS FROM WHICH SOFT SIGNALS IS TO BE CONNECTED TO DDCMIS (OTHER THAN REMOTE I/O) 1. From Unit and other 24 V DC Charger systems to respective DDCMIS 2. From UNIT and other UPS systems to respective DDCMIS 3. From AHP compressor to AHP DDCMIS 4. From Air compressor (IAC, PAC) to SAC DDCMIS 5. From air conditioning system to SAC DDCMIS Note: No of link and quantity of signals shall be on as required basis and type of communication protocol shall be as per bidder's standard.			
C	<u>CONTRACT QUANTITIES FOR UCD & PANELS</u>			
1.00.00	CONTROL DESKS AND PANELS			
1.01.00	The following are the contract quantities of control desks: Arc shaped Control Desks shall be provided as mentioned below. 1. UNIT Control Room – 8 m (1 per unit) 2. Unit Incharge Desk (UID) - 3 m (1 common) 3. Centralized Off-site Control Room – 4 m (for Water System) 4 m (for Ash Handling System) 3 m (for FGD System) 4. CHP System CR - 4m (1 per system) 5. FGD System CR - 3m (1 per system) Furniture shall be provided as mentioned below. 1. Unit Control Room: Chair-5 nos, Keypad-1 no, Locker set- 2 no, Almirahs- 3 nos, PC Rack- 1 set 2. Programmer Room: Chair-12 nos, Keypad-1 no, Server Rack- 1, workstation Furniture- 1 set 3. C&I Maintenance Room: Chair-2 nos, Computer Table- 2 nos. 4. Unit Incharge Desk (UID): Chair- 2 nos. 5. Centralized Off-site Control Room: Chair-9 nos, Keypad-3 no, Locker set- 3 no, Almirahs- 3 no, PC Rack – 3 set, workstation furniture – 2 set 6. Water system CER: Server Rack- 1 set 7. AHP system CER: Server Rack- 1 set 8. CHP System CR: Chair-4 nos, Keypad-1 no, Locker set- 1 no, PC Rack – 1 set, workstation furniture – 1 set FGD System CR: Chair-2 nos, Keypad-1 no, Locker set- 1 no, work furniture -1 no. 9. FOPH System Area: Server Rack – 1 no. 10. For each Workstation (located at areas not covered above) and for each Common PC Station: Chair- 1 for each, Computer Table – 1 for each 11. For Printer in area where workstation furniture is not available: 1 Printer table for each printer 12. For each Control Room (Other than those mentioned above: Keypad- 1 no, Locker set- 1no.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	Annexure B to IIC Contract quantity	PAGE 8 OF 19

CLAUSE NO.	SCOPE OF SUPPLY	
Note-1:	The UCD in Unit Control Room shall have mechanism for concealing synchroscope (1 no. per unit). For details of this mechanism, refer to Part-E, tender drawing. The exact details shall be finalized during detailed engineering stage.	
Note-2:	Draw-out section/plaque shall be provided in UCD and CD for CHP as follows: (A) UCD: (i) One no. draw out section for process side (ii) One no. draw out section for electrical side (iii) One no. synchronization plaque - mosaic tiles, of adequate nos so that synchroscope, 2 nos. voltmeters, 2 nos. frequency meters and two indicators are accommodated in the size of one TFT monitor, so that size of concealing arrangement for this plaque is same as that of TFT monitor. (B) CD of CHP: One no. Draw out section for process side-	
Note-3:	Instruments like Push buttons, LEDS etc. shall be furnished for each generating unit on as required basis to be mounted on the draw out section of Unit Control Desk of each unit. For design philosophy of draw out section of process side & electrical side, refer sub section IIC-11, Control Desk and Panels	
Note-4	The following instruments shall be furnished for each Coal Handling Plant to be mounted on the draw out section of Control Desk of each Coal Handling Control Room. 1. Stop PB: 45 nos. 2. Release PB: 1 no. 3. Emergency stop PB: 1 no. (With cover)	
Note-5:	One set Conference Table & 15 no's Chairs shall be provided.	
D	<u>CONTRACT QUANTITIES FOR INSTRUMENTATION CABLES, CONTROL & POWER SUPPLY CABLES, OTHER CABLES & ACCESSORIES.</u>	
1.00.00	The Contractor shall supply, erect, lay, terminate and test the following cables ensuring functional completeness of the control system on as required basis. 1. All instrumentation (Type A, B, C, F, & G), control & power supply cables including heat resistant cables. Co-axial cables, network cables including Optical fiber/shielded twisted pair Cat-5e cables for system for connection of peripherals, data highway, network etc. 2. All types of cables related to fire detection and protection system 3. All cable trays/ sub trays, rigid and flexible conduits, HDPE Conduits, conduit fittings, cable glands, junction boxes including temperature transmitter JB's (for DIN rail mounted TTs), lugs, pull boxes accessories and all supports between the cable trays (trunk route) and equipments as required for installation of all cables for complete package shall be supplied by Contractor on as required basis 4. All grounding cables for control systems, cabinets, equipments etc. 5. All special tools required for wiring terminations as recommended by Contractor	
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1.00.00		A) The major zones shall be: 1 for each of the generating unit, 1 for common plant system, 1 with at least 2 sub-zones for CHP B) Suitable interface shall be provided for connection with Employer's main telephone exchange and minimum 4 channel GSM connectivity from both the Servers such that it is possible to communicate with any station in any zone from any telephone set.																																																																																																																																																	
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1.01.00	All hardware & software along with necessary licenses shall be capable of handling 30% additional call stations over and above the number of call stations specified in each zone for future use.																	
F	<u>Contract quantities for CCTV SYSTEM for O&M</u>																	
1.00.00	The complete system shall be divided into the following zones: - One Zone for Each Of The Generating Unit., One Zone For Common Plant System, One Zone For Coal Handling Plant, One Zone for Distant Plant.																	
2.00.00	Cameras (HIGH Definition) along with motorized zoom lens, housings, PAN and TILT mechanism.																	
2.01.00	Unit Areas <table border="1"><thead><tr><th>SN</th><th>Locations</th><th>No. of Cameras (per unit)</th></tr></thead><tbody><tr><td>1.</td><td>TG hall Elevation 17.0 M (Generator Side, BFP side), 8.5 M, 0 M, Boiler Firing Floor (Front & Rear, Left Side & Right Side)</td><td>30</td></tr><tr><td>2.</td><td>Raw Coal Feeders, Air Heater, ESP Field area (Front & Rear), Bottom Ash Hopper Area, CER, Cable Gallery (at different areas), Switch Gear Room, Coal Mill, FGD (absorber area) , BUNKER FLOOR, Mill Reject Area, APH Hoppers, SCR Hoppers, Duct / Eco Hopper, Transformer Bay, MOT room,</td><td>90</td></tr><tr><td>3.</td><td>Seal Oil Skid</td><td>1 (Refer Note-1)</td></tr><tr><td>4.</td><td>Miscellaneous applications (AHP /ESP area)</td><td>20</td></tr></tbody></table>			SN	Locations	No. of Cameras (per unit)	1.	TG hall Elevation 17.0 M (Generator Side, BFP side), 8.5 M, 0 M, Boiler Firing Floor (Front & Rear, Left Side & Right Side)	30	2.	Raw Coal Feeders, Air Heater, ESP Field area (Front & Rear), Bottom Ash Hopper Area, CER, Cable Gallery (at different areas), Switch Gear Room, Coal Mill, FGD (absorber area) , BUNKER FLOOR, Mill Reject Area, APH Hoppers, SCR Hoppers, Duct / Eco Hopper, Transformer Bay, MOT room,	90	3.	Seal Oil Skid	1 (Refer Note-1)	4.	Miscellaneous applications (AHP /ESP area)	20
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CLAUSE NO.	SCOPE OF SUPPLY															
	4.	Crushed Coal Stock pile (each)	1													
	5.	Stacker Reclaimer-(each)	1													
	6.	Raw Coal Bunkers (each Unit)	2													
	7.	At each Transfer Point	1 (per floor)													
	8.	At each Conveyor Gallery	1 (length ≤ 250 m) 2 (250 m < length ≤ 550 m) 3 (length > 550 m)													
	9.	Track Hopper, CHP Control Room, T/U Tower, MGR Entry/Exit Gate, Reclaim Hopper, Train entry/Exit point near plant boundary Biomass handling plant	30 (2 nos. at each location)													
	10.	Stockyard area (Coal and Biomass)	10													
	11.	To be decided during detailed engineering	20													
3.00.00	Fixed Cameras (High Definition-HD) along with housings: Contractor shall provide fixed cameras (High Definition-HD) for monitoring ash accumulation above furnace S-panel area and in bottom ash hoppers. The quantity and location of these cameras is indicated in the table below.															
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2	Outside bottom ash hopper at about 2 M elevation (Refer Note-B)	06														
	Note-A: Contractor shall provide suitable opening with seal box in left and right side of boiler water walls, fitted with sight glass. Cleaning arrangement of sight glass using service air shall be provided by the contractor from nearest available tapping point.															
	Note-B: Contractor shall provide suitable opening in Bottom ash hopper with sight glass (if not available in bottom ash hoppers) in front and back side of bottom ash hoppers. Cleaning arrangement of sight glass using service water (if not available) shall be provided by the contractor from nearest available tapping point.															
4.00.00	The following items shall be provided on as required basis without any cost implication to Employer subject to minimum qty. mentioned as under: -															
	<table><tr><th>Sr. No</th><th>Item</th><th>Quantity</th></tr><tr><td>(i)</td><td>Camera/Database Servers with external Speaker (min. 5 W)</td><td>Minimum one set for each zone. (One set comprises of one primary and one standby server)</td></tr><tr><td>(ii)</td><td>Workstations with Monitor, External Speaker (min. 5 W) Keyboard & Joystick</td><td>One no for each zone and Twelve (12) nos. for plant common area (see note-2 below).</td></tr><tr><td>(iii)</td><td>Workstations with External Speaker (min. 5 W), Keyboard & Joystick (without Monitor)</td><td>One no for each of the generating units, three for common plant areas (AHP, FGD and water system) and one for CHP.</td></tr></table>			Sr. No	Item	Quantity	(i)	Camera/Database Servers with external Speaker (min. 5 W)	Minimum one set for each zone. (One set comprises of one primary and one standby server)	(ii)	Workstations with Monitor, External Speaker (min. 5 W) Keyboard & Joystick	One no for each zone and Twelve (12) nos. for plant common area (see note-2 below).	(iii)	Workstations with External Speaker (min. 5 W), Keyboard & Joystick (without Monitor)	One no for each of the generating units, three for common plant areas (AHP, FGD and water system) and one for CHP.	
Sr. No	Item	Quantity														
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(ii)	Workstations with Monitor, External Speaker (min. 5 W) Keyboard & Joystick	One no for each zone and Twelve (12) nos. for plant common area (see note-2 below).														
(iii)	Workstations with External Speaker (min. 5 W), Keyboard & Joystick (without Monitor)	One no for each of the generating units, three for common plant areas (AHP, FGD and water system) and one for CHP.														
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		Annexure B to IIC Contract quantity	PAGE 12 OF 19											

CLAUSE NO.	SCOPE OF SUPPLY				
5.00.00	(iv)	Network Switches	Minimum one set for each zone-		
	(v)	Layer-III Switch/Router	1 set		
	(vi)	Interconnecting Cables	1 lot		
	(vii)	Hardware and Software for interfacing with Large Video Screens (LVS)	One set for each unit, one for AHP, one for CHP and one for Water system area.		
	(viii)	Wireless Connectivity and its accessories	1 set		
	Hardware like network switches, camera/database servers, Layer-3 switches/routers PDB & software, Wireless Equipment etc. along with necessary licenses for each zone shall be capable of handling 30% additional cameras over and above the number of cameras specified in each zone.				
	Notes:				
	1. Cameras & its accessories shall be Explosion proof.				
	2. Common areas shall include Office of Head of the Project, Office of O & M In-charge, Erection In-charge's Office, Central Fire Station, FGD control room, Water System Control Rooms, Ash Handling System Control Room, Plant Security Control Room, Main Gate of the Plant, Safety control room and any other locations to be decided during detail engineering.				
	G	CONTRACT QUANTITIES FOR SWAS			
LIST OF ANALYSERS:					
Sample		Measurements			
Makeup DM water		Degassed Cation Conductivity (DCC)			
CEP discharge		Degassed Cation Conductivity (DCC), Sodium, pH, Dissolved Oxygen			
CPU outlet		Specific Conductivity, Cation Conductivity, Silica, Sodium, pH			
Deaerator outlet		pH, Dissolved Oxygen			
FW at Eco inlet		DEGASSED CATION CONDUCTIVITY ANALYSER, Silica, Sodium, pH, Hydrazine, Dissolved Oxygen, Turbidity, Iron Analyser			
Separator outlet (Steam)		Specific Conductivity, Cation Conductivity			
Sat. Water BCW Discharge		Specific Conductivity, Cation Conductivity, Silica, Sodium, Hydrazine, Dissolved Oxygen			
Main Steam - HTSH O/L		Specific Conductivity, Cation Conductivity, Silica, Sodium, pH, Chloride, Dissolved Oxygen			
Hot Reheated steam		Specific Conductivity, Cation Conductivity			
Closed circuit CW (ECW-SG)		pH			
Condenser CW		Specific Conductivity, pH			
Hotwell		Specific Conductivity			
Closed circuit CW (ECW-TG)		pH			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		Annexure B to IIC Contract quantity	
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CLAUSE NO.	SCOPE OF SUPPLY			
H	Notes: 1. Multistream for Silica and Sodium Analyser shall be acceptable. Multistream analysers shall have at least one stream as spare. 2. Any Other analyser as recommended by Contractor or Equipment OEM shall be supplied by Contractor as per OEM standard and proven practice within the contract price.			
	<u>FLUE GAS ANALYSERS (CEMS)</u>			
	1.01.00	LIST OF FLUE GAS ANALYSERS FOR CONTINUOUS EMISSION MONITORING SYSTEM (CEMS)- (PER UNIT QUANTITY) 1. SO2 in stack emission 2. NOX in stack emission 3. CO2 in stack emission 4. CO in stack emission 5. Particulate Matter (Dust Density) in stack emission 6. Mercury (Hg) in stack emission 7. Flue Gas flow at stack Note: Oxygen (O2) measurement in stack emission based on Paramagnetic/ Zirconia type instrument shall be provided by the Contractor for correction of SO2, NOx and Particulate matter value corresponding to the standard/reference O2		
1.02.00	LIST OF OTHER FLUE GAS ANALYSERS FOR BOILER SYSTEM: 1. O2 ANALYSER AT PLATTEN SH OUTLET 2. O2 ANALYSER AT PLATTEN SH OUTLET 3. O2 ANALYSER AT ECO OUTLET (L) 4. O2 ANALYSER AT ECO OUTLET (L) 5. O2 ANALYSER AT ECO OUTLET (R) 6. O2 ANALYSER AT ECO OUTLET (R) 7. PAH-A GAS O/L O2 * 8. PAH-A GAS O/L O2 * 9. SAH-A GAS O/L O2 * 10. SAH-A GAS O/L O2 * 11. PAH-B GAS O/L O2 * 12. PAH-B GAS O/L O2 * 13. SAH-B GAS O/L O2 * 14. SAH-B GAS O/L O2 * 15. IDF-A I/L O2 16. IDF-B I/L O2 17. CO ANALYSER AT ECO OUTLET- ECO-3 O/L 18. CO ANALYSER AT ECO OUTLET- ECO-3 O/L NOTES: 1. These are per unit quantities. 2 * These O2 Analyzer quantities are w.r.t. Bi-sector RAPH, However, for total quantity of O2 Analyzers for Tri-sector type RAPH outlet refer tender Drawing 9585-001-POM-A-018b.			
1.03.00	SOx ANALYSERS FOR FGD SYSTEM:			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	Annexure B to IIC Contract quantity	PAGE 14 OF 19

CLAUSE NO.	SCOPE OF SUPPLY																																																																									
I	1. SO2 Analyser at FGD Outlet 2. SO2 Analyser at FGD inlet																																																																									
	CONTRACT QUANTITIES OF TOOLS AND TACKLES The list of Tools and Tackles to be supplied as part of this package is as follows: - <table><tr><th>Sl no</th><th>Item Description</th><th>Common Qty. for all units</th></tr><tr><td>1.</td><td>Ring spanners set (6mmx7mm to 21mmx23mm sizes, nine pieces per set)</td><td>3 sets</td></tr><tr><td>2.</td><td>D spanner set (6mmx7mm to 21mmx23mm sizes, nine pieces per set)</td><td>3 sets</td></tr><tr><td>3.</td><td>Adjustable spanner set (6",9',12',15' –one each of these sizes per set)</td><td>3 sets</td></tr><tr><td>4.</td><td>Socket Spanner set (6mmx7mm to 21mmx23mm sizes, nine pieces per set)</td><td>3 sets</td></tr><tr><td>5.</td><td>Pliers set consisting of nose pliers, combination pliers</td><td>3 each</td></tr><tr><td>6.</td><td>Cable termination kit (including crimping & wrapping tools for various types of termination blocks)</td><td>1 set</td></tr><tr><td>7.</td><td>Pipe wrench set, -(12",15",18",24"-one each of these sizes per set)</td><td>1 set</td></tr><tr><td>8.</td><td>Torque wrench set</td><td>1 set</td></tr><tr><td>9.</td><td>Cable stripper (from 0.5 sq mm to 4 sq mm)</td><td>1 set</td></tr><tr><td>10.</td><td>Allen key set (from 1 mm to 12 mm, 12 pieces per set)</td><td>2 sets</td></tr><tr><td>11</td><td>Insulated screw gripping screwdriver set</td><td>2 sets</td></tr><tr><td>12.</td><td>Adjustable Position Hacksaw (6",12" and 18 "frame sizes per set)</td><td>1 set</td></tr><tr><td>13.</td><td>Cable splicer and cutter set (For OFC cables)</td><td>2 sets</td></tr><tr><td>14.</td><td>Optical Time-Domain Reflectometer (OTDR)</td><td>2 nos.</td></tr><tr><td>15.</td><td>Precision tweezer</td><td>1 set</td></tr><tr><td>16</td><td>Copper tube cutter and bender (up to 1" size)</td><td>1 set</td></tr><tr><td>17</td><td>Fold up Hex key set</td><td>1 set</td></tr><tr><td>18</td><td>Rubber Mallet</td><td>1 set</td></tr><tr><td>19</td><td>Needle file set</td><td>1 set</td></tr><tr><td>20</td><td>Marking punches</td><td>1 set</td></tr><tr><td>21</td><td>IC inserter and Extractors</td><td>1 set</td></tr><tr><td>22</td><td>Ferrule printing machine with PC interface suitable for sleeve and tape printing for cable identification</td><td>2 nos</td></tr><tr><td>23</td><td>Portable Testing and Commissioning tool-Ref Clause no.</td><td>2 nos</td></tr></table>			Sl no	Item Description	Common Qty. for all units	1.	Ring spanners set (6mmx7mm to 21mmx23mm sizes, nine pieces per set)	3 sets	2.	D spanner set (6mmx7mm to 21mmx23mm sizes, nine pieces per set)	3 sets	3.	Adjustable spanner set (6",9',12',15' –one each of these sizes per set)	3 sets	4.	Socket Spanner set (6mmx7mm to 21mmx23mm sizes, nine pieces per set)	3 sets	5.	Pliers set consisting of nose pliers, combination pliers	3 each	6.	Cable termination kit (including crimping & wrapping tools for various types of termination blocks)	1 set	7.	Pipe wrench set, -(12",15",18",24"-one each of these sizes per set)	1 set	8.	Torque wrench set	1 set	9.	Cable stripper (from 0.5 sq mm to 4 sq mm)	1 set	10.	Allen key set (from 1 mm to 12 mm, 12 pieces per set)	2 sets	11	Insulated screw gripping screwdriver set	2 sets	12.	Adjustable Position Hacksaw (6",12" and 18 "frame sizes per set)	1 set	13.	Cable splicer and cutter set (For OFC cables)	2 sets	14.	Optical Time-Domain Reflectometer (OTDR)	2 nos.	15.	Precision tweezer	1 set	16	Copper tube cutter and bender (up to 1" size)	1 set	17	Fold up Hex key set	1 set	18	Rubber Mallet	1 set	19	Needle file set	1 set	20	Marking punches	1 set	21	IC inserter and Extractors	1 set	22	Ferrule printing machine with PC interface suitable for sleeve and tape printing for cable identification	2 nos	23	Portable Testing and Commissioning tool-Ref Clause no.
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CLAUSE NO.	SCOPE OF SUPPLY			
J		35.00.00, Sub-section IIIC-02, Part-B, Section VI for technical specification		
	NOT USED			
	K	<u>Vibration Monitoring System</u>		
L	Vibration sensors shall be provided in Motor DE & NDE and Fan/Pump DE/ NDE bearing as a minimum for all Major/ HT drives as per OEM's standard and proven practice. Vibration Monitors shall be provided on as required basis in CER, Unit FGD Control rooms, cooling tower control room, CW pump house and Raw Water Pump House. Contractor shall provide 2 vibration sensors per measurement location. Contractor shall provide Phase marker sensor for ID, FD, PA, BFP, CEP, ACW, ECW, CW drives as a minimum. Contractor shall provide compatible buffered phase marker and vibration signals required for integrated diagnostics and analysis of vibration of all the above equipments and for crushers as a minimum and other drives as per OEM recommendation for connectivity to the analysis system.			
	<u>Other Instruments</u>			
	1	Impact Head type flow element with flow transmitters	2 no per unit	
		As an alternate DUAL PATH TRANSIT TIME CLAMP-ON ULTRASONIC FLOW METER can be supplied for this application)		
	2	Instruments to be installed in ECP Transducers (Incoming voltage, Incoming Frequency, Running voltage, Running Frequency) Synchronizing relays (Check relays, Guard relays, Auxiliary relay, Auxiliary Potential Transformer 110V/110V, Auxiliary Potential Transformer 63.5 V/110V)	On as required basis	
	3	Effluent Quality Monitoring System (EQMS)	Quantity common for all units	
	(a-1)	pH Analyser	1 no	
	(a-2)	Conductivity Analyser	1 no	
	(b)	Chemical Oxygen Demand*(COD) Analyser	1 no	
	c	Biological Oxygen Demand *(BOD) Analyser	1 no	
(d)	Total Suspended Solids (TSS) Analyser	1 no		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	Annexure B to IIC Contract quantity	PAGE 16 OF 19

CLAUSE NO.	SCOPE OF SUPPLY																											
M	(e)	Oil In Water (OIW) Analyser	1 no																									
	(f)	Temperature Element (RTD)	1 no																									
	(g)	Temperature Transmitter	1 no																									
	(h)	Flow transmitters	1 no																									
	(i)	Power Supply Distribution Board (PDB)	1 no																									
	* BOD & COD analysers are shown separately for the purpose of input only otherwise any of the BOD & COD analysers can be clubbed together to be provided as a single unit meeting the specifications																											
	List of Temperature Monitoring locations (as referred in Subsection IIA-01 Part A of technical specification) along with minimum quantities for each location:																											
	<table><tr><th colspan="4">Table-I: Temperature monitoring in Penthouse cavity and ash hoppers</th></tr><tr><th>S. No.</th><th>Location of measurement</th><th>Minimum quantity of thermocouple (TC) per boiler</th><th>Type of TC</th></tr><tr><td>1</td><td>Inside Penthouse cavities at 2/3 of depth from penthouse top.</td><td>4 nos. (One no. each near to Divisional header, Platen Header, Reheater header, LTSH header)</td><td>Mineral insulated K-type TC</td></tr><tr><td>2</td><td>Bottom ash hopper (BAH) below quenching/spray nozzles. Thermowell tip shall be inserted in BAH refractory facing downwards.</td><td>One no. in each BAH hopper</td><td>K type TC with thermowell</td></tr><tr><td>3</td><td>Economizer Hopper above hopper discharge gate</td><td>One no. in each Economizer hopper</td><td>Metal Temperature Thermocouple (MTT) mounted in metallic weld pad</td></tr><tr><td>4</td><td>APH Hopper above hopper discharge gate</td><td>One no. in each APH hopper</td><td>MTT mounted in metallic weld pad</td></tr></table>				Table-I: Temperature monitoring in Penthouse cavity and ash hoppers				S. No.	Location of measurement	Minimum quantity of thermocouple (TC) per boiler	Type of TC	1	Inside Penthouse cavities at 2/3 of depth from penthouse top.	4 nos. (One no. each near to Divisional header, Platen Header, Reheater header, LTSH header)	Mineral insulated K-type TC	2	Bottom ash hopper (BAH) below quenching/spray nozzles. Thermowell tip shall be inserted in BAH refractory facing downwards.	One no. in each BAH hopper	K type TC with thermowell	3	Economizer Hopper above hopper discharge gate	One no. in each Economizer hopper	Metal Temperature Thermocouple (MTT) mounted in metallic weld pad	4	APH Hopper above hopper discharge gate	One no. in each APH hopper	MTT mounted in metallic weld pad
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CLAUSE NO.	SCOPE OF SUPPLY																															
N	2	Soot blower area: In the middle of each wall of boiler, hanging near to water wall just above Separated OFA top.	One no. in middle of each wall of boiler	K type TC																												
	3	Penthouse roof top area: Hanging near the boiler wall	8 nos. (1 no. each on front and rear side, 3 nos each of left and right side of boiler)	Mineral insulated K-type TC																												
	4	Main Steam, HRH piping	4 no. per Main steam piping (Left/Right) and HRH steam piping (Left/Right)	MTT mounted above insulation metal sheet of MS/HRH piping using metallic clamps	TC shall be provided for each vertical portion of the pipeline, clamped at the top end of each of the respective vertical portions.																											
	<u>Safety Control Room:</u> Contractor shall supply and install IP based CCTV system along with IP based announcement system which shall be used for monitoring safety during construction from Safety control room. It shall be possible to make announcements to alert the workers whenever required. These cameras shall be installed at all strategic locations in the plant area. These cameras can be wired or wireless as per suitability at site. Initially these installations will be temporary & locations will keep on changing depending upon the work in progress. After COF of last Unit these cameras are to be installed permanently at suitable locations in consultation with SCCL. Drone based safety monitoring shall be done during day to monitor critical works at a close range. The images / Video feed from drone shall have sufficient resolution to identify the work under progress. Following quantity of items shall be provided by contractor as a minimum. <table><tr><th>SI No</th><th>Name of Item</th><th>Quantity common for the station</th></tr><tr><td>1</td><td>IP based PTZ dome camera (HD)(wired/wireless)</td><td>25 nos</td></tr><tr><td>2</td><td>CCTV camera database redundant server with speaker (Shall work in redundant mode, one primary and another secondary server)</td><td>one set</td></tr><tr><td>3</td><td>Drone</td><td>One no</td></tr><tr><td>4</td><td>LED display panel-based video wall (85 “)</td><td>2 nos</td></tr><tr><td>5</td><td>Vehicle speed detection system with 5 no of IP based camera at road turning points</td><td>One set</td></tr><tr><td>6</td><td>IP based announcement system with 30 loudspeakers with sufficient power for the intent.</td><td>One set</td></tr><tr><td>7</td><td>Hardware & Software</td><td>On as required basis</td></tr><tr><td>8</td><td>Power supply / cables / desk / furniture / network switches/joy sticks etc.</td><td>On as required basis</td></tr></table>					SI No	Name of Item	Quantity common for the station	1	IP based PTZ dome camera (HD)(wired/wireless)	25 nos	2	CCTV camera database redundant server with speaker (Shall work in redundant mode, one primary and another secondary server)	one set	3	Drone	One no	4	LED display panel-based video wall (85 “)	2 nos	5	Vehicle speed detection system with 5 no of IP based camera at road turning points	One set	6	IP based announcement system with 30 loudspeakers with sufficient power for the intent.	One set	7	Hardware & Software	On as required basis	8	Power supply / cables / desk / furniture / network switches/joy sticks etc.	On as required basis
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SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		Annexure B to IIC Contract quantity	PAGE 18 OF 19																											

CLAUSE NO.	SCOPE OF SUPPLY	
	The above quantity is minimum and any additional item or quantity required for meeting the intent of specification shall also be in the scope of this package Analytics for Safety vest and helmet is to be deployed on all 25 nos. of cameras and any safety violation shall be alerted through IP based announcement system. Any over speeding of vehicle should also be warned through speakers automatically. 24/7 safety control room shall be functional from initial stage of the project construction. Temporary safety control room for the same is to be made functional within three (3) months of LOA. Permanent safety control room shall be made functional within six (6) month from LOA.	
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	Annexure B to IIC Contract quantity
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SUB-SECTION–IID

CIVIL WORKS

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES		
1.00.00	SCOPE OF CIVIL, STRUCTURAL & ARCHITECTURAL WORKS OF EPC PACKAGE The scope of civil, structural and architectural works shall include topographical survey, site clearance, preparation of design documents and drawings and getting approval of the same from the Employer and construction of all civil, structural and architectural works including supply of all construction materials for all buildings, equipment and facilities for the project. The nature of work generally involves earthwork in excavation in all types of soil and rock including controlled blasting/ mechanical means, de-watering, backfilling around completed structures, plinth filling, disposal of surplus earth/rock/excavated material/dismantled material, concreting including reinforcement and form work, chimney construction using slip form, masonry work, plastering, corrosion protection measures including painting, un-insulated / sandwiched insulated metal wall cladding, roofing and flooring including permanent steel decking, false ceiling, under deck and over deck insulation, acid and alkali resistant lining, fabrication of all structures at factory, pre assembly of fabricated structures at factory, transportation of pre-fabricated structures and erection of steel structures (with bolted field connections) and miscellaneous steel works (i.e., steel staircase, cable supports, pipe supports, ladders, walkways, railing, chequered plate/grating floors, inserts etc.), painting of structures, paving, gravel filling, providing pre-cast covers, damp proofing, roof water proofing, anti-weed treatment, roads, drainage, sewerage, rain water harvesting, final grading and site clearance before handing over and any other item of work required for completion of all systems under the scope of work complete. The works covered under the scope of the bidder have to be executed in an existing power station. The bidder shall take all necessary precautions to protect the existing equipment, structures, facilities and buildings etc. from damage. In case any damage occurs due to activities of the bidder on account of negligence, ignorance, accidental or any other reason whatsoever, the damage shall be made - good by the bidder at his own cost to the satisfaction of the Owner. The bidder shall take all necessary safety measures to avoid any harm, injury to his workers/staff from the equipment / facilities of the power station. The scope of Bidder for civil, structural and architectural works as defined above shall include but not be limited to the following buildings/ areas/ systems along with their foundations, super structures and finishes complete: 1. Topographical Survey. 2. Geotechnical Investigation. 3. Site clearance including cutting of trees of girth less than 30 centimeters. Cutting of trees of girth 30cm and more shall be done by Owner after finalization of GLP. However, removal and disposal of roots of trees of all girths including trees of girth less than 30cm or more and other vegetation is in Bidder's scope. 4. NOT USED		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001 SUB-SECTION-IIID CIVIL WORKS PAGE 1 OF 10		

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	5. Infrastructure Works a. Rigid pavements Roads in Plant area and all other roads as shown in General Layout plan (GLP)/ Road layout tender drawing including approach road /heavy duty paving/heavy duty passage to buildings/ facilities in the package, including construction of priority roads at onset of project works and maintenance of the roads during the entire construction period. Laying of 40mm bitumen mastic wearing course over roads after completion of construction activities i.e at the time of handover as specified in CI 5.10.00 of part-B sub-section D-1-5. b. RCC Storm water drainage in Plant area (including facilities/structures) and RCC drains along roads in Bidder's Scope including connection upto disposal point as shown in GLP/Layout of drain. Drains to be constructed simultaneously with roads. c. Connection of sewage lines of all buildings under Bidder's scope to the nearest sewerage system. d. Water supply system for Plant area. e. Safety Park Building as per tender drawing. f. Safety Control Room at onset of project works. g. Separate RCC drainage network with GI grating cover and sump pit for plant effluents for all buildings and facilities in Bidder's scope including floor wash water from all the facilities in Plant Area upto Effluent Treatment plant including connection of effluent line from structures under the scope of package. h. Hard crusting in plant area and preassembly area to facilitate movement of vehicles and erection of equipment. i. Construction stores (covered) and Open Store Yard with RCC paving & chain link fence and gate as per requirement specified in Civil section. These stores shall be handed over to Employer on completion of civil works or as agreed with Employer for future use after repairs etc. 6. Foundations for all buildings/ area/ systems including machine foundations. 7. All Civil, Structural, Architectural works including underground facilities like drainage, sewerage, trenches, earthing mat/ grounding for entire Plant area covering the following: a. Boiler and ESP supporting structures and foundations. b. Elevator pit & Civil Works for Machine Room for Boiler Elevator. c. Mill Bunker building supporting structures and foundations, floors, roof & side cladding. d. ESP control room building. e. Mill reject silo and associated trenches. f. Compressor house. g. Coal mill foundations & PA/FD/ID Fan foundations.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IIID CIVIL WORKS	PAGE 2 OF 10

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES
	h. Seal air fan foundation and all other equipment foundations. i. Coarse ash hopper tower foundations & FEA tower foundations. j. Coal transfer points, coal conveyor galleries and supporting trestles in the boiler area – foundations, floors, roof & side cladding, staircases, gravity take up structure for conveyors in the boiler area. k. Area Paving and miscellaneous foundations in entire area enclosed within the peripheral roads of the entire plant area from edge of drain along peripheral road beyond transformer yard up to road beyond Ash handling facilities area bound by peripheral roads in orthogonal directions, including heavy duty passages, sump pits, drains, culverts, cable slits, fire water trench, including, rail/ road/ drain crossing of fire water trench & pipes etc. (as shown in tender drawing). l. Bunker MCC including RIO room. m. Main Power House building. n. Foundations for turbine generator, turbine driven boiler feed pumps and motor driven boiler feed pump(s) including steel helical springs and viscous dampers below RCC top deck (The foundation type can be with/without steel helical springs/ dampers as per option provided in specification) o. CW Pit, CEP Pit, and all other equipment foundations in Turbine-Generator (TG) area. p. CW duct /liner including PCC/RCC encasement q. Transformer yard area foundations including rail track cum road along the entire A-Row extending up to peripheral roads on either side and transformer yard, condensate storage tank foundation, condensate transfer pump foundation, fire barrier wall, pit, sump, pipe and manhole, common oil retention pit/oil-water separation pit, gate and fencing etc. r. Diesel generator set foundations & stack foundations along with steel support structure and foundations for stack support. s. Civil, structural, architectural works for CPU system in Main Power House & regeneration area including Switchgear/MCC and control room building and Transformer foundations. t. Civil, Structural & Architectural works for rooms for Owner's Electrical equipment like HT/LT switchgear, cable vault, batteries/battery chargers, foundation of service transformers, space for bus ducts and cable trays etc. as listed in Clause no 1.19.00 of Subsection -IIB, Part A , Section VI of Technical specification. 8. Chimney including elevator, electrical works, aviation obstruction lighting. 9. Civil, structural, architectural works of all facilities of Flue gas desulfurization (FGD) system listed in Part A of Technical specification including modification/cutout for floor openings/construction of pedestals etc in existing buildings as required.
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001 SUB-SECTION-IID CIVIL WORKS PAGE 3 OF 10

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES
	10. Civil, Structural, Architectural works for all buildings/ structures/ facilities for ash handling and ash water recirculation system along with switchgear building & control room including the following: a. Ash Water Pump House open type b. Ash Slurry Pump house shed as per system requirement c. HCSD Pump house shed, Mixing tank foundation. d. Switch gear/MCC and Control Room for all buildings. e. Silo area utility building (build type as per system requirement) f. Fly Ash Silo, Foundation for Dewatering bin, including base plate and supporting pedestals g. Transport air compressor Shed with side sheeting h. Conveying air Compressor Shed with side sheeting (if required as per system) i. Steel Trestles including foundation for supporting fly ash Piping within plant area and up to silos j. RCC pedestals for ash slurry disposal pipes lines and Ash water recirculation pipe line inside pant boundary and outside plant boundary up to ash dyke including garlanding pedestals. Excavation/grading of area required for pipe routing including disposal is also in bidder's scope k. Bottom ash slurry trench as per system requirement. l. Miscellaneous works like Transformer Foundation, Fencing, Paving etc. m. Miscellaneous structures including Foundation for settling tank, surge tank BA overflow tank, etc. n. Culverts/local humps or bridges as per site conditions, for routing of the ash pipes at crossing for nallah /water body crossing /roads/rail lines etc. o. Weigh Bridge p. Any other buildings/structures if required as per system. 10. Civil, structural and architectural works for O&M store, rest rooms for O&M workers 11. Civil and architectural works for First Aid Centre 12. Civil, structural, architectural works for fuel oil storage system namely fuel oil pressurizing pump house with switchgear room, MCC cum control room, foundation and dyke wall and all associated works for LDO storage tank. 13. CW system Civil, Structural and Architectural works a) CW pump house with steel superstructure and metal sheeting at roof including pump foundations, maintenance area, forebay and Transition zone b) CW Switchgear/MCC & control room building including transformer foundation.
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001 SUB-SECTION-IID CIVIL WORKS PAGE 4 OF 10

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES
	19. Coal and Biomass Handling Plant All civil, structural & architectural works associated with coal, handling plant, i.e. Wagon tippler, reclaim hopper, silos, truck tippler, transfer points, crusher houses, overhead/ground conveyor galleries, tunnels for conveyor galleries, stacker/reclaimer foundations, pump houses, MCC/Control Buildings, penthouse, wind barrier, approaches, drainage etc and all other related works complete as per system requirement. 20. Pipe /Cable / duct supporting structures, trenches, culverts, duct banks, pedestals, hume pipe culverts and thrust blocks etc. associated with all systems covered under the scope of EPC package. 21. Civil works for Outdoor transformer foundations 22. Earthing mats & risers for all buildings. 23. Sheds for Construction workers and O&M/Workers, including food serving kiosk and bio Toilet Blocks for ladies and gents, in adequate numbers to cater to the workers working in each work area. The sheds should be easily accessible to workers by foot. Minimum 06 numbers of shed in different areas shall be provided. Drinking water facility and maintenance of toilet and shed shall be the responsibility of the bidder till COD of the unit. The sheds shall be constructed at start of the project construction. 24. Facilities for rainwater harvesting in Plant area and other buildings in Bidder's scope. 25. Civil Works associated with fire detection and fire protection system Civil, structural, architectural works for fire water tank foundation including Switchgear/MCC & Control room, fire water booster pump house & control room, foam system including foam system shed & control room, deluge valve housing, pedestals for pipes, concrete encasement of pylon pipes (within filled up gravel portion) used for HVV spray system for protection of transformers, rail/road crossing of fire water trench etc, civil works associated with buried pipes & crossing etc. 26. Civil works associated with air conditioning & ventilation system. 27. Civil, Structural works for pipe /cable /duct supporting structures, trestles and foundations, trenches, culverts, duct banks, pedestals, hume pipe & culverts, buried pipes, racks, culverts across rail/road tracks for pipes/ drains/ cables and any other facility and thrust blocks etc. associated with all systems covered under the scope. 28. Miscellaneous Switchgear building. 29. Civil, structural, architectural works for SOLAR PV plant on 'roof top of building/facilities in the bidder's scope. 30. Vehicle parking sheds and any other miscellaneous building or facility. 31. Ash Dyke The scope under Ash Dyke involves construction of 'intermediate Starter Dyke' in existing ash pond and is mainly related, but not limited, to the following:
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001 SUB-SECTION-II D CIVIL WORKS PAGE 6 OF 10

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	and architectural works though not explicitly mentioned in the above list but required for the completion of the various systems of the package shall also be in the scope of the bidder			
1.00.02	CORROSION PROTECTION The plant lies in the corrosive category C3 as per ISO 12944. Protection measures shall be provided as specified in Part-B of Technical Specifications.			
1.00.03	The scope of work of the successful bidder includes: - (a) To interact, discuss with the Proof Checking agency for the modalities, schedule, and design parameters, loading to be considered in line with the Owner's specifications. (b) To submit the drawings and design calculations as per the project schedule sequentially as pe the sequence below. (c) Incorporate all the comments/observations/suggestions furnished by the PC on the drawings and design documents. (d) After review of the drawings and design documents by PC the same shall be submitted to the Owner for consent. In case of further observation by Owner the same is also to be incorporated. Sequence of submission of documents: - 1) Design basis which will include all design philosophy, seismic and wind criteria furnished by Owner, foundation type along with bearing capacity as per Geotechnical Report, materials of construction, loading details, finishing schedule etc. 2) Architectural details/General Arrangement drawings for buildings, facilities, equipments including the elevations and cross sections. 3) Design calculation along with the STAAD/ANSYS/SAP 2000 models and/or computer work sheets or any other software model as mutually agreed with Owner. 4) Foundation drawings. 5) Superstructure drawings sequentially as per construction sequence or material projection, as applicable.			
2.00.00	LABOUR & STAFF COLONY AND CONSTRUCTION FACILITIES			
2.01.00	LABOUR & STAFF COLONY The following are in the Bidder's scope of work for labour& staff colony:- a) Development of Bidders temporary staff colony and labour colony along with toilets & fencing etc.For safety of labour, bidder to provide separate approach road for their movement, as per site conditions, which shall be completely isolated from material movement road/path. No material movement shall be allowed on approach road meant for Labour colony. b) Adequate no. of Rest rooms with toilet for bidder's labour& staff.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		PAGE 8 OF 10

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
2.02.00	c) All Civil and Structural work associated with drinking and service water for Bidder's labour and other personnel at the work site/colony/offices including pump houses, pipes, overhead tank, tube wells etc. d) The EPC Contractor shall have total responsibility for providing and maintaining facilities for safety, welfare, drinking water and sanitation, hygiene, biennial health checkup etc. for construction workers at their workplaces as well as at labour& staff colonies. The facilities for occupational safety, healthy environment, first aid, drinking water, resting place & toilets, canteen, crèche, etc. shall be provided at the workplace for construction workers by the contractor. e) Accommodation for Workers & staff colony in adequate numbers as required for the project peak demand shall be made in the form of temporary structures which shall be removed after completion of the project. It shall have facilities for drinking water & sanitation, approach road, dust suppression, drainage, sewage treatment plant, solid waste collection & disposal, fuel for cooking, medical healthcare, creches, etc. f) Sole responsibility of development and maintenance of above facilities for construction workers hired by the Contractor or his sub-contractors shall rest with the Contractor. Land, water, electricity for the labour& staff colony shall be arranged by the Contractor as stipulated elsewhere in Technical Specification.			
	CONSTRUCTION FACILITIES The following are in the Bidder's scope of work pertaining to construction facilities in this package. 1. Construction Water Construction water shall be the responsibility of Bidder during all stages of construction. However, construction water may be provided by Owner at one point on chargeable basis. Bidder shall arrange for further distribution/transportation to required location by their own. 2. Construction Power Scope of supply of construction power is specified in SECTION – VI,PART-A, SUB SECTION IIB of Technical specification. 3. Construction of following temporary facilities of bidder a) Construction office, b) Construction stores (covered) & open stores as per his requirement. c) Workshops for maintenance of construction plant and equipment. d) Material/field testing laboratory facilities and any other temporary building. 4. Providing all necessary fire-fighting devices/equipment/fire tender etc. required during the project execution stage in project areas including laydown/pre-assembly yard area. 5. Providing all tools and tackles required for the work. 6. The Bidder shall arrange skilled/semiskilled/unskilled labour (from local source(s) as far as available) and supervisory staff for quality execution of all civil, structural and architectural works.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-IID CIVIL WORKS	PAGE 9 OF 10



SUB-SECTION-III

TERMINAL POINTS & EXCLUSIONS AND OWNER'S INPUT

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	TERMINAL POINTS & EXCLUSIONS		
1.00.00	TERMINAL POINTS The following terminal points are to be read in conjunction with the tender drawings, scope of supply and technical specifications of various systems.		
1.01.00	MECHANICAL		
1.01.01	Auxiliary Steam System Headers Interconnection a) TP Location for Auxiliary Steam interconnection for Auxiliary Steam Station Header with existing Stage-I HT Header with motorized and manual isolation valves as indicated in the tender drg. shall be near Column No. 20, C-Row at 32-35 M elevation of Stage I TG Bay. b) The stub/Tee-off connections with Isolating valve and blank flange on the auxiliary steam Unit/Station header for future connections as indicated in the tender drg. All the interconnection with existing piping system (HT Station Header) to be done by the bidder. All the required fittings, specialties & valves, Anchors / Additional Supports required for interconnection shall be provided by the bidder.		
1.01.02	DM Water Make up (Normal/ emergency) and Boiler/ Deaerator Fill Water System c) Contractor shall provide a provision for interconnecting existing DM water tanks with the New DM Water Tanks with connection Flanges. Contractor shall also provide an interconnection provision with isolation valve & flanges for New DM Make Up Pumps discharge connectiun with existing DM Make Up Pumps discharge Header. d) Contractor shall provide a provision for interconnecting existing Boiler Fill Pump discharge header connection with New Boiler fill pump discharge header with isolation valve & flanges.		
1.01.03	Clarified Water make up system Contractor shall provide a connection flange provision with interconnecting valve from puddle pipe from the clarified water distribution chamber at Clarified Water Intake Well of New Stage for connecting with existing Stage.		
1.01.04	Potable Water Piping System a) Contractor shall take connections with interconnecting valves from potable water header running at 324E near the road behind the chimney of Stage-I at suitable locations to meet the potable water requirement of Stage-II. b) Contractor shall take connections with isolation valves from potable water pipe 65 NB running at coordinate at about 1075.0S, 305.0W to meet the potable water requirement of new CHP.		
1.01.05	Raw Water System at Reservoir a) Raw water reservoir R2 outlet dummy pipe of 1000 NB for drawing make-up water for the plant from Reservoir 2 at 400N, 750 E in GLP (approximate location) to ST II RWPH.		
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CLAUSE NO.	TERMINAL POINTS & EXCLUSIONS			
	b) One 1000 NB line dummy shall be provided outside stage-I make-up water pump house near reservoir R1 for drawing make-up water for the plant from Reservoir 1 to St II RWPH. c) Contractor shall provide a provision for interconnecting New Raw water Discharge Piping to PT Plant with existing Raw Water Discharge Piping for Stage I PT Plant with a provision of Valve and Dummy Flange.			
1.01.06	Compressed Air System			
1.01.05	Instrument Air System			
	a) Bidder shall interconnect stage-II instrument air header with two existing 150 NB instrument air header running along C-ROW pipe rack near the column no.11 of stage-I. Interconnection shall be provided with motorized valves. b) Bidder shall take connection with interconnecting valves from stage-I 50 NB instrument air header running on existing pipe rack to fuel oil pump house for the instrument air requirement of new fuel oil pressurizing pump house.			
1.01.07	Service Air System			
	a) Bidder shall interconnect stage-II service air header with existing 200 NB service air header running along A-ROW pipe rack near the column no.11. Interconnection shall have provided with interconnection valves. b) Bidder shall take connection with interconnecting valves from existing 50 NB service air header running on existing pipe rack to fuel oil pump house for the service air requirement of new fuel oil pressurizing pump house.			
1.01.09	Others			
	a) Outlets of mill reject storage bunkers.			
1.01.08	Limestone			
	Limestone slurry with 30% solid concentration and fineness as mentioned elsewhere in the specification shall be provided by Employer at its Limestone slurry storage tank.			
1.01.09	Gypsum			
	Gypsum Slurry with 45% solid concentration after Primary Hydro cyclones shall be connected to inlet chute of employer's Vacuum belt filters.			
1.01.10	Fuel oil system			
	a) Connection from existing LDO supply to pressurizing pump suction line as indicated in the tender drawing. b) Interconnection tap off at common discharge line of existing LDO system			
1.01.11	Coal & Biomass Handling Plant:			
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CLAUSE NO.	TERMINAL POINTS & EXCLUSIONS			
1.01.12	a) Feed from Employer's TP of Stage-I to Stage-II			
	b) Feed to Employer's Conveyor of Stage-I			
1.01.12	Ash handling system & AWRS			
1.01.13	a) Existing Ash dyke for Bottom Ash slurry disposal piping/HCS D pipes			
	b) Rail wagon/ closed tanker/ open truck loading outlets of Main Fly Ash storage Silos			
1.01.13	c) Closed tanker/ open truck loading outlets of HCS D Silos			
	d) OFL of existing ash dyke for New AWRS pumps			
1.01.13	Fire Detection and Protection system			
2.00.00	Separate hydrant and spray headers available in plant area of Stage-I for tapping required for Hydrant and Spray system of Stage-II. However, if found necessary during detailed engineering, dedicated & new fire water headers/mains (hydrant & spray) tap-off shall be taken from existing discharge headers of hydrant/spray pumps and shall be routed to Phase-II area for connection to fire water pipe network of Phase-II.			
2.00.00	ELECTRICAL			
3.00.00	a) Terminal point for Construction power – 3.3kV terminal of employers switchgear.			
	b) Terminal points for switchyard- 400 KV Switchyard at Singareni stage-II shall be in the bidder's scope.			
3.00.00	NOT USED			
4.00.00	EXCLUSIONS			
4.01.00	MECHANICAL			
4.01.00	a) Manufacturing, supply, erection and commissioning scope of SCR/Hybrid System which shall only be limited to the works required for SCR ready /Hybrid ready plant.			
	b) Supply of coal, limestone, Biomass.			
4.01.00	c) Truck, Dozer, Dumpers etc			
	d) Fuel Oil unloading system			
4.01.00	e) Fugitive dust suppression system at ash pond			
4.02.00	ELECTRICAL			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-III TERMINAL POINTS & EXCLUSIONS AND OWNER'S INPUT
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CLAUSE NO.	TERMINAL POINTS & EXCLUSIONS 		
4.03.00	a) 400kV transmission lines CIVIL a) Green belt development and afforestation b) Township c) Landscaping		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-III TERMINAL POINTS & EXCLUSIONS AND OWNER'S INPUT PAGE 4 OF 4

CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES			
	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES FOR SHORTFALL IN PERFORMANCE AND GUARANTEE TESTS The term "Performance Guarantees" wherever appears in this Sub-Section shall have the same meaning and shall be synonymous to "Functional Guarantees". Similarly the term "Performance Tests" wherever appears in this Sub-Section shall have the same meaning and shall be synonymous to "Guarantee Test(s)". The term "BMCR" (Boiler Maximum Continuous Rating) appearing in the Technical Specification shall mean the maximum continuous steam output of Steam Generator (as defined Cl. No. 1.02.00 Sub-section A-01, Part-B) at super heater outlet at rated parameters. The term "TMCR" (Turbine maximum continuous rating) appearing in the technical specification shall mean 800 MW electrical power output at generator terminals (power at generator terminals as per clause indicated in this sub-section) under rated steam parameters, 0% cycle make-up and 77 mmHg (abs) condenser pressure unless used in conjunction with a different cycle make-up and/or a different condenser pressure and /or a different throttle steam pressure.			
1.00.00	PERFORMANCE GUARANTEES			
1.00.01	General Requirements			
	a) The Contractor shall guarantee that the equipment offered shall meet the ratings and performance requirements stipulated for various equipment covered in these specifications. b) The guaranteed performance parameters indicated in furnished by the bidder in his offer, shall be without any tolerance values whatsoever and all margins required for instrument inaccuracies and other uncertainties shall be deemed to have been included in the guaranteed figures. c) The Contractor shall conduct performance test and demonstrate all the guarantees covered herein, during performance guarantee/acceptance test. The various tests which are to be carried out during performance guarantee/acceptance test are listed in this Sub-section. The guarantee tests shall be conducted by the Contractor at site in presence of Employer on each unit individually. d) All costs associated with the tests including cost associated with the supply, calibration shall be included in the bid price. e) It is the responsibility of the contractor to perform the Performance Guarantee/ Acceptance test as specified in this subsection. At all times during the Performance Tests the emissions and effluents from the Plant shall not exceed the Guaranteed Emission and Effluent Limits. f) The Contractor shall make the plant ready for the performance guarantee tests before start of Initial Operation. All CAT-1 Performance Guarantee tests shall be conducted along with initial operation except following a) Coal Pulverisor Wear Parts Warranty b) Particulate Emission/ESP Efficiency, FGD. c) "PG test of Cooling Tower (IDCT) shall be carried out by the contractor within one year of successful completion of trial operation of the cooling tower and at a time when the atmospheric conditions are within limits of deviation from the design conditions as specified, preferably in the period from May to September. If Unit trial operation falls in these months then PG test of IDCT can be clubbed with Unit trial operation. d) PG test of A/C System (for aux. power consumption under station auxiliaries) shall be carried out by the contractor within one year of successful completion of			
SINAGRENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID DOC. NO. CW-CM-11159-C-O-M-001	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 1 OF 71

CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES			
	trial operation of the respective A/C system during summer in the months of May-August. If unit trial operation falls in these months then PG test of A/C system can be clubbed with unit trial operation. g) Instruments for PG test and instruments for process control of similar applications are envisaged to be of same make and model having same accuracy level. However, instruments for PG test are also acceptable as per standard and proven practice of the contractor/OEM and in such case, instruments for process control shall be as per requirements specified in Part-B of technical specifications. Instruments to be used for PG test shall be additionally supplied over and above the instruments shown in tender P&IDs. PG test equipment being supplied, installed and commissioned for each unit, shall be retained by employer after completion of PG test. Control system loop tuning required to limit the variation of parameters during performance guarantee testing shall be completed prior to PG Test / initial operation. All PG test process parameters shall be made available in DDCMIS h) Tools and tackles, instruments/devices including flow devices, matching flanges, impulse piping & valves etc. and any special equipment, required for the successful completion of the tests, shall be provided by the contractor free of cost. i) The Performance / Acceptance test shall be carried out as per the standard procedure included in the specification. For some of the PG tests, standard PG test procedures have not been included in the specification. PG test procedure for such PG tests shall be submitted, as per latest International codes / standard meeting the specification requirements along with sample calculations & detailed activity plan of preparation (including test instrumentation), conductance and evaluation of Guarantees, within 90 days of the date of Notification of Award and finalization of the PG test procedure shall be done within 180 days from the date of Notification of Award. 1. For Cat-I Performance / Acceptance tests to be conducted along with the initial operation: After the conductance of Performance test, the test results shall be calculated in contractor's PG test program/software. The correction curves shall be fed/inbuilt in the PG test program/software. Provision of manual entry of offline data which cannot be captured online (such as Relative humidity, Atmospheric pressure, Coal analysis, Unburnt carbon in fly ash and bottom ash, Bottom ash / fly ash collection at various hoppers, Flue gas analysis (grid result) etc .) and necessary for calculation of PG Test result shall also be provided. The contractor shall submit the detailed test evaluation report of Performance test results to Employer promptly but not later than 7 days from the date of conductance of Performance test. 2. For Performance / Acceptance tests other than those identified at 1 above: After the conductance of Performance test, the contractor shall submit the test evaluation report of Performance test results to Employer promptly but not later than 7 (seven) days from the date of conductance of Performance test. However, preliminary test reports shall be submitted to the Employer after completing each test run. j) The contractor shall submit for Employer's approval the detailed Performance Test procedure (except for the guarantee tests for which the standard PG test procedure is identified in technical specification) containing the following:			
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	1. Object of the test. 2. Various guaranteed parameters & tests as per contract. 3. Method of conductance of test and test code. 4. Duration of test, frequency of readings & number of test runs. 5. Method of calculation. 6. Correction curves and respective equations for graphs to be fed for the online computation. 7. Instrument list consisting of range, accuracy, least count, and location of instruments along with reference approved P&IDs. 8. Scheme showing measurement points. 9. Sample calculation. 10. Acceptance criteria. 11. Any other information required for conducting the test. k) In case during performance guarantee tests it is found that the equipment/system has failed to meet the guarantees, the Contractor shall carry out all necessary modifications and/or replacements to make the equipment/system comply with the guaranteed requirements at no extra cost to the Employer and re-conduct the performance guarantee test(s) with Employer's consent. However, if the specified performance guarantee(s) are still not met even after the above modifications/replacements within ninety (90) days or a reasonable period allowed by the Employer, after the tests have been completed Employer will have the right to the following: i) For Category-I Guarantees Accept the equipment/system/plant after levying Liquidated Damages as specified hereunder. The liquidated damages, for shortfall in performance indicated in clause 1.01.02 for this sub-section are on per unit basis and shall be levied separately for each unit, except for the rate indicated for auxiliary power consumption for station auxiliaries which is on station basis. The liquidated damages shall be prorated for the fractional parts of the deficiencies. The performance guarantees coming under this category shall be called 'Category - I' Guarantees. ii) For Category-II Guarantees In case the performance guarantee(s) are not met by the Contractor during demonstration test, the Contractor shall carry out all necessary modifications and/or replacements to comply with the guaranteed requirements at no extra cost to the Employer and re-conduct the performance guarantee test(s) with Employer's consent. If, however, the demonstrated guarantee(s) are not met even after the above modifications / replacements within ninety (90) days, it will be concluded that, the equipment has failed to meet the guarantee(s). In such a case, Employer shall Reject the equipment/plant/system and recover from the Contractor the payments already made. The performance guarantees under this category shall be called 'Category - II ' Guarantees. Conformance to the performance requirements under Category -II is mandatory. iii) For Category-III Guarantees Accept the equipment/system after assessing the deficiency in respect of the various ratings, performance parameters and capabilities and recover from the contract price an amount equivalent to the damages as determined by the EMPLOYER. Such damages shall, however be limited to the cost of replacement of the equipment(s) / system(s) replacement of which shall			
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1.01.00 1.01.01	remove the deficiency so as to achieve the guarantee performance. These parameters/capacities shall be termed as category - III, guarantees. GUARANTEES UNDER CATEGORY - I The performance guarantees which attract liquidated damages (LD) are as follows: i) Unit Heat Rate at 100% TMCR load Guaranteed Unit Heat rate in kcal/kWhr under rated steam conditions at 77 mmHg(abs) condenser pressure with zero make up at 800 MW load (i.e. 100% of rated load). ii) Unit Heat Rate at 55% TMCR load Guaranteed Unit Heat rate in kcal/kWhr under turbine throttle main steam pressure of 150 Kg/cm² (abs) and rated Main Steam and Reheat Steam temperature at 77 mmHg(abs) condenser pressure with zero make up at 440 MW load (i.e. 55 % of rated load) . iii) TG Output Continuous TG output of 840 MW unit load (i.e. 105% of rated load) under rated steam conditions at 77 mm Hg (abs) condenser pressure with zero make-up. iv) Average Condenser Pressure Average Condenser pressure in mm Hg (abs) measured at 300 mm above the top row of condenser tubes with 840 MW output, 0% make up, design CW temperature and design CW flow. Note: (a) The condenser pressure measurement while conducting the guarantee tests from (i) to (iv) above shall be measured at 300 mm above the top row of condenser tubes. v) Steam Generating Capacity Steam generating capacity in T/hr of steam at rated steam parameters at superheater outlet & rated steam temperature at reheater outlet (with any combination of mills working as per Employer's discretion) with the coal being fired from within the range specified in the table at Annexure-IV-2, Sub section I-B (Project information), Part A, Section VI . vi) Coal Pulveriser Wear Parts Warranty Life of coal pulveriser wear parts, in hours of operation, for the entire range of coal characteristics specified. (To be demonstrated as per clause 1.01.04 of this sub-section). vii) Particulate Emission/ ESP Efficiency Contractor shall guarantee that the particulate emission from ESP(s) shall not be more than 17 mg/ Nm³ under guarantee point (refer clause no. 1.05.20 related to ESP sizing criteria Sub-Section-A-01, Part-B(Mechanical), Section-VI) condition at 100 %TMCR i.e. at 800 MW unit load with design coal firing. The corresponding ESP efficiency shall be worked out as per the procedure outlined in clause 1.01.06 of this Sub-section. viii) FGD SO₂ Removal Efficiency SO₂ removal efficiency to achieve SO₂ emission in the Chimney to less than 60 mg per Nm³ as per Part-B, Sub-section-A-02. ix) Limestone Consumption Rate			
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1.01.02	Limestone consumption of FGD system in kg/hr under guarantee point conditions (refer clause no. 1.05.21.01 related to FGD sizing criteria, Sub-Section-A-01, Part-B (Mechanical), Section-VI)) shall be demonstrated. Note: Bids with lime stone consumption higher than 8500 kg/hr shall not be accepted and no evaluation credit shall be given for lower consumption rate. x) Unit Auxiliary Power Consumption Unit auxiliary power consumption comprising of all Unit Auxiliaries shall be guaranteed in line with the requirements stipulated in clause 1.01.07.01 of this sub section. Power consumption of all unit auxiliaries shall be taken for continuous unit operation at 800 MW (i.e. 100% rated load) under rated steam conditions and at condenser pressure of 77 mm Hg (abs) with 0% make-up with design coal. Station auxiliary power consumption comprising of all station Auxiliaries required for continuous station operation at 1 x 800 MW (i.e. 100% rated load) under rated steam conditions and at condenser pressure of 77 mm Hg (abs) with 0% make-up with design coal shall be guaranteed in line with the requirements stipulated in clause 1.01.07.02 of this sub section. Notes: (a) Power consumption of each of the pump/fan/compressors/ Conveyors etc. wherever mentioned shall be measured with its own drive at the switchgear end. xi) Cooling Tower The cold-water temperature as specified shall be guaranteed for the design conditions of CW flow, range, ambient WBT as per the performance test procedure of cooling tower elaborated elsewhere in the specification. “Predicted cold water temperature” shall be arrived from the guaranteed cold-water temperature by correcting the same for the test conditions of range, ambient conditions and circulating water flow using the performance curves furnished by the contractor. In case the “Test cold water temperature” is higher than the “Predicted cold water temperature”, Employer reserves the right to accept the tower after assessing the liquidated damages. The liquidated damages for shortfall in cold water temperature shall be worked out for all the cooling towers as per relevant clause & sub-section. xiii) LD for 0.1% increase in APH Leakage against the shortfall (as per part-B guarantee condition description). AMOUNT OF LIQUIDATED DAMAGES APPLICABLE FOR CATEGORY-I GUARANTEES If the performance guarantee(s) are not met by the Contractor during PG Test, it will be concluded that, the equipment has failed to meet the guarantee(s) and action shall be taken as per the Contract Requirement. If the performance guarantee(s) specified at clause 1.01.01 are not met by the Contractor even after the modifications and/or replacements mentioned at clause 1.00.01 of this Sub-section, Employer will accept the equipment/system only after levying liquidated damages against the Contractor, at the rates listed herein, and such liquidated damages shall be deducted from the Contract Price:			
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CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES				
	S. No	Guarantee	Rate of Liquidated Damages (LD)	Limiting Value	
	(i)	For Increase in the Guaranteed unit heat rate in kcal/kwhr at 800 MW under rated steam conditions at 77 mmHg(abs) condenser pressure with zero make up	INR 92348836 (INR ninety-two million three hundred forty-eight thousand eight hundred thirty-six only) per 1 kcal/kwhr increase in Unit heat rate	Not more than 2081 kcal/Kwhr	
	(ii)	For Increase in the Guaranteed unit Heat rate in kcal/kwhr under turbine throttle main steam pressure of 150 kg/cm2 (abs) and rated Main Steam and Reheat Steam temperature at 77 mmHg(abs) condenser pressure with zero make up at 440 MW load (i.e. 55 % of rated load).	INR 33209900 (INR thirty-three million two hundred nine thousand nine hundred only) per 1 kcal/kwhr increase in Unit heat rate	Not more than 2185 kcal/Kwhr	
	(iii)	For deficiency in Continuous TG output of 840 MW unit load (i.e. 105% of rated load) under rated steam conditions, 77 mmHg (abs) condenser pressure with 0% make-up.	INR 133697 (INR one hundred thirty-three thousand six hundred ninety-seven only) per 1 kW shortfall in TG output		
	(iv)	For deficiency in Average Condenser Pressure in mm Hg(abs) measured at 300mm above top row of condenser tube at 840 MW, 0% makeup, design CW temperature and design CW flow	INR 103061301 (INR one hundred three million sixty-one thousand three hundred one only) per 1 mm Hg increase in condenser pressure	Not more than 65 mmHg (abs)	
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CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES				
	S. No	Guarantee	Rate of Liquidated Damages (LD)	Limiting Value	
	(v)	Steam Generator Capacity For shortfall in the guaranteed steam generating capacity in T/h at rated steam parameters at superheater outlet & rated steam temperature at reheater outlet (with any combination of mills working as per Employer's choice) with the coal being fired from within the range specified	INR 17411726 (INR seventeen million four hundred eleven thousand seven hundred twenty-six only) for every 1 T/hr short fall in steam output	Not less than 102% of the turbine VWO steam flow requirement	
	(vi)	Coal Pulveriser Wear Parts Warranty Life of Coal Pulveriser wear parts in hours of operation	To be calculated as per clause 1.01.04 of the Functional Guarantees subsection	Not less than 8000 hours	
	(vii)	ESP Efficiency For shortfall in guaranteed ESP efficiency in percentage points under conditions specified at clause 1.01.01 (xi) of this sub section	INR 120344700 (INR one hundred twenty million three hundred forty-four thousand seven hundred only) for every 0.01% point shortfall in ESP Efficiency	Not less than as worked out to limit ODB to 17 mg/Nm ³ (max.) at ESP outlet before FGD inlet	
	(viii)	FGD SO₂ Removal Efficiency For shortfall in guaranteed SO ₂ removal efficiency in percentage points under condition stipulated in clause 1.01.01 (xii) of this Sub Section of Technical Specification	INR 3015763 (INR three million fifteen thousand seven hundred sixty-three only) for every 0.1% point shortfall in SO ₂ removal efficiency	SO ₂ removal efficiency to achieve SO ₂ emission in the Chimney to less than 60 mg per	
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CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES				
	S. No	Guarantee	Rate of Liquidated Damages (LD)	Limiting Value	
				Nm ³ as per Part-B, Sub-section-A-01	
	(ix)	Limestone Consumption Rate For increase in guaranteed limestone consumption of FGD system in kg/hr/unit under condition stipulated in clause 1.01.01 (xiii) of this Sub Section of Technical Specification	INR 22780060 (INR twenty-two million seven hundred eighty thousand sixty only) for every 100 kg/hr increase in limestone consumption rate	Not more than 8500 kg/hr.	
	(x)	For increase in the Auxiliary power consumption in kW for unit auxiliaries required for continuous unit operation at 100% TMCR i.e. 800 MW unit load.	INR 588872 (INR five hundred eighty-eight thousand eight hundred seventy-two Only) per 1 kW increase in Unit Auxiliary Power Consumption.	Not more than 56000 KW	
	(xi)	Per Cooling Tower - For every 0.2 deg. C rise in Cold Water Temperature from the guaranteed value* (* The Liquidated damages for Cooling tower shall be pro-rata for fractional parts of the deficiencies.)	INR 112913661 (INR one hundred twelve million nine hundred thirteen thousand six hundred sixty-one only) per for every 0.2 deg C rise in cold water temperature.		
	(xii)	LD for 0.1% increase in APH Leakage (as per part-B guarantee condition description)	INR 17844594 (INR seventeen million eight hundred forty-four thousand five hundred ninety-four only) for every 0.1% point increase from the guaranteed or		
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CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES				
1.01.03	S. No	Guarantee	Rate of Liquidated Damages (LD)	Limiting Value	
			specified value (whichever is lower).		
1.01.03	NOTE: - Each of the liquidated damages specified above shall be independent and these liquidated damages shall be levied concurrently as applicable. - All these liquidated damages for short fall in performance shall be deducted from the contract price as detailed in accompanying General Conditions of Contract (GCC)/ Special Conditions of Contract (SCC). - Contractor's aggregate liability to pay liquidated damages for failure to attain the functional guarantee shall not exceed twelve percent (12 %) of the Contract Price. - The LD values are applicable on per unit basis except for the value indicated for auxiliary power consumption for station auxiliaries, which is on station basis. The liquidated damages shall be prorated for the fractional parts of the deficiencies. - Bidder not confirming about meeting the limiting values as specified for various guarantees shall not be considered and their bids shall be rejected.				
	UNIT HEAT RATE Following tests for Turbine Cycle Heat Rate and Efficiency of Steam Generator shall be conducted simultaneously but independently: - Turbine Cycle Heat rate in kcal/kWhr under rated steam conditions at 77 mmHg(abs) Condenser pressure with zero make up at 800 MW unit load (i.e. 100% of rated load). - Efficiency of the Steam Generator at 800 MW unit load (i.e. 100% of rated load) with 27 degree Celsius ambient temperature and 60% RH, while firing the design coal, at rated steam parameters, rated coal fineness and rated excess air. - Turbine Cycle Heat rate in kcal/kWhr under turbine throttle main steam pressure of 150 Kg/cm² (abs) and turbine throttle main steam temperature / reheat steam temp. at turbine inlet of 600 deg C / 600 to 610 deg C (as selected) at 77 mmHg(abs) Condenser pressure with zero make up at 440 MW unit load (i.e. 55 % of rated load) with one TDBFP in operation. - Efficiency of the Steam Generator at 440 MW unit load (i.e. 55 % of rated load) with 27 degree Celsius ambient temperature and 60% RH, while firing the design coal, at rated steam parameters, rated coal fineness and rated excess air. Unit Heat Rate is to be computed as follows: Unit Heat rate in kcal/kWhr under rated steam conditions at 77 mmHg(abs) Condenser pressure with zero make up at 800 MW unit load (i.e. 100% of rated load):				
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1.01.03.01	$= \frac{\text{THR (100\%)}}{\text{SG\_EFF (100\%)}}$			
	Unit Heat rate in kcal/kWhr under turbine throttle main steam pressure of 150 Kg/cm2 (abs) and turbine throttle main steam temperature / reheat steam temp. at turbine inlet of 600 deg C / 600 to 610 deg C (as selected) deg C at 77 mmHg(abs) Condenser pressure with zero make up at 440 MW unit load (i.e. 55 % of rated load):			
	$= \frac{\text{THR (55\%)}}{\text{SG\_EFF (55\%)}}$			
	Where			
	THR (100%) : Turbine Cycle Heat rate in kcal/kWhr under rated steam conditions at 77 mmHg(abs) Condenser pressure with zero make up at 800 MW unit load (i.e. 100% of rated load). (To be calculated as per clause 1.01.03.01 of this sub-section)			
	SG_EFF(100%): Efficiency of the Steam Generator at 800 MW unit load (i.e. 100% of rated load) with 27 degree Celsius ambient temperature and 60% RH, while firing the design coal, at rated steam parameters, rated coal fineness and rated excess air. (To be calculated as per clause 1.01.03.03 of this sub-section). The efficiency shall be based on Heat Input GCV of coal.			
	THR (55%) : Turbine Cycle Heat rate in kcal/kWhr under turbine throttle main steam pressure of 150 Kg/cm2 (abs) and turbine throttle main steam temperature / reheat steam temp. at turbine inlet of 600 deg C / 600 to 610 deg C (as selected) deg C at 77 mmHg(abs) Condenser pressure with zero make up at 440 MW unit load (i.e. 55 % of rated load). (To be calculated as per clause 1.01.03.01 of this sub-section)			
	SG_EFF(55%): Efficiency of the Steam Generator at 440 MW unit load (i.e. 55% of rated load) with 27 degree Celsius ambient temperature and 60% RH, while firing the design coal, at rated steam parameters, rated coal fineness and rated excess air. (To be calculated as per clause 1.01.03.03 of this sub-section). The efficiency shall be based on Heat Input GCV of coal.			
	(1) TURBINE CYCLE HEAT RATE			
	Turbine Cycle Heat Rate shall be calculated as follows & indicated in all computed heat balance diagrams:			
$\text{HEAT RATE} = \frac{M1 (H1-h1) + M2 (H3-H2) + Mir (H3 - hir)}{Pg}$				
Where,				
M1 - Quantity of live steam entering the turbine stop valve including any live steam supplied to valve stems, or glands etc. in Kg/hr.				
M2 - Quantity of steam from turbine to reheater in Kg/hr.				
Mir - Quantity of desuperheating water flowing into reheater system for regulation of steam temperature in Kg/hr.				
H1 - Enthalpy in kcal/kg of live steam.				
H2 - Enthalpy in kcal/kg of steam to reheat.				
H3 - Enthalpy in kcal/kg of reheated steam.				
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CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES			
	h1 - Enthalpy of feed water in kcal/kg at the downstream of the junction of feed flow and bypass flow of HP heaters. hir - Enthalpy of desuperheating water flowing into reheat system in Kcal/Kg. Pg - Unit output after deducting the power consumption by auxiliaries as listed below and the same shall be 800MW, and 440 MW respectively for 100%, and 55% TMCR unit load: (a) Power taken by Excitation system (KW) including transformer losses, as applicable for various guarantee points in case of static excitation system is offered. (The transformer losses at various points shall be based on factory test to be conducted). (b) Power required for ventilation of oil and control fluid tanks, if ventilating fans are separately driven (KW). (c) Power required for lubrication, if lubricating pumps are separately driven (KW). (d) Power required for control fluid pumps, if control fluid pumps are separately driven (KW). (e) Power required for hydrogen, seal oil auxiliaries, if separately driven (KW). (f) Power required for stator water cooling system, if cooling pumps are driven separately (KW). (g) Power required for Gland Steam Exhauster (GSC) if GSC Exhausters are separately driven. (2) APPLICABLE CORRECTIONS FOR HEAT RATE, OUTPUT AND CONDENSER PRESSURE i) Corrections Applicable for Turbine Cycle Heat rate & Turbine Generator Output tests Based on cycle condition & covering entire range of operation for Turbine following correction curves for variation in Turbine Cycle Heat rate at 100% load & 55% load & Turbine Generator output to be furnished along with bid: (a) Variation in main steam pressure and temperature. (b) Variation in reheater steam temperature. (c) Correction Curves, if applicable, due to change in reheater spray quantities with respect to coal properties. (d) Variation in condenser pressure for main condenser. (e) Variation in power factor, frequency, generator hydrogen pressure and voltage. (f) Change in system water storage. NOTE: In case any of the above correction curves are not submitted along with price bid, no negative corrections shall be allowed on turbine Heat rate on this account. Positive corrections if required to be applied, the amount shall be decided by Employer. Further, no positive corrections shall be allowed on turbine output on this account. Negative corrections if required to be applied, the amount shall be decided by Employer. Above corrections curve shall be provided for following cases. a) 105% of TMCR for output guarantee. b) 100 % of TMCR for heat rate guarantee. c) 55% of TMCR for heat rate guarantee.			
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1.01.03.02	(ii) Corrections Applicable for Condenser pressure Guarantee (a) Variation in Cooling Water Temperature (b) Variation in Cooling Water Flow (c) Variation in Heat Load It may be noted that the heat balance diagrams and guarantees shall be furnished considering the quantities of water for reheater sprays with any mill combination in service to the Employer's choice. For reheater, the spray quantities used shall not exceed the limits specified elsewhere in the specification. During Performance Guarantee Testing in case the spray quantity used are at variance from the values used in the heat balance diagrams, the actual values will be used for calculation of heat rate and no correction shall be allowed. However, correction on account of variation in Reheater spray quantities with respect to values used for the purpose of turbine cycle heat rate values shall be permitted only to the extent that such variations are solely attributable to the change in coal properties with respect to those specified for the design coal. Bidders shall necessarily include the correction curves for variation in reheater spray quantities with coal properties in his bid proposal, failing which no corrections shall be permitted. The above list of correction curves is conclusive & curves in addition to above shall not be applied.												
	SPECIFIC AND LIMITING REQUIREMENTS FOR STEAM GENERATOR EFFICIENCY a) Steam generator efficiency shall be calculated as per the requirements of BS EN 12952-15:2003 (by loss method) and as per stipulations of Clause 1.01.03.03 of this Sub-Section. b) The efficiency quoted by the Bidder shall comply with following limiting parameters with design coal firing: <table><tr><td>a. Excess air at economizer outlet at 100% & 55% TMCR load)</td><td>20% (min.)</td></tr><tr><td>b. Corrected flue gas temperature at air preheater outlet at</td><td></td></tr><tr><td>100% TMCR</td><td>125 degree C or as predicted by the Bidder whichever is higher</td></tr><tr><td>55% TMCR</td><td>115 degree C or as predicted by the Bidder whichever is higher</td></tr><tr><td>c. Unburned fuel at all efficiency load at 100% & 55% TMCR load</td><td>1.0% (min.)</td></tr></table> c) Bidder/Contractor to note that no credit shall be given in the bid evaluation or in the evaluation of the results of the guarantee tests for performance predictions/ guarantees etc. if the values considered by the Bidder/Contractor for parameters indicated at a), b) & c) above are lower than those specified above. d) For the purposes of guarantees the ambient air temperature and relative humidity shall be taken as 27 degree Celsius and 60% respectively. e) Unless otherwise specified, the guarantees shall be based on design coal firing with coal/ ash analysis as given in the table at Annexure-IV-2, Sub-Section-I-B(Project Information) of Part-A of Technical Specification. The performance guarantee test will be carried out along with the Initial Operation of facilities or as per the time frame specified for a particular equipment/ plant/ system in the Technical specifications. Delay in conductance of the test beyond this period will not be				a. Excess air at economizer outlet at 100% & 55% TMCR load)	20% (min.)	b. Corrected flue gas temperature at air preheater outlet at		100% TMCR	125 degree C or as predicted by the Bidder whichever is higher	55% TMCR	115 degree C or as predicted by the Bidder whichever is higher	c. Unburned fuel at all efficiency load at 100% & 55% TMCR load
a. Excess air at economizer outlet at 100% & 55% TMCR load)	20% (min.)												
b. Corrected flue gas temperature at air preheater outlet at													
100% TMCR	125 degree C or as predicted by the Bidder whichever is higher												
55% TMCR	115 degree C or as predicted by the Bidder whichever is higher												
c. Unburned fuel at all efficiency load at 100% & 55% TMCR load	1.0% (min.)												
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1.01.03.03	normally permitted by the EMPLOYER. In the event of EMPLOYER agreeing to conductance of such tests after Initial Operations, for reasons not attributable to the EMPLOYER, as assessed by the Employer, no factor for ageing shall be considered for computing performance of the equipment																			
	MAJOR REQUIREMNTS/ METHOD OF STEAM GENERATOR EFFICIENCY TESTS																			
	i.	Test Code :	As per BS EN 12952-15:2003 (By loss method based on GCV of Coal)																	
	ii.	Test Loads	100% TMCR (800 MW unit Load) 55% TMCR (440 MW unit Load)																	
	iii.	Test Conditions	Boiler operating with rated excess air, coal fineness and firing design coal.																	
	iv.	Ambient air condition	27 degree Celsius temperature (Dry bulb) and 60%relative humidity. The reference air temperature for the Steam Generator efficiency guarantee/ testing shall be taken as the temperature of air (i.e. 27 degree Celsius) entering PA and FD fans.																	
	v.	No. of readings	Two sets of consistent readings for each of test loads. Average of the test efficiencies based on above two readings for each load shall be considered for steam generator efficiency.																	
	vi.	Measurement and computation of heat losses will include but not be limited to the following:																		
		<table><tr><th>S.No.</th><th>Losses to be measured</th><th>Remarks</th></tr><tr><td rowspan="5">a.</td><td>Flue gas losses</td><td rowspan="5">As per Cl. 8.3.3.2 of BS EN 12952-15:2003</td></tr><tr><td>i) Dry Flue gas losses</td></tr><tr><td>ii) Loss due to hydrogen in fuel</td></tr><tr><td>iii) Loss due to moisture in fuel</td></tr><tr><td>iv) Loss due to moisture in air (inlet air moisture to be considered in the vapour phase)</td></tr><tr><td>b.</td><td>Loss due to carbon mono-oxide (CO) in flue gas</td><td>As per Cl. 8.3.3.3 of BS EN 12952-15:2003</td></tr><tr><td>c.</td><td>Loss due to unburned carbon</td><td>Ash samples to be collected from furnace bottom hoppers, Air heater, economizer and ESP hoppers, duct hopper (if applicable). The ash collection rate for computation of losses shall be 20%, 3%, 5% in the furnace bottom hopper, air heater, economizer, duct) and balance in ESP hopper. The unburned carbon loss for Steam Generator efficiency at each load shall be taken as at least 1.0%</td></tr></table>			S.No.	Losses to be measured	Remarks	a.	Flue gas losses	As per Cl. 8.3.3.2 of BS EN 12952-15:2003	i) Dry Flue gas losses	ii) Loss due to hydrogen in fuel	iii) Loss due to moisture in fuel	iv) Loss due to moisture in air (inlet air moisture to be considered in the vapour phase)	b.	Loss due to carbon mono-oxide (CO) in flue gas	As per Cl. 8.3.3.3 of BS EN 12952-15:2003	c.	Loss due to unburned carbon	Ash samples to be collected from furnace bottom hoppers, Air heater, economizer and ESP hoppers, duct hopper (if applicable). The ash collection rate for computation of losses shall be 20%, 3%, 5% in the furnace bottom hopper, air heater, economizer, duct) and balance in ESP hopper. The unburned carbon loss for Steam Generator efficiency at each load shall be taken as at least 1.0%
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SINAGRENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID DOC. NO. CW-CM-11159-C-O-M-001	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 13 OF 71																

CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES																			
	<table><tr><td></td><td></td><td>or actual, whichever is higher.</td></tr><tr><td>d.</td><td>Loss due to Radiation and Convection</td><td>As per Cl. 8.3.3.6 of BS EN 12952-15:2003</td></tr><tr><td>e.</td><td>Additional external losses to be considered</td><td></td></tr><tr><td></td><td>- Loss due to radiation from furnace bottom.</td><td>To be worked out based on furnace bottom hopper opening and heat flux in this area.</td></tr><tr><td></td><td>- Loss due to Mill Rejects</td><td>The total mill rejects throughout of the test (minimum four hours) from all mills shall be considered as one gross which will be weighed to workout the reject rate and then reduce by halving and quartering to the required sample size for calorific value analysis to be used for working out loss due to mill rejects.</td></tr><tr><td>g</td><td>Loss due to sensible heat in ash</td><td>To be computed based on the ash collection rates indicated at (c) above & ash temperature of furnace bottom ash as 1040 °C . Temperature of Duct / economiser ash, Air heater hopper ash, ESP ash shall be same as that of flue gas in these areas.</td></tr></table>			or actual, whichever is higher.	d.	Loss due to Radiation and Convection	As per Cl. 8.3.3.6 of BS EN 12952-15:2003	e.	Additional external losses to be considered			- Loss due to radiation from furnace bottom.	To be worked out based on furnace bottom hopper opening and heat flux in this area.		- Loss due to Mill Rejects	The total mill rejects throughout of the test (minimum four hours) from all mills shall be considered as one gross which will be weighed to workout the reject rate and then reduce by halving and quartering to the required sample size for calorific value analysis to be used for working out loss due to mill rejects.	g	Loss due to sensible heat in ash	To be computed based on the ash collection rates indicated at (c) above & ash temperature of furnace bottom ash as 1040 °C . Temperature of Duct / economiser ash, Air heater hopper ash, ESP ash shall be same as that of flue gas in these areas.	
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Note to vi: Ratio of unburnt combustible to supplied fuel mass flow (lu) shall be calculated considering unburnt combustible contents in slag and flue dust based on 1% or actual unburnt fuel loss, whichever is higher. vii. The-steam generator efficiency shall be without any heat credit. viii. The Steam Generator efficiency shall be based on ambient air temperature of 27 degree Celsius and relative humidity of 60%. ix. Correction to tested efficiency shall be applicable for variation in following parameter only : a. Ambient air temperature. b. Relative humidity of ambient air. c. Hydrogen in coal. d. Moisture in coal. e. GCV of coal. f. Percentage of ash in coal. x. The duration of the test shall be at least four hours. No soot blowing shall be allowed during the test period or during stabilization period of four hours prior to commencement of the test.																				
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1.01.04	xi. The Bidder shall furnish the correction curves, for Employer's approval covering the expected ranges of variations for all these parameters for the range of coal specified. xii. For all other aspects, not spelt out above, or in the specifications, where BS code stipulates the agreement between the parties concerned before commencement of the test, the Bidder shall get these approved by the Employer. However no correction to SG efficiency on account of variation in turbine cycle parameters, or vice versa shall be allowed. xiii. The number, location, type and accuracy of the test grade thermocouples and pressure gauges shall be to Employer's approval. xiv. The Steam Generator efficiency testing shall be carried out with any combination of mills in operation to Employer's choice, with fineness of pulverized coal not exceeding 75% through 200 mesh. Steam generator efficiency shall be with guaranteed or actual air heater leakages, whichever is higher.			
	MAJOR REQUIREMENTS FOR COAL PULVERISER WEAR PART WARRANTY a) The Contractor shall warrant the wear life of all wear parts of the coal pulveriser when grinding the specified range of coal(s). Pulveriser wear parts are defined as those parts of the pulveriser which are in contact with coal or coal dust and are likely to wear out during the operation of the pulveriser. The guarantee/warranty shall be demonstrated on each pulveriser during the Guarantee Trial Period (GTP) commencing after establishing successful operation of the pulveriser continuously for a period of not less than twenty four (24) hours, at or near its guaranteed rated capacity. The GTP for the respective wear part(s) shall be at least three years or the wear life of that wear part(s), whichever occurs later. The establishment of the warranty will be based on equivalent running hours of the pulveriser regardless of the specified coal. The average wear life (AWL) of the mill wear parts during GTP shall, however be corrected for the variation in YGP index for the coal fired during GTP. b) Minimum Guaranteed Life for various coal pulveriser wear parts shall be as indicated in relevant clause of sub-section A-01 related to equipment sizing criteria, Part-B, Section VI of technical specification. c) The wear parts shall be considered to have passed their warranted operating life when they have successfully demonstrated their capability to meet the full load rated capacity of the pulveriser (as per requirements of relevant clause of sub-section A-01, Part-B, Section VI of Technical Specification) during the guaranteed life of the wear part. No weld buildup or reversing of grinding elements will be permitted for achieving the guaranteed wear life. In case any of the wear part has worn out to such an extent that either the normal or safe operation of the pulveriser is jeopardized if this part is not replaced/repared, or continuous use with this part may lead to exposure or wear of other parts which are not meant for the purpose of checking the shortfall in wear life, even if there is no reduction in pulveriser rated capacity, then the part shall be deemed to have outlived its wear life. If any of the wear parts fail to meet the warranted life, additional quantities of these wear parts shall be supplied on pro-rata basis as defined in Clause 1.01.04 f) below. For the duration of this warranty period, the replacement wear parts shall be available to the Employer at the spare part price indicated in the Contract, adjusted as per terms and conditions of the Contract. d) Computation of liquidated damages for plant life of 10 years On the expiry of GTP (minimum 3 years), deficiency in the life of each wear part that has not fulfilled the warranty will be worked out on an item wise basis and shortfall so			
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	established due to reduced wear life and its implications for the plant life shall be worked out. The contractor at no extra cost to the Employer shall provide one and half times the wear parts needed to make good the shortfall in the wear life for 10 years of plant life. e) The shortfall part settlement (SPS) will be calculated based on the actual wear life of the parts that have worn-out in the GTP on a pulveriser-by-pulveriser basis. In this connection the procedure given below in clause 1.01.04 f) shall be followed. f) Pulveriser Warranty Shortfall Part Settlement (SPS) Procedure (With Example): For all wear parts of each vertical coal pulveriser: <table><tr><th>S.N</th><th>Description</th><th>Procedure</th><th>Example</th></tr><tr><td>(i)</td><td>Guaranteed wear life of wear part</td><td>(say X hours)</td><td>X=16000 Hrs.</td></tr><tr><td>(ii)</td><td>Total life achieved by a particular wear part during GTP (say X1 hours by originally installed part(s) & X2 hours by subsequently replaced part(s))</td><td>X1= 13000 Hrs X2= 14000 Hrs</td><td>Life of wear parts replaced during guarantee trial period(GTP)</td></tr><tr><td>(iii)</td><td>Average wear life (AWL) of failed wear parts</td><td>$AWL = \frac{X1+X2}{2}$</td><td>$AWL= (13000+14000)/2 = 13500$</td></tr><tr><td>(iv)</td><td>Short fall in Hrs Total shortfall for wear part during GTP.</td><td>$S = (X-X1) + (X-X2)$</td><td>$(16000-13000) + (16000-14000) = 5000$</td></tr><tr><td>(v)</td><td>GTP in years</td><td>$GTP= (X1+X2)/8760$</td><td>$(13000+14000)/8760 = 3.08$</td></tr><tr><td>(vi)</td><td>Shortfall part settlement (SPS)</td><td>$= \frac{S \times (10)}{AWL \times GTP}$</td><td>$= \frac{5000 \times (10)}{13500 \times 3.08}$ $= 1.202$ (To be rounded off to nearest whole number. In case of 0.5 or higher decimal place, it shall be next higher number.) $= 1.0$</td></tr></table> g) The Contractor shall provide to Employer either the wear parts of original or better quality material in number equivalent to one and half times the quantity worked out based on the method explained in the above example so as to compensate for the shortfall in wear life for a plant life of 10 years as has been established above, or the cost of such number (i.e. one and half times the quantity worked out as per the above example) of wear parts based on the prices agreed for mandatory spares. The final mode of compensation for such shortfall viz. by means of additional quantities of spares worked out or by cost thereof shall be as per employer's discretion. The total cost of such replacements shall be without any limit to the maximum amount recoverable subject to the provisions of Clause 1.01.02 note (iv) of this Sub-Section.				S.N	Description	Procedure	Example	(i)	Guaranteed wear life of wear part	(say X hours)	X=16000 Hrs.	(ii)	Total life achieved by a particular wear part during GTP (say X1 hours by originally installed part(s) & X2 hours by subsequently replaced part(s))	X1= 13000 Hrs X2= 14000 Hrs	Life of wear parts replaced during guarantee trial period(GTP)	(iii)	Average wear life (AWL) of failed wear parts	$AWL = \frac{X1+X2}{2}$	$AWL= (13000+14000)/2 = 13500$	(iv)	Short fall in Hrs Total shortfall for wear part during GTP.	$S = (X-X1) + (X-X2)$	$(16000-13000) + (16000-14000) = 5000$	(v)	GTP in years	$GTP= (X1+X2)/8760$	$(13000+14000)/8760 = 3.08$	(vi)	Shortfall part settlement (SPS)	$= \frac{S \times (10)}{AWL \times GTP}$	$= \frac{5000 \times (10)}{13500 \times 3.08}$ $= 1.202$ (To be rounded off to nearest whole number. In case of 0.5 or higher decimal place, it shall be next higher number.) $= 1.0$
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	The credit of one and half times of shortfall in wear parts life shall also apply for already supplied mandatory spare parts under this contract based on average wear life achieved during GTP period. h) Average Wear Life (AWL) during GTP, to be considered for pulveriser wear part warranty shall be as arrived at from the station record for each pulveriser, and as corrected for variation in YGP index of the coal being fired during GTP. For this purpose the coal YGP shall be the average tested value during GTP. The Contractor shall collect the coal samples and get them tested for YGP index at recognized, Employer's approved test lab, periodically. (The frequency of sampling and testing shall be mutually agreed between Contractor & Employer). The YGP index testing shall be done as per the BS Standard specified. A jointly signed record shall be maintained during GTP. 1.01.05 PARTICULATE EMISSION/ ESP EFFICIENCY 1.01.05.01 The performance test on electrostatic precipitator will commence after a minimum period of three thousand (3000) hours of cumulative operation after completion of initial operation. During the interval between the commencement of initial operation and the commencement of performance test only routine maintenance shall be carried out. No physical or chemical cleaning of ESP shall be permitted during this period or immediately before the conductance of the performance tests. 1.01.05.02 The test efficiency shall be based on the overall performance of the electrostatic precipitator over a mutually agreed period of operation under the conditions given in this specification and allowing the normal operation of the unit including rapping and normal soot blowing and/or when fuel oil is being fired in the igniters and/or warm up guns. The overall test efficiency and test temperature/inlet dust burden for one set of ESP passes (stream) serving one Steam Generator shall be worked out as follows:- a) Vm (guarantee point test flow) shall be the total of inlet gas flows to the six gas streams at the time of test. b) Test inlet dust burden (Di) shall be weighted mean of the inlet dust burdens for the individual streams i.e.: $Di = \frac{(Vm1 \times Di1) + (Vm2 \times Di2) + (Vm3 \times Di3) + (Vm4 \times Di4) + (Vm5 \times Di5) + (Vm6 \times Di6)}{(Vm1 + Vm2 + Vm3 + Vm4 + Vm5 + Vm6)}$ Where suffix 1,2,3,4,5 & 6 represents the six gas streams. Similarly the test outlet dust burden (Do) will be calculated based on outlet gas flow. a. The weighted test inlet gas temperature (Ti) shall also be worked out in a similar manner i.e. $Ti = \frac{(Ti1 \times Vm1) + (Ti2 \times Vm2) + (Ti3 \times Vm3) + (Ti4 \times Vm4) + (Ti5 \times Vm5) + (Ti6 \times Vm6)}{(Vm1 + Vm2 + Vm3 + Vm4 + Vm5 + Vm6)}$			
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1.01.05.03	d) The measured test efficiency shall be : $E_m = \frac{D_i - D_o}{D_i} \times 100 (\%)$ e) The corrections for the flue gas flow and ESP inlet flue gas temperature in excess of the values for these parameters under guarantee point conditions, shall be allowed only in case and to the extent such variations are caused solely due to changes in specified coal properties and ambient conditions. Further, the corrections for the flue gas flow and temperature lower than the guarantee point values shall be applied based on actually measured test values. Subject to the above, the corrections for the variation in flue gas flow, inlet dust burden and ESP inlet flue gas temp. shall be based on the above computed test values and the procedure indicated in the next para. At the time of performance testing if the inlet flue gas conditions are not consistent with the specified conditions, due to variation in coal characteristics from the design coal and boiler operating conditions the precipitator performance conforming to this specification, shall be determined using performance curves and correction factors accepted at the time of award of contract. However, the test efficiency shall be corrected to the guarantee point conditions in the following manner: 1. $E_c = 1 - e^Z$ Where E_c = Corrected test efficiency to guarantee point conditions. $Z = C \cdot \ln(1 - E_g)$ and $C = \frac{1}{Ca \cdot Cb \cdot Cc \text{ etc.}}$ Ca.Cb.Cc etc. are Correction factors for flue gas at temperature, moisture content in flue gas, ESP inlet dust loading, sulphur and sodium contents of coal ash based on correction curves furnished by the Bidder and approved by the Owner. 2. $E_g = 1 - e^Y$ Where $Y = (V_m/V_g)^{0.5} \ln(1 - E_m)$ E_g = Measured test efficiency corrected to the specified guarantee point flow V_g = Specified Guarantee point gas flow (m³/sec) V_m = Measured gas flow (m³/sec) E_m = Measured test efficiency $\ln$ = Logarithm, natural base. The correction curves should be realistic for expected range of operation and variation in characteristics specified. The test efficiency shall be the average of at least three corrected test efficiencies. .			
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1.01.05.04	The Performance tests shall be carried out in accordance with method-17 of EPA (Environmental Protection Agency of USA) code. The details of the test shall, however be mutually agreed upon between the Employer and the Contractor.			
1.01.05.05	Further, during the performance test of the Electrostatic Precipitator, if the contractor establishes that the average of three tested outlet dust burden (Do) values (uncorrected) are either equal to or less than 14 mg/Nm3 at ESP outlet before FGD system inlet, then the contractor shall also be deemed to have successfully met the guaranteed ESP efficiency			
1.01.06	METHOD OF COMPUTING TEST EFFICIENCY OF FGD The performance tests shall be carried out in accordance with ASME PTC 40 (2017) code. The details of the test shall, however be mutually agreed upon between the employer and the contractor.			
1.01.07	AUXILIARY POWER CONSUMPTION The respective auxiliary power consumption for unit and the station are to be calculated in isolation to calculate the respective guaranteed power consumption as is illustrated hereunder:			
1.01.07.01	Unit Auxiliary Power Consumption The unit auxiliary power consumption shall be calculated using the following relationship with design coal. Pau = Pu + TL (Unit) Pau = Guaranteed Unit Auxiliary Power Consumption. Pu = Power consumed by the auxiliaries of the unit under test. TL = Losses of the Generator Transformer and Unit Transformers supplied by bidder based on works test reports and the criteria specified under the Clause 1.01.07.02 (j) under the subheading Transformers. The power consumption (Pu) of entire unit auxiliaries fed from unit transformers shall be measured at the incomers of respective unit boards. Suitable correction for auxiliaries not in service at the time of this measured power consumption like MDBFP etc, shall be done on as per the technical specification. If GCB scheme is adopted, suitable corrections for station auxiliaries shall be done. While guaranteeing the auxiliary power consumption the bidder shall necessarily include all continuously operating unit auxiliaries. The auxiliaries to be considered shall include but not be limited to the following: (a) Turbine Unit Oil purifier. (b) Turbine Unit control oil purifier. (c) Electric oil heater for turbine lube oil tank (rated power shall be considered). (d) Feed and discharge pumps of turbine oil purification system. (e) Main turbine Condenser air-evacuation pumps. (f) CW pumps (g) Condensate extraction pumps. (h) Drip pump (if envisaged). (i) Hydrazine dosing pumps (if required). (j) Ammonia dosing pumps (if required). (k) Oil purifiers of 2x50% TDBFPs and their feed and discharge pumps. (l) Lube oil pumps of 2x50% TDBFPs and the electrical oil heater for lube oil.			
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	(m) Auxiliary oil pump for MDBFP. (n) Oil pumps for HP-LP bypass system. (o) Motor Driven Boiler Feed Pump (For this purpose only 15% of the power consumed by the MDBFP and MDBP at design point as determined during shop test shall be considered). (p1) TG - DM Cooling (All working pumps) Water pumps to supply cooling water on the primary (DM) side of the plate type heat exchangers in the closed loop Equipment cooling (Unit auxiliaries) water system. (p2) SG - DM Cooling (All working pumps) Water pumps to supply cooling water on the primary (DM) side of the plate type heat exchangers in the closed loop Equipment cooling (Unit auxiliaries) water system. (q) Auxiliary Cooling (All working pumps) water pumps to supply cooling water on the secondary side of the plate type heat exchangers in the closed loop Equipment cooling (unit auxiliary) water system. r) Mills. s) PA Fans. t) FD Fans. u) ID Fans. v) Air Heaters. w) Coal Feeders. x) Steam Generator Start up drain recirculation Pumps (If required). y) Seal Air Fans. z) Lube oil pumps for fans/ Air heaters & mill system etc. aa) Scanner air fans. ab) Electrostatic Precipitator with all TR sets , all hopper heaters including wrap around heaters of adapters, if applicable & all insulator heaters/pent house fans (if applicable) of all ESP passes working and rapping system in normal operation. During the test all hopper heaters including wrap around heaters of adapters, if applicable & all insulator heaters/pent house fans (if applicable) of all ESP passes will be kept in continuously ON condition at 100% duty condition and set point temperature shall be kept 5 degree Celsius above the flue gas temperature. (Refer Note 4 below) ac) Gas Recirculation Fan (if applicable) ad) FGD System i. Absorber Recirculation Pump(s) ii. Absorber Oxidation Air Blower(s)/Compressor(s) iii. Absorber Oxidation Tank Agitators iv. Gypsum Bleed Pumps v. Limestone Slurry Pump(s) vi. Process water pump(s) vii. Mist Eliminator Wash Water pump(s) viii. Booster Fans in case Booster Fan is provided by the Contractor. ae) Pressurising pumps of fuel oil system			
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1.01.07.02	af) Power consumption of fans of Air washer units for TG building and fans of air filtration units for ESP and FGD buildings at its rated duty point to be arrived based on shop test. ag) Power consumption of any other continuously operating auxiliary for unit operation at 100% TMCR with Design Coal. ah) GCB Losses of Unit : Losses and fan power for Generator Circuit Breaker (if applicable) Note : - The bidder shall furnish a list of equipment to be covered under Unit auxiliary power consumption, which shall be subject to Employer's approval. - The bidder shall ensure that power supply to all such equipment to be covered under unit auxiliary power consumption is fed from unit board of the respective unit. - Method of Computation of Auxiliary Power consumption for ESP:- The measurement for guaranteed auxiliary power consumption shall be carried out during ESP collection efficiency test. The method for computing the power shall be as described below:- - Power consumption of ESP will be measured pass wise and for one pass (Say ESP-A) at a time with the help of energy meter in ESP MCC. - Energy meter reading will be taken before starting the collection efficiency test and after completion of collection efficiency test. - Before starting collection efficiency test, switch off all the TR sets, all hopper heaters, all insulator heaters/pent house fans (if applicable) and rapping systems serving to one pass (ESP-A) temporally and note down energy meter readings for period t1 i.e. E1. The power consumption shall be $W2=E2/t1$. - During the collection efficiency test the total energy fed in to ESP MCC of one pass (say ESP-A) will be measured during entire period of collection efficiency test i.e. E2. Total time period (t2) of test shall be noted. The power consumption shall be $W2=E2/t2$. During the test all hopper heaters of all ESP passes will be in ON condition and set point temperature shall be kept 5 degree Celsius above the flue gas temperature. - Measured power consumption for one ESP pass (say ESP-A)=$(W2-W1)$ - Measured Electrostatic Precipitator power of one unit= Power of (ESP-A + ESP-B + ESP-C + ESP-D + ESP-E + ESP-F) 5. Guaranteed Unit Auxiliary Power Consumption of FGD system shall be taken by considering the additional pressure drop in the FGD system during FGD SO2 removal efficiency test at specified guarantee point conditions. For this purpose, difference of FGD system pressure drop during FGD SO2 removal efficiency test and that at Unit Auxiliary Power Consumption test shall be loaded as additional Auxiliary Power Consumption. 6. Generation from roof top solar during the test period shall be added to the total measured power consumption.(not applicable) Station Auxiliary Power Consumption The station auxiliary power consumption shall be calculated using the following relationship with design coal. P. Stn = Pau. Stn + T_L . Stn Pau. Stn =SUM (P_i X D_i)			
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	Where, P. Stn = Power consumed by the station auxiliaries Pau. Stn = Total Power Consumption, while running at 100% design load for all the auxiliaries of the station supplied by bidder. P_i = Power consumed by each station auxiliary. D_i = Duty factor to be considered for each station auxiliary. $T_L - Stn$ = Transformer Losses of the station transformers and that of any other transformer associated with station auxiliary power supply system (excluding those included in Unit system like GT, UT, UAT,UST etc.) and shunt reactor supplied by the bidder for meeting the station auxiliary power supply shall be included based on work test report. Losses of transformers shall be considered based on the works test reports as per the criteria specified under Clause 1.01.07.02 (h) under the subheading Transformers. While guaranteeing the station auxiliary power consumption the bidder shall necessarily include all the station auxiliaries <u>running at full load</u> with duty factors as have been defined at the ensuing para of this chapter. The station auxiliaries that shall be running during the guarantee test for calculating " Pau. Stn " shall include but not be limited to the following: (Where duty factor is not indicated the same is to be considered as 1.0) a) Plant & Instrument air compressors & Air drying plant Power consumption of:- <table><tr><td>i)</td><td>Instrument Air compressor</td><td>2 Nos.</td><td>Duty Factor =0.6</td></tr><tr><td>ii)</td><td>Plant Air compressor</td><td>1 Nos.</td><td>Duty Factor = 0.33</td></tr><tr><td>iii)</td><td>Air Drying plant (Heaters) (if applicable)</td><td>2 Nos.</td><td>Duty Factor =0.5</td></tr><tr><td>iv)</td><td>Air Drying plant (Blowers) (if applicable)</td><td>2 Nos.</td><td>Duty Factor = 1.0</td></tr></table> Power consumption at rated duty point for compressors to be arrived based on shop test and power consumption at rated duty point for Air Drying plant to be arrived based on site test. b) Air Conditioning & Ventilation System Power consumption at motor input terminals of working units (i.e. excluding stand-by) at its rated duty point of Chilling machines, Chilled water Pumps, Condenser water Pumps, Air handling unit (AHU) fans, for the Air conditioning system of main plant building, FGD control room, ESP control room of each units, AHP control room,. Power consumption at motor input terminals of working units (i.e. excluding stand-by) at its rated duty point of compressor and condenser fans of air cooled condensing unit, Air handling unit (AHU) fans for the Air conditioning system of water system control building, CHP system control building, switchyard control building, Simulator building, training center. Power consumption at rated duty point for water cooled chillers & air cooled condensing units shall be based on site test and for other drives like chilled water pumps, Condenser water Pumps & AHU/centrifugal fans shall be based on shop test. (Duty factor for power consumption of A/C equipments of Simulator building, training center shall be 0.5) c) FGD System				i)	Instrument Air compressor	2 Nos.	Duty Factor =0.6	ii)	Plant Air compressor	1 Nos.	Duty Factor = 0.33	iii)	Air Drying plant (Heaters) (if applicable)	2 Nos.	Duty Factor =0.5	iv)	Air Drying plant (Blowers) (if applicable)	2 Nos.	Duty Factor = 1.0
i)	Instrument Air compressor	2 Nos.	Duty Factor =0.6																	
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	i. Booster water pump ii. Waste water pump iii. Filtrate Pump(s) iv. Hydro-cyclone Waste Water Sump Pump and Waste Water Pump v. all other continuous running Agitators d) Auxiliary Water System Pumps (Working Pumps) i. Makeup (Clarified water) water pump (if applicable) ii. AC & Ventilation make-up pumps iv. DM water make up pumps vi. Filtered water feed pumps for DM plant vii. Degassed water pump (if applicable) x. Service water pumps xi. Raw water (PT) Pumps xii. Raw water (Ash) Pumps e) Ash Handling Plant List of drives with corresponding weightage factors thereof for which power consumption is to be guaranteed is as follows: <table><tr><td>1.</td><td>Bottom Ash Crushers</td><td>0.3125 for jet pump system & 1.0 for submerged scrapper conveyor system/dry type bottom ash system.</td></tr><tr><td>2.</td><td>Bottom Ash H.P. Water Pumps</td><td>0.625 for jet pump system & 1.0 for submerged scrapper chain conveyor system/dry type bottom ash system.</td></tr><tr><td>3</td><td>Bottom ash L.P. Ash Water Pumps</td><td>1.0</td></tr><tr><td>4.</td><td>Fly ash water pumps</td><td>1.0</td></tr><tr><td>5.</td><td>Bottom Ash Slurry transportation pumps and Bottom ash slurry disposal pumps</td><td>1.0</td></tr><tr><td>6.</td><td>Coarse Ash Slurry transportation pumps</td><td>0.1875 for intermittent system & 1.0 for continuous system</td></tr><tr><td>7.</td><td>Submerged scrapper chain conveyor/dry type bottom ash</td><td>1.0</td></tr></table>			1.	Bottom Ash Crushers	0.3125 for jet pump system & 1.0 for submerged scrapper conveyor system/dry type bottom ash system.	2.	Bottom Ash H.P. Water Pumps	0.625 for jet pump system & 1.0 for submerged scrapper chain conveyor system/dry type bottom ash system.	3	Bottom ash L.P. Ash Water Pumps	1.0	4.	Fly ash water pumps	1.0	5.	Bottom Ash Slurry transportation pumps and Bottom ash slurry disposal pumps	1.0	6.	Coarse Ash Slurry transportation pumps	0.1875 for intermittent system & 1.0 for continuous system	7.	Submerged scrapper chain conveyor/dry type bottom ash	1.0
1.	Bottom Ash Crushers	0.3125 for jet pump system & 1.0 for submerged scrapper conveyor system/dry type bottom ash system.																						
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5.	Bottom Ash Slurry transportation pumps and Bottom ash slurry disposal pumps	1.0																						
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CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES			
		conveyors		
	8.	(i) Fly ash conveying air compressors with air drying plant (ADP)	1.0	
		(ii) Fly ash conveying vacuum pumps	1.0	
	9.	Transport air compressor with air drying plant (ADP)	1.0	
	10.	High Concentration Ash Slurry disposal pumps	0.5	
	11	Ash Water Recirculation Pumps	1.0	
	12	Transport air compressor with air drying plant (ADP) for classification system	1.0	
	f) Mill Reject System			
	Mill reject mechanical type Conveying system: Duty Factor 1.0			
	g) Coal & Biomass Handling plant			
	Total power consumption for all the equipments including auxiliaries with single stream operation at its guaranteed capacity for:			
	Coal flow path (Direct stream) as per clause no 1.03.07.02.1 (i) and one no. stacker-reclaimer, one no of yard conveyor (maximum of stacking / reclaiming modes)			
Biomass flow path as per clause no 1.03.07.02.1 (iv)				
Except following.				
Lighting				
Hoists				
Coal sampling unit				
Sump Pumps				
- Elevators				
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CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES			
	DS, DE, Ventilation, SW System, Potable water system. Duty factor for coal and Biomass handling plant shall be 0.5 The above list is not comprehensive and only indicative. Bidder shall furnish a list of equipment to be covered under station auxiliary system, which is to be considered under station auxiliary power consumption. These are subject to Employer's approvals. h) Transformers NOTE: Transformer losses (TL) shall be considered as per following (as applicable)- • GT - 100% no load loss, 54% of Copper losses & 100% Cooler Loss. • ST– 100% no load loss, 8% of Copper losses & 9% Cooler Loss. • UT – 100% no load loss, 52% of Copper losses & 50% Cooler Loss. • Aux/ LT Outdoor/ LT Indoor Transformer: 100% no load loss & 25% of Copper losses • Reactor – losses at rated voltage			
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CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES			
1.02.00	<u>GUARANTEES UNDER CATEGORY - II</u> Noise All the plant, equipment and systems covered under this specification shall perform continuously without exceeding the noise level over the entire range of output and operating frequency specified in General Technical Requirement, Part-C Section-VI of the technical specifications. Noise level measurement shall be carried out using applicable and internationally acceptable standards. The measurement shall be carried out with a calibrated integrating sound level meter meeting the requirement of IEC 61672-1 & 2 (latest edition) Sound pressure shall be measured all around the equipment at a distance of 1.0 m horizontally from the nearest surface of any equipment/ machine and at a height of 1.5 m above the floor level in elevation. A minimum of 6 points around each equipment shall be covered for measurement. Additional measurement points shall be considered based on the applicable standards and the size of the equipment. The measurement shall be done with slow response on the A - weighting scale. The average of A-weighted sound pressure level measurements expressed in decibels to a reference of 0.0002 micro bar shall not exceed the guaranteed value. Corrections for background noise shall be considered in line with the applicable standards. All the necessary data for determining these corrections, in line with the applicable standards, shall be collected during the tests.			
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CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES							
1.03.00 1.03.01 1.03.02	<u>GUARANTEES UNDER CATEGORY – III</u>							
	The parameters/capabilities to be demonstrated for various systems/ equipments shall include but not be limited to the following:							
	Not used							
	Steam Generator and Auxiliaries							
	Category-III Guarantees of this sub-section for various systems/ equipment for steam generator and auxiliaries shall be based on and demonstrated corresponding to ambient air condition of 27 deg. C temperature & 60% RH.							
	(i) Coal Pulverizer capacity at rated fineness							
	Performance testing shall be conducted on coal pulverizers toward establishing their guaranteed capacity meeting the specification requirement. Corrections may be applied for the variation in coal characteristics i.e. HGI & Total Moisture of test coal with respect to specified design coal.							
	Capacity demonstration test shall be carried out for the following conditions:							
	(a) The Contractor shall demonstrate capacity output on one coal pulverizer (of Employer's choice) of each Steam Generator for establishing its capacity at 100% mill loading, at rated pulverized coal fineness with specified design coal with new set of grinding elements.							
	(b) Further, Contractor shall also demonstrate capacity output on four coal pulverizers (of Employer's choice) of each Steam Generator, not less than the 90% of guaranteed value of (a) above, at 100% mill loading with the originally installed grinding elements in nearly worn-out condition or at the end of guaranteed wear life of grinding elements, whichever is earlier.							
Capacity test as mentioned at a & b above shall be demonstrated at the following conditions occurring simultaneously during testing:								
<table><tr><td rowspan="2">Rated pulverised coal fineness</td><td>i. not less than 75% through 200 mesh and</td></tr><tr><td>ii. not less than 99% through 50 mesh screen</td></tr><tr><td>Test Coal</td><td>Any available coal from the specified range</td></tr></table>				Rated pulverised coal fineness	i. not less than 75% through 200 mesh and	ii. not less than 99% through 50 mesh screen	Test Coal	Any available coal from the specified range
Rated pulverised coal fineness	i. not less than 75% through 200 mesh and							
	ii. not less than 99% through 50 mesh screen							
Test Coal	Any available coal from the specified range							
In case the Contractor successfully demonstrates the guaranteed capacity of coal pulverizers as stated above, remaining coal pulverizers of corresponding steam generator will also be considered to have successfully met the above capacity guarantee requirement. However, in the event of any of the coal pulverizers not meeting the guarantee test, all the coal pulverizers of corresponding steam generator will have to be tested by the contractor to demonstrate guaranteed capacity.								
During the demonstration of the mill capacity output, manufacturer's operating instructions will be followed and mill will be operated with the specified range of coals without any such readjustment that requires a shutdown of the mill or reduction of the load and/or any replacement of any mill wear parts.								
For the purpose of testing to demonstrate the capacity, if HGI (grindability) and total moisture vary from those given in coal characteristics, the above pulverizer measured capacity shall be corrected using the capacity correction curves furnished								
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	by the Contractor and approved by the Employer. HGI versus coal pulverizer capacity curve shall be furnished for HGI variation upto a value above which the capacity remain constant. (ii) Furnace Exit Gas Temperature (FEGT) The Contractor shall conduct a comprehensive thermal performance test (TPT) (on one unit only). Through such TPT the Contractor, by indirect measurement, shall demonstrate that the Furnace Exit Gas Temperature (FEGT) does not exceed the specified maximum temperature limit, with coal pulverizer combinations to Employer's choice and all other requirement in line with sub-section- A-01 ,Part-B(Mechanical) of Technical Specifications. The demonstration shall be done by backward calculations method, after having measured/tested/calculated the economizer outlet gas temperature (average), excess air (average), unit heat load (based on turbine flow and reheater flow), characteristics of coal being actually fired during testing, heat absorption in different stages of heat transfer equipments (based on steam/water temperature and pressure measurements) etc. FEGT for the specified design and worst coals shall be calculated using the measured FEGT (with test coal) as above and using computer modeling technique for necessary conversion of the results to the specified design and worst coals. The FEGT demonstration using computer modeling technique shall involve following steps: - Development of a computer field model (FM) (backward) using above measured/computed field data. This will be used to calculate the surface effectiveness factor (SEF) for each of heat transfer banks including furnace water walls with test coal. - The above field model shall have to be validated by various tests (loads, coal pulveriser combination etc. with test coal) to ensure SEFs for each bank are consistent (within $\pm 5\%$) for all tests. - Using above SEFs, for each heat transfer bank contractor's original boiler design model will be changed to make it "Singareni TPP-II specific". - The validity of the above model shall be checked for each test by feeding the test coal both from backward direction FM and the calibrated "Singareni TPP-II specific" model as per step-(c) above. The model validity is established if the results for flue gas temperature profile in the boiler, zonal assumptions etc. are identical in both the 'BACKWARD' and 'FORWARD DIRECTION'. - The validated "Singareni TPP-II" model shall have "Fuel Switching" capability i.e. it shall be able to appropriately vary the furnace absorption with changes in the coal properties. Validation of the above fuel switching capability will also have to be established to the satisfaction of SCCL. - Having established and demonstrated Fuel Switching capability, the contractual FEGT can be demonstrated by using the site specific calibrated model as per step-(d) and plugging in the specified coal(s). The detailed procedure and the correction curves for the above test shall be to Employer's approval. The contractor through thermal performance test (TPT) as per above shall also demonstrate that the flue gas temperature (Actual/MHVT values) at the entry and exit of various boiler heating surfaces and also the variations across the cross section perpendicular to gas flow do not exceed the values indicated in the data sheets for 100% TMCR (800 MW).			
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CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES			
1.03.03	(iii) Run back capabilities Refer Sub section-G-01, Part-B (Mechanical), Section VI of Technical Specifications. (iv) Air Preheater air in leakage Contractor shall demonstrate that the maximum drift in air leakage do not exceed the guaranteed or specified value (whichever is lower) as per Sub section-A-02, Part-B (Mechanical), of Technical specifications. Above requirement needs to be complied with recirculation of flue gas from downstream of ESP. (v) Temperature of tubes at steam generator water wall outlet: The contractor shall guarantee the following temperature values pertaining to steam generator water wall tubing: a) Maximum tube to tube temperature differential between any two adjacent tubes. b) The maximum deviation of temperature of any tube w.r.t. to the average temperature of all the tubes. The tube metal temperatures shall be measured at the intermediate header (spiral to vertical / rifled tube wall to vertical plain tube wall changer over), if provided, and outlet of the water walls (end of furnace) at minimum once through load of the steam generator with firing range of coals along with oil firing. The same shall be demonstrated during plant operation by measuring the tube temperatures by affixing thermocouples as specified in sub section A-02 of Part B of the technical specification. (vi) Water wall corrosion/erosion rate: The contractor shall demonstrate that the average thinning in the water wall tubes in the furnace due to corrosion, erosion etc. does not exceed the specified value as per Sub section-A-02, Part-B (Mechanical), of Technical specifications. The same shall be demonstrated by calculating the average thinning in the water wall tubes in the furnace by measuring the tube thicknesses between two overhauls at about 1500 locations arranged in a grid around the furnace. The areas to be covered under the grid shall include burner zone extended upto the OFA Nozzle location. Flue Gas Desulphurisation System (i) Pressure Drop across FGD The contractor shall demonstrate that the total pressure drop in the gas path across the FGD System shall not exceed the guaranteed values for the range of coal and loads specified in the Technical Specification (ii) Waste Water The Contractor guarantees that the maximum purge flow rate to waste water treatment system from FGD system for 1X800 MW units shall be less than averaged over a 24 hour period for a the range of specified coal(s). (iii) Mist Outlet Droplet Content The mist eliminator outlet droplet content shall be guaranteed to be ≤ 20 mg/Nm³ at absorber outlet measured over a period of 24 hrs continuous operation. Mist outlet-droplet content shall be measured as per applicable clauses in VDI Norm 3679 and the Contractor shall carry out the tests as per the test procedure approved by the			
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CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES			
1.03.04	Employer. Air Conditioning & Ventilation System (i) Air Conditioning System: A. Following shall be demonstrated at Shop 1) Capacity and discharge pressure of chilled water pumps, condenser water pumps at its rated duty point. 2) Capacity and static pressure of AHU fans at its rated duty point. B. Following shall be demonstrated at Site 1) Capacity (TR) of water cooled chillers for A/C system of Main Plant Area (TG Building), and A/C system of ESP/AHP/FGD control rooms/HCS D VFD Rooms. 2) Capacity (TR) of Air cooled condensing (D-X) unit for A/C system of water system control building, CHP system control building, switchyard control building, Simulator building, training center. 3) Guaranteed room conditions during summer for all the Air conditioned areas. 4) Parallel operation of chilled water and condenser water pumps. 5) Vibration level of chillers, condensing units, centrifugal fans of AHUs and all pumps. (ii) Ventilation System A. Following shall be demonstrated at Shop 1) Capacity and discharge pressure of pumps of air washer units and UAF units at its rated duty point of Ventilation system. 2) Capacity and static pressure of centrifugal fans, roof exhausters at its rated duty point of Ventilation system. B. Following shall be demonstrated at Site 1) Parallel operation, Vibration level of centrifugal fans & pumps of Ventilation system.			
1.03.05	Fuel Oil Handling Plant a) All pumps shall be guaranteed for capacity, total dynamic head either in isolation or during parallel operation. b) Each storage tank shall be guaranteed for capacity and stability. c) Entire piping and supports for smooth operation.			
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CLAUSE NO.	FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES			
1.03.06	The parameters/capabilities to be demonstrated for following systems/ equipments of Raw Water Pump House and ACW pump house shall be:			
1.03.06.01	(i) GANTRY Cranes: Over load tests, travel and hoist speed checks as per relevant Indian standards IS (latest edition). (ii) Electrically operated hoist etc.: Over load test, Travel and speed checks, functional and performance tests as per relevant Indian standards IS (latest edition).			
1.03.07	COAL & BIOMASS HANDLING PLANT			
1.03.07.01	SYSTEM FACILITIES In accordance with Section GTR placed at Part-C after commissioning and before handing over, the entire plant shall be subjected to System Trial Operations. The duration of Trial Operations of the complete equipment shall be fourteen (14) days with minimum twelve hours daily operation. For successful Trial Operation, the trial shall necessarily include steady operation of the plant at its rated flow path capacity for at least one hour duration per day on an average.			
1.03.07.02	PERFORMANCE REQUIREMENTS The Contractor shall guarantee that the equipment offered shall meet the ratings and performance requirements stipulated for various equipments covered in the specification.			
1.03.7.02.1	GUARANTEES The Contractor shall furnish a declaration in the manner prescribed and included in the relevant Attachment of Section-VII for the following guaranteed parameters which shall attract levy of liquidated damages for shortfall in Performance. Capacity in T/Hr (equivalent to 100% of rated) of conveyor system including the intermediate equipments for each of the two parallel conveyor streams separately or any combination thereof to be tested in the following flow path operations. Apron feeder taking feed of incoming coal from Wagon Tippler-WT-1 and WT-2 and discharging coal into Conveyors. (i) Flow Path IA (Direct Stream): Apron feeder taking feed of incoming coal from WT hopper and discharging crushed coal into last bunker through travelling tripper mounted on Bunker Conveyor including all intermediate Conveyors and equipments. (ii) Flow Path IB (Stacking Stream) : Apron feeder taking feed of incoming coal from WT hopper and stacking crushed coal in stockyard using yard conveyor with stacker/reclaimer station farthest from yard conveyor tail end and boom conveyor at highest angle including all intermediate equipments.			
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1.03.08	(iii) Flow Path II(Reclaiming Stream): Reclaiming coal from stockyard using yard conveyor with stacker- reclaimers at farthest position from stacker conveyor head end, with the boom conveyor at its lowest position and feeding last bunker through travelling tripper on bunker conveyor including all intermediate equipments.										
	(iv) Flow Path III (Biomass stream): Bulk receiving unit/Box Feeder/Surface Feeder etc. taking feed of incoming Biomass and discharging Biomass into Storage silos/Bin which in turn feeds Biomass into Coal Conveyors through Biomass Conveyors including all intermediate equipments.										
	Bidder shall also demonstrate the guaranteed tipping rate of Truck Tipplers.										
	Further for the purpose of Guarantee tests all left out Conveyors/bucket elevators not appearing above along with all associated equipments shall also be considered.										
1.03.09	Performance tests and the procedure for performance testing of complete coal, flow handling plant shall be as per Annexure-II.										
	Mill Reject System Continuous effective discharge and conveying at the rated capacity of the mill rejects without spillage , in the system.										
	Ash Handling Plant										
	<table><tr><th>S. No</th><th>DESCRIPTION</th><th>PERFORMANCE GUARANTEE PARAMETERS</th><th>REMARKS</th></tr><tr><td>A.</td><td>Bottom ash system, Economizer ash,APH ash, Duct hoppers (if applicable)</td><td>(i) In case bidder offers intermittent type bottom ash removal system employing triple V type water impounded hopper and jet pump system shall be guaranteed to meet following performance: Continuous effective extraction, crushing and conveying of bottom ash generated during various modes of boiler operation to the ash slurry sump and the continuous effective pumping of combined slurry from this sump to the ash slurry dump area. The extraction of bottom ash shall be done twice in every shift of eight (8) hours. Ash from each individual hopper section in a unit will be removed in parallel. The total time for evacuating four (4) hour collection of bottom ash from a unit corresponding to collection rates specified shall not exceed 85 minutes including five (5) minutes time required for starting, stopping and water</td><td>Continuous effective conveying system shall be established by no stagnation of ash or slurry at any point in the complete system.</td></tr></table>				S. No	DESCRIPTION	PERFORMANCE GUARANTEE PARAMETERS	REMARKS	A.	Bottom ash system, Economizer ash,APH ash, Duct hoppers (if applicable)	(i) In case bidder offers intermittent type bottom ash removal system employing triple V type water impounded hopper and jet pump system shall be guaranteed to meet following performance: Continuous effective extraction, crushing and conveying of bottom ash generated during various modes of boiler operation to the ash slurry sump and the continuous effective pumping of combined slurry from this sump to the ash slurry dump area. The extraction of bottom ash shall be done twice in every shift of eight (8) hours. Ash from each individual hopper section in a unit will be removed in parallel. The total time for evacuating four (4) hour collection of bottom ash from a unit corresponding to collection rates specified shall not exceed 85 minutes including five (5) minutes time required for starting, stopping and water
S. No	DESCRIPTION	PERFORMANCE GUARANTEE PARAMETERS	REMARKS								
A.	Bottom ash system, Economizer ash,APH ash, Duct hoppers (if applicable)	(i) In case bidder offers intermittent type bottom ash removal system employing triple V type water impounded hopper and jet pump system shall be guaranteed to meet following performance: Continuous effective extraction, crushing and conveying of bottom ash generated during various modes of boiler operation to the ash slurry sump and the continuous effective pumping of combined slurry from this sump to the ash slurry dump area. The extraction of bottom ash shall be done twice in every shift of eight (8) hours. Ash from each individual hopper section in a unit will be removed in parallel. The total time for evacuating four (4) hour collection of bottom ash from a unit corresponding to collection rates specified shall not exceed 85 minutes including five (5) minutes time required for starting, stopping and water	Continuous effective conveying system shall be established by no stagnation of ash or slurry at any point in the complete system.								

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			flushing of the system for the following two conditions and with 25mm wear on the diameter of the throat section of the jet pumps: 1) Maintained water level mode. 2) Complete draw down mode by totally emptying the hopper of all water and ash with the make-up valve closed.		
			(ii) In case the Bidder offers continuous type bottom ash removal system employing submerged scrapper chain conveyors, the system shall be guaranteed to meet the following performance. Continuous effective discharge, crushing and sluicing of bottom ash generated during various modes of boiler operation to the bottom ash slurry sump and the continuous effective pumping of slurry from this sump to the main slurry sump in ash slurry pump house for onward effective pumping from main sump to the ash slurry dump area. Continuous normal conveying capacity ----- T/hr of the submerged scrapper chain conveyors with the linear speed of chain not exceeding 2.0 m/min. (guaranteed extraction rate). Dead start capability of submerged scrapper chain conveyor i.e. it shall be able to start and discharge the bottom ash with water filled trough full of bottom ash upto maximum water level.	Continuous effective mixing and sluicing shall be established by no stagnation of ash or slurry at any point in the complete system.	
	B.	Economizer + Eco duct Hopper (if applicable) ash handling system	In case of wet type Intermittent type bottom ash removal system, the ash collected in economiser hoppers will drop continuously into bottom ash hopper through vertical pipes, flushing connection, flushing equipment in form of slurry. From bottom ash hopper, the economiser ash shall be evacuated and transported to ash slurry sump of bottom ash slurry pump house alongwith bottom ash. In case of wet type continuous type bottom ash removal system the ash collected in economiser hoppers will be dropped into sluicing trench through flushing equipment. From sluicing trench, the economiser ash slurry will be conveyed upto the ash slurry sump of bottom ash slurry pump house alongwith bottom ash slurry and the slurry will be transported to ash disposal area by bottom ash slurry disposal pumps. Economizer ash removal shall be done and continuously. . In	The continuously effective conveying of ash as stated above shall be established by no stagnation of ash or slurry at any point in the complete system and will all interlocks. Protections working satisfactorily.	
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			case of dry type bottom ash removal system the ash collected in economizer hoppers will be conveyed using mechanical conveyors to the unit silo. From the silo, the ash shall be sent to the sump of ash slurry disposal pump house and the slurry will be transported to the ash disposal area by bottom ash slurry disposal pumps. Economizer ash removal from unit shall be done continuously		
	C	Air preheater, duct hopper (if applicable) ash handling	In case of intermittent type bottom ash removal system the ash collected in air preheater hoppers will be removed twice in a shift in sequence after bottom ash and economizer ash removal from units.The ash from air preheater shall be removed by feeder ejectors to a slurry tank in each unit.The slurry from the tank shall be evacuated by means of jet pump to the ash slurry sump in disposal pump house. Four (4) hour collection of air preheater ash of a unit shall be removed within 30 minutes to ash slurry sump for further removal to ash slurry disposal area. In case of continuous type bottom ash removal system the ash collected in air preheater hoppers will be dropped in to sluicing trench through flushing equipment. From sluicing trench the air preheater ash slurry will be conveyed upto the ash slurry sump for further removal to ash slurry disposal pump house for disposal.	The continuously effective conveying of ash as stated above shall be established by no stagnation of ash or slurry at any point in the complete system and will all interlocks. Protections working stasfactorily.	
	D.	Fly ash extraction and conveying system	1) Continuous effective conveying of fly ash from all fly ash collection hoppers in each unit i.e. ESP hoppers and primary & secondary air preheater hoppers ash (if applicable) generated during various modes of boiler operation upto buffer hoppers and continuous effective transportation of fly ash from buffer hoppers in each unit either to main ash storage silos or to HCSD silos and continuous effective pumping of high concentration slurry from Mixing tank of HCSD system to disposal area.	Continuous effective extraction and conveying system shall be established by no stagnation of ash or slurry at any point in the complete system.	
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			The fly ash collected in each unit in every shift of eight (8) hours corresponding to specified ash collection rates shall be removed in six (6) hours. 2) Parameters of blowers/ compressors/ vacuum pumps including power consumption when operating at the rated capacity and pressure corresponding to the above conditions (shop test).	
	D.	Water pumps for ash handling (ash water, seal water, flushing water, ash conditioning, wash water, sump drain pumps, etc.).	Power consumption at motor input terminal (kw) of each pump when operated at rated capacity and head.(to be tested and proven at shop).	
	E.	Bottom Ash slurry disposal system	Rated capacity ,head and power consumption at motor input terminal of each bottom ash slurry disposal pump to be tested and proved at shop applying correction for slurry density.	
	F.	HCSD	Rated capacity head and power consumption at motor input terminal of each HCSD pump (to be tested and proved at shop)	
	G	Weigh bridge below storage silos	Bidder to demonstrate weighment of loaded ash truck / Rail Wagons	
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1.03.10	POWER CYCLE PIPING Actual hanger readings, under cold and hot condition (at rated parameters) to match with those of design cold and hot hanger readings for MS/CRH/HRH/ HP & LP bypass piping system.			
1.03.11	Not used			
1.03.12	Fire Detection and Protection System a) Following shall be demonstrated at Shop i) Capacity, Head & Power consumption of fire water pumps.			
1.03.13.01	CW Pumps a. Each pump shall be tested at shop/ site (as applicable) for capacity, head, and power consumption. Current, Voltage, Motor input Power, Frequency, Speed, Bearing/ Motor winding Temperature, Vibration and noise level of pumps and drives and parallel operation (as applicable) without hunting & abnormal noise and with load sharing within 10% of each other at the rated duty point of pumps shall be demonstrated at site as a part of Performance & Guarantee test. b. Shop tests conducted with the actual motor shall be considered to determine the guaranteed performance parameters of Flow, Head, Efficiency and Power Consumption. During the shop test no negative tolerance in the guaranteed capacity, head and efficiency of the pump shall be allowed.			
1.03.13.02	Plate Heat Exchanger (ECW system) Heat transfer coefficient determining the performance under design heat load and inlet & outlet temperatures of the plate type heat exchangers on the primary and secondary side to be demonstrated at site. Further, pressure drop across the plate type heat exchanger on the primary and secondary water circuit to be demonstrated at site.			
1.03.14	PRE-TREATMENT PLANT A) CLARIFICATION PLANT 1. Each clarifier unit of PT-CW system shall be guaranteed for design effluent capacity meeting the effluent quality as mentioned below. 2. Effluent quality at the outlet of clarifiers (PT-CW system) shall be guaranteed for the following : i) Organic Matter : Less than 0.05 mg/l (see note below) ii) Iron Content : Less than 0.3 mg/l iii) Turbidity : Less than 5 NTU Note: Organic matter shall be tested as per $KmnO_4$ method. 3. Each clarifier shall be tested to demonstrate the above mentioned Guarantees at site under P&G test. In addition, demonstration of satisfactory working of all			
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1.03.15	the clarifiers, its drives, scrapper mechanism, operation of sludge blow-off etc, shall be demonstrated. TUBE SETTLERS/LAMELLA CLARIFIERS 1) Each Tube Settlers/Lamella Clarifier shall be guaranteed for design effluent capacity meeting the effluent quality as mentioned below. 2) Effluent quality at the outlet of Tube Settlers/Lamella Clarifier shall be guaranteed for the following: a) Effluent Turbidity : 10 NTU at design flow b) Effluent Oil & grease : 5 ppm (maximum) 3) Each Tube settler/Lamella clarifier shall be tested to demonstrate the above mentioned Guarantees at site under P&G test. In addition, demonstration of satisfactory working of settler/clarifiers, operation of sludge blow-off etc shall be demonstrated by Contractor. COAL SLURRY SETTLING POND Guaranteed effluent TSS at the outlet of each Coal Slurry Settling Pond during storm water (design) flow condition of 1000Cu.M/hr shall be 100 ppm (max.) and particles of size 50 microns & above shall be arrested in the CSSP. Testing shall be carried out tested to demonstrate the above mentioned Guarantees at site under P&G test. DM PLANT (ION EXCHANGE DM PLANT) A) ACTIVATED (AC) CARBON FILTERS a) Each filter shall be guaranteed for the design capacity. A.C. filter shall be backwashed once in 24 hours. b) Free chlorine content in effluent water shall not be detectable as per latest ASTM procedure. c) Organic matter in the effluent water shall be below detectable level. d) Turbidity in the effluent water shall be less than 0.5 NTU. B) ION-EXCHANGER UNITS a) Each ion exchange unit shall be guaranteed for design capacity meeting the effluent quality as mentioned below. However, each ion exchange unit shall be guaranteed for a Design flow (net) after meeting the water requirement for various regeneration steps. Service Cycle (Period between two successive regenerations) shall be 12 hours for each stream of cation and anion exchangers and 108 hours for each MB exchanger. Net output from each cation-anion unit between two regenerations shall not be less than Design flow (net) x 12 m³/hr and for mixed bed Design flow (net) x 108 m³/hr of treated water. b) Chemical consumption of the ion exchange units shall be guaranteed against the regeneration level employed and resin volume provided. Total time requirement for regeneration and backwash operation for each stream (AC filter, cation, and anion) shall not exceed four (4) hours. With mixed bed in regeneration, total time of			
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1.03.16	regeneration of stream shall not exceed six (6) hours. The guaranteed values of chemical consumption shall hold good for chemical conforming to following: • HCl - As per IS: 265 Tech. Grade • NaOH – As per IS: 252 Pure Grade available in Flakes or lye form			
	c) Effluent from the mixed bed unit shall be guaranteed to meet the following requirements, at rated capacity, throughout the period between two successive regenerations: i. Reactive Silica not to exceed: 0.01 ppm as SiO₂ ii. Iron as Fe: Not detectable as per ASTM (ASTM-D-1068) iii. Total Hardness: Not detectable iv. pH Value: 6.8 – 7.3 v. Conductivity: Not more than 0.1 micromhos/cm at 25 deg.C. d) Effluent from the anion exchanger shall be guaranteed as follows at rated capacity throughout the period between two regenerations: i) Reactive silica not to exceed: Not to exceed 0.2 ppm as SiO₂ ii) Conductivity at 25 deg.C : Not more than 10 micro mhos/cm e) Sodium leakage through cation shall not exceed 2 ppm as CaCO₃ throughout the period between two regenerations. f) Effluent from degassifier should not have CO₂ content more than 5 ppm. g) Life of cation resin shall be minimum five (5) years and life of anion resin shall be minimum three (3) years. C) POLSHING UF SYSTEM 1. Net permeate flow rate from each UF train shall be guaranteed for design capacity meeting the effluent quality as mentioned below. 2. Colloidal Silica shall be $\leq$ 0.01ppm as SiO₂. 3. SDI shall be limited to 3. 4. Life of Ultrafiltration membranes shall be guaranteed for minimum five (5) years. 5. For the guaranteed water quality and the permeate water capacity, UF plant shall give an undiminished recovery of 92% up to the end of 5 years of operation with replacement guarantee of membrane elements. Chlorination Plant 1.Each chlorinator for CW-Chlorination and PT-Chlorination system shall be guaranteed for the design capacity.			
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1.03.17	CW Chemical Treatment Plant (1) The bidder shall guarantee that the program offered shall meet the performance requirements stipulated for CW System. Also, the bidder shall demonstrate the guaranteed chemical consumption proposed in the bid, during the contract period. (2) For the purpose of verifying the guarantees on scale, a deposit monitor/test heat exchanger/fouling monitor shall be provided by the bidder stimulating the condenser operating conditions. The deposit monitor shall be weighed in new and clean condition and then weighed again on monthly basis and after completion of the test period. Prior to commencement of treatment program and after chemical cleaning of condenser tubes, the fouling factor shall be calculated for each condenser of 1X 800 MW units. The fouling factor shall also demonstrate the cleanliness of condenser tubes by visual examination of the same. (3) Corrosion coupons reflecting the metallurgy of the system components shall be supplied and installed by the contractor to measure guaranteed corrosion value and corrosion rate shall be determined based on observations on monthly basis after completion of six months. (4) For the purpose of verifying bio fouling in circulating water system, a bio fouling monitor or bio film activity monitor shall be provided by the bidder. The bio fouling shall be determined based on observation on monthly basis and after completion of six months. (5) Guarantee Values of Scale, Corrosion, Fouling & Bio Fouling a) Cumulative Corrosion Rate on Mild Steel < 3 mils/year b) Cumulative Corrosion Rate on Stainless Steel < 0.1mils/year c) Cumulative Corrosion Rate on Cu/Ni < 0.3 mils/year. d) Cumulative Scaling Rate of Internal Tube Surface Area of Condenser <15mg/dm2/year e) Fouling Factor: Deterioration in Heat Transfer Coefficient shall not be more than 5% of the original value just before commencement of the treatment program. f) TVC (Total Viable Count) (Micro Biological Counts) < 1.2 x 100000 counts/ml of circulating water. g) SRB (Sulphate Reducing Bacteria) <100 organisms/100 ml of circulating water. Bidder shall guarantee the above design parameters in the circulating water system of all the Units of the project.			
1.03.19	CONDENSATE POLISHING PLANT Effluent quality at outlet of each vessel at its rated design flow and design service length between two regenerations (as defined elsewhere).			
1.03.20	Pumps (Equipment Cooling Water system, Auxiliary Water system, Raw water system, Pre-treatment plant, DM Plant & Condensate Polishing Plant)			
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1.03.21	a) Capacity, head, and power consumption of all the pumps at the rated duty point (to be demonstrated and proved at shop with the respective job motors) and to operate in accordance with the approved pump characteristic curves. During the shop test no negative tolerance in the guaranteed capacity, head and efficiency of the pump shall be allowed. b) Current, Voltage, Motor input Power, Frequency, Speed, Bearing/ Motor winding Temperature, Vibration and noise level of pumps and drives and parallel operation (as applicable) without hunting & abnormal noise and with load sharing within 10% of each other at the rated duty point of pumps shall be demonstrated at site as a part of Performance & Guarantee test.			
	AIR COMPRESSOR UNIT a) Following shall be demonstrated at shop: i) Capacity and discharge pressure of each air compressor. b) Following shall be demonstrated at site: i) Parallel operation of air compressors ii) Dew point of air at the outlet of air drying plants of instrument air compressor. iii) Pressure drop across the air drying plants of air compressors. iv) Vibration level of air compressors, blowers of air drying plant			
	1.03.22 The parameters/capabilities to be demonstrated for following systems/ equipment's shall be: (i) EOT Cranes: Over load tests, travel and hoist speed checks as per relevant Indian standards IS (latest edition). (ii) HOT Cranes, Monorails etc.: Over load test, Travel and speed checks, functional and performance tests as per relevant Indian standards IS (latest edition). (iii) Butterfly valves: - The functioning of various Butterfly valves, opening and closing operation as per control logic, accumulator capacity of hydraulic operated valves etc. shall be demonstrated as per the approved design document.			
1.03.23	Passenger & Goods Lift of Various Areas Over load tests, travel and hoist speed checks, functional & performance tests			
1.03.24	(i) Performance Guarantee on Steel Helical Springs and Viscous Dampers for Machine Foundations The contractor shall guarantee the performance of the Steel Helical Springs and Viscous Dampers, to be provided by him for various machine foundations as specified in detailed technical specification, for a period of 24 months from the date of commissioning of each machine. For TG foundation, TDBFP & MDBFP & PA/FD/ID Fan foundations,, in case Alternative-2 (Open Foundations) are adopted by the bidder, then bidder has to furnish extended warranty of Five Years for satisfactory Static & dynamic performance of the respective foundations. (ii) Performance Guarantee on Acid / Alkali Resistant Linings & Anti-Weed Treatment The contractor shall furnish a performance guarantee for the acid/ alkali resistant linings and anti-weed treatment, as specified in detailed technical specification, for a period of three years from the date of completion of work or date of handing over, whichever is later. (iii) Performance Guarantee on HDPE Liner system of Raw water reservoir			
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	The contractor shall furnish a performance guarantee for the HDPE liner system to be provided by him for use in raw water reservoir, as specified in detailed technical specification, for a period of five years from the date of completion of work or date of handing over, whichever is later. (iv) Any defect observed during the guarantee period shall be made good by the contractor by re-carrying out/ replacing or by rectifying (if the defect is localized) the acid-alkali resistant linings, the anti-weed treatment and HDPE liner, to the entire satisfaction of the Employer without any extra cost to the Employer. 1.03.24 For all other equipment included in the scope of supply of the bidder but not covered above, the demonstration tests to be carried out shall be mutually finalized between contractor & Employer after award of contract. 1.03.25 Unit Load Ramp rate capability test: The contractor shall demonstrate minimum $\pm 3\%$ per minute ramp rate for 70% to 100% load range, minimum $\pm 2\%$ per minute ramp rate for 55% to 70% load range and minimum $\pm 1\%$ per minute below 55% load to 40% Load while maintaining the parameters within prescribed limits as defined in closed loop control system requirements (Refer clause 1.03.26.02) towards compliance to the requirements of the technical specifications (Sub section G-01 of Part B "Operating Capability of Plant"). 1.03.25A Contractor shall, during the initial operation of each unit, demonstrate the compliance to the requirements as mandated in the latest Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2023 as per the details mentioned in clause 26.02.00 & 26.06.00 of Part C (GTR) of technical specifications. 1.03.26 Control & Instrumentation System Requirements (DDCMIS SYSTEM GUARANTEE REQUIREMENTS) These guarantee requirements shall be demonstrated before COD. During demonstration of these guarantees, control system and process experts of both QSGM and QSTGM shall be present at site and participate fully in the demonstration of PG test. 1.03.26.01 The parameters/capabilities to be demonstrated for various systems/ equipments shall include but not be limited to the following: 1.03.26.02 Performance Requirement of the Closed Loop Control System (i) The closed loop Control System shall provide automatic control of the plant for full applicable operating range of the unit and shall provide a unit operating turndown ratio of not less than six to one. The closed loop Control System shall permit the performance of the dynamic load tests (ramp test, steady state test & step tests) while maintaining safe furnace conditions, major process parameters and without endangering other equipment. All tests will be performed with the system in automatic mode: (a) Drop load from 100% to 70% of full load at a rate such that actual unit load ramp rate of 3% per minute is achieved without causing deviation in process variables and vice versa. (b) Drop load from 70% to 55% of full load at a rate such that actual unit load ramp rate of 2% per minute is achieved without causing deviation in process variables and vice versa.			
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	(c) Drop load from 55% to 40% of full load at a rate such that actual unit load ramp rate of 1% per minute is achieved without causing deviation in process variables and vice versa. (d) Drop load from full rated output to the lowest runback limit, at a rate corresponding to the fastest run back rate. During transient conditions causing deviation of process variables, the control system furnished under the specification shall not permit deviations, which exceed those permitted by the manufacturers of the controlled process equipment, for load changes as indicated above. SG and its auxiliaries along with its control system (SG C&I), TG and its auxiliaries along with its control system (TG C&I) when integrated with UNIT C&I systems shall meet the permissible limits for important parameters, under various operating conditions specified. The tentative parameters to be monitored for this test are given in the Table-1, given below and the exact parameters shall be as finalized by the boiler and turbine suppliers. The control loops shall perform to return the controlled variable to the set point in a stable manner without cycling in the shortest possible time and without any loop interactions or cycling of generation when generation matches unit load demand. (ii) The Bidder shall also guarantee that the control system provided by him will be responsive and stable and will maintain the deviation of controlled variables from set point within the limits specified so that the equipment being controlled will operate as specified over the range required. The controls shall operate automatically, with no assistance from the operator. The controller shall successfully demonstrate the performance of Closed Loop Control Systems before acceptance and taking over of this system by the Employer. (iii) The control system including furnace draft & firing rate control shall also comply with all relevant requirements of NFPA code no. 85 'Standard for Prevention of Furnace Explosions in Pulverizer Fired Utility Stations' and other applicable codes regarding safety. (iv) All runback conditions listed below shall be proved by the Contractor without any oil support. -- FD/ID/PA fan trip -- BFP/CEP/ trip -- One mill and two mill trip. -- Any other condition decided during detailed engineering. <table><tr><td>PERFORMANCE REQUIREMENTS FOR CLOSED LOOP CONTROL SYSTEM</td></tr><tr><td>(TABLE – 1)</td></tr></table>				PERFORMANCE REQUIREMENTS FOR CLOSED LOOP CONTROL SYSTEM	(TABLE – 1)
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	Sl. No.		Load/Rate of load change		MAXIMUM DEVIATION OF PARAMETERS FROM SET POINT											
		(% of MCR per min.)	Throttle Pressure Deviation (Kg/cm2)	Flue Gas Oxygen Deviation (%O2)	Furnace Pressure Deviation (mmWC)	S.H. Steam Temp. Deviation (Deg C)	R.H. Steam Temp. Deviation (Deg C)	*Max. S.H. Metal Temp. Limit (Deg C)	*Max. R.H. Metal Temp. Limit (Deg C)							
	A.		Steady State Condition													
		1	100%	± 2.0	± 0.4	± 8.0	± 5.0	± 5.0								
		2	70%	± 2.0	± 0.4	± 8.0	± 5.0	± 5.0								
		3	55%	± 2.0	± 0.4	± 8.0	± 5.0	± 5.0								
		4	40%	± 2.0	± 0.4	± 8.0	± 5.0	± 5.0								
	B.		Actual Load Cycling RAMP Test (as per clause no 1.03.26.02 (i)- (a) & (c) above).													
		1	± 1%	± 3.0	+0.6/-0.4	± 12.0	± 8.0	± 8.0								
		2	± 2%	± 3.0	+0.6/-0.4	± 12.0	± 8.0	± 8.0								
		3	± 3%	± 3.0	+0.6/-0.4	± 12.0	± 8.0	± 8.0								
	C.		Step Load Changes													
		1	From 100% to 80% and vice versa	± 5.0	+1.5/-0.5	± 20.0	± 15.0	± 15.0								
	* For superheater metal temperature and reheater metal temperature, the limits shall not cross the design temperature limit as specified in sub-section-A-01, Part-B of the Specification. Notes <table><tr><td>1.</td><td>Sufficient time shall be allowed as setting period between conducting the tests.</td></tr><tr><td>2.</td><td>Plant operating condition, i.e. main equipment status, availability of auxiliaries, operational and equipment constraints, which can influence the test, shall also be recorded.</td></tr><tr><td>3.</td><td>Control system shall be running in the CMC mode i.e. Boiler master, fuel flow, air flow, feed water and turbine load control shall be in automatic mode Load set point, maximum and minimum load set point, rate of raise/lower of load shall be set through the Operator Work Stations, Large Video Screen.</td></tr></table>										1.	Sufficient time shall be allowed as setting period between conducting the tests.	2.	Plant operating condition, i.e. main equipment status, availability of auxiliaries, operational and equipment constraints, which can influence the test, shall also be recorded.	3.	Control system shall be running in the CMC mode i.e. Boiler master, fuel flow, air flow, feed water and turbine load control shall be in automatic mode Load set point, maximum and minimum load set point, rate of raise/lower of load shall be set through the Operator Work Stations, Large Video Screen.
	1.	Sufficient time shall be allowed as setting period between conducting the tests.														
	2.	Plant operating condition, i.e. main equipment status, availability of auxiliaries, operational and equipment constraints, which can influence the test, shall also be recorded.														
	3.	Control system shall be running in the CMC mode i.e. Boiler master, fuel flow, air flow, feed water and turbine load control shall be in automatic mode Load set point, maximum and minimum load set point, rate of raise/lower of load shall be set through the Operator Work Stations, Large Video Screen.														
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1.03.26.02.01	The following parametric tests shall also be conducted under worst case loading conditions as defined in Annexure-I to this sub-section – (details of which shall be as approved by Employer during detailed engineering.) (i) For control system - CPU loading, Cycle time/controller reaction time (ii) For MMIPIS - CPU loading, spare duty cycle, spare memory Capacity (iii) Spare duty cycle for system bus (iv) Various display response time (v) Display update time					
1.03.26.02.02	For the parametric test, the following requirements shall be met (i) Processor Spare Duty Cycle (Free Time) - Under worst case loading of MMIPIS and system bus each MMIPIS processor shall have 40% free time when measured over any two second period and 50% free time when measured over any one minute period. - Under worst case loading conditions of control system control system processor shall have 20% free time when measured over any one minute period. - The Bidder shall furnish all necessary data to fully satisfy the Employer that the processor spare duty cycle figures quoted by the Bidder are realistic and based on configuration and computation capability of the offered system and these shall be actually achieved in the fully implemented system as commissioned at project site. (ii) System Bus Spare Duty Cycle (Free Time). The system bus shall have min. 50% free time during the worst case loading conditions of control system, MMIPIS and the system Bus, measured over any 2 seconds interval (iii) Response Time (a) Display The time from mouse click or last button pressed to the commencement of the requested display under the worst case loading conditions shall not be worse than the following: <table><tr><td>All control related displays</td><td>1 sec</td></tr></table>				All control related displays	1 sec
All control related displays	1 sec					
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		<table><tr><td>Point Details Display (single point)</td><td>1-2 secs</td></tr><tr><td>Bar chart display (20 points, current data)</td><td>2-3 secs.</td></tr><tr><td>Operator guide/plant start-up guide message display (full screen of alphanumeric information and a maximum of ten numbers of dynamic data items)</td><td>1-2 secs.</td></tr><tr><td>Plant mimic display of fair complexity with a minimum of 120 numbers of dynamic data items e.g., values, macros, line segment, etc.</td><td>2-3 secs.</td></tr><tr><td>Group review display (current values of twenty points)</td><td>2-3 secs.</td></tr><tr><td>X-Y plot display (2 X-Y- plots and a single display requiring both historical as well as current data)</td><td>3-4 secs.</td></tr><tr><td>X-T plot display (Trend of 6 analog points and a single display requiring both historical as well as current data)</td><td>3-4 secs.</td></tr><tr><td>Plant Summary display (e.g., bad point summary, limit check removed point summary. Assume the whole data base search is required and the summary display contains ten points only).</td><td>3-4 secs.</td></tr></table>	Point Details Display (single point)	1-2 secs	Bar chart display (20 points, current data)	2-3 secs.	Operator guide/plant start-up guide message display (full screen of alphanumeric information and a maximum of ten numbers of dynamic data items)	1-2 secs.	Plant mimic display of fair complexity with a minimum of 120 numbers of dynamic data items e.g., values, macros, line segment, etc.	2-3 secs.	Group review display (current values of twenty points)	2-3 secs.	X-Y plot display (2 X-Y- plots and a single display requiring both historical as well as current data)	3-4 secs.	X-T plot display (Trend of 6 analog points and a single display requiring both historical as well as current data)	3-4 secs.	Plant Summary display (e.g., bad point summary, limit check removed point summary. Assume the whole data base search is required and the summary display contains ten points only).	3-4 secs.
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	Plant Summary display (e.g., bad point summary, limit check removed point summary. Assume the whole data base search is required and the summary display contains ten points only).	3-4 secs.																
	(b)	Command: The response time for screen update, after the execution of the control command, from the time the command is issued (for example command to start a motor to the time the screen is updated) shall be within two seconds (excluding the drive actuation time).																
(iv)	Display Updated Rates All displays shall be updated at least every two seconds.																	
(v)	The spare capacities of working and bulk memory shall meet the requirements indicated in Section-VI, Part-B, Sub-section -DDCMIS.																	
1.03.26. 03	Sequence of Event																	
1.03.26.03.01	The sequence of event in operating with 1 m sec. resolution as per Sub-Section-DDCMIS, Part-B, Section-VI.																	
1.03.26. 04	Availability Tests																	
1.03.26. 04.01	The Bidder shall guarantee 99.7 percent system availability for a continuous period of 180 days. An availability guarantee test shall be conducted to assure this level of availability. If the accrued down time exceeds 0.3 percent of 180 days, during availability test run, a new 180 days test run shall start at the time when the system becomes available again. Loss of availability (unavailable system) shall be defined as the loss of the system's guaranteed accuracy and repeat ability or of any system function, except however, that the loss of a																	
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1.03.26. 04.02 1.03.26. 04.03 1.03.26. 04.04 1.03.26. 04.05 1.03.26. 05	function for not more than five percent of the points shall not be considered loss of availability. Loss of a function for more than five percent of the points shall be treated as partial unavailability and the corresponding outage time shall be weighted with respect to the function and the percentage of the points for which the function is unavailable. Loss of each function shall have one weighing factor and unavailability of each equipment, peripheral device or process I/O card etc. shall have another weighing factor. The guaranteed accuracy and repeat ability and system parametric requirements specified in clauses on system parametric requirements shall be maintained for the entire 180 days run without any manual recalibration or any other changes made to the DDCMIS. Downtime shall start upon loss of a system function and shall end upon full restoration of the affected system function. A minimum of one hour's down time shall be charged for each loss of availability in determining system availability. The Bidder shall submit the Availability Test procedure for Employer's approval. The details regarding outage time, weighing factors for various system functions equipments to calculate the down time, test duration etc., shall be discussed and finalised during detail engineering. After conductance of availability test, Contractor shall prepare report covering the methods followed, observations & submit to Employer. If availability is lost due to reasons not attributed to the Contractor / Contractor's system or due to force majeure, then downtime shall not accrue & interrupted test resulting from the same shall be extended by an amount of time equal to the length of interruptions. Loss of each of the following functions shall be treated as full system unavailability (i.e. factor of 1) and the downtime shall accrue individually for each of the following function: (a) Interruption of control command communication between HMI and controllers for a period more than three seconds for any drive (i.e. Unavailability of information in HMI for carrying out the control command shall also be treated as interruption of control commands). (b) Permanent data loss in history functionality for a period more than three seconds for more than five percent of the history database. (c) Delay in reporting of alarms in HMI for more than five percent of the alarms for more than three seconds. If loss of function as described at (a) to (c) above is attributed to server changeover, due to system feature, then unavailability due to the above loss of function shall accrue even if the function is not specifically attempted by Employer during the server changeover period. The performance & guarantee test for C&I system shall constitute verification of the parameter as mentioned above & shall be carried out as per agreed procedure. The PG test procedure shall be submitted within 90 days of the date of Notification of Award for	
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	Employer's review and approval. After the conductance of Performance test, the Contractor shall submit the test report to the Employer			
1.03.27	The operating capabilities of the plant as listed out in Sub-section- G-01, (Operating Capability) of Section-VI, Part-B shall also be demonstrated along with other parameters/ capabilities specified under category-III guarantees. The treatment of these operating capabilities of compliance/ non-compliance shall be the same as given to other Cat-III guarantees.			
2.00.00	PERFORMANCE GUARANTEE/ ACCEPTANCE TEST			
2.01.01	TEST INTERRUPTIONS In the event of a test interruption resulting from an Event of Force Majeure or Employer-Caused-Delay, Contractor shall be entitled to relief as provided in the contract, provided that the interrupted Performance Test must be started again and test data that were collected/recorded during the interrupted test must be ignored.			
2.02.00	TURBINE GENERATOR PERFORMANCE/ ACCEPTANCE TEST			
2.02.01	Performance test for the turbine generator set will be conducted in accordance with the latest edition of ASME PTC-6 and as specified otherwise in the specification. Such test shall be binding on the parties to the contract to determine compliance with the guaranteed unit heat rate and heat balance conditions at 800 MW (100% TMCR) MW and 440 MW (55% TMCR) unit outputs corresponding to the conditions specified elsewhere in the specification. Power consumed by the auxiliaries mentioned under clause 1.01.03.01 of this Sub-section which is to be deducted from electrical power generated, shall be measured during the performance / Acceptance Test. Wherever the measurement is not possible, design values of power consumption by an auxiliary shall be considered.			
2.02.02	No shutdown shall be allowed for installation of PG test instrument/ flow nozzle etc. Any advanced class instrument system such as those using electronic devices or mass flow technique shall be arranged by the contractor, if required. However, same shall be installed before start of initial operation of unit. For determination of primary flow to the turbine, a calibrated low Beta-ratio throat-tap nozzle assembly shall be installed permanently in condensate line prior to initial operation, same shall be also used for process control. All the instruments including the flow nozzle shall be calibrated by the contractor before initial operation in a reputed international institute. All calibrations reports shall be made available prior to the start of initial operation and calibration certificates in original submitted to Employer. All instruments including flow nozzles as necessary for conductance of PG tests shall be installed prior to the start of initial operation.			
2.02.03	Corrections to the test results for steam turbine shall be applied as per the correction curves listed in this subsection. All the efforts shall be made to control the unaccounted for leakage to the minimum, when the system is properly isolated for a performance test. It shall be bidder's responsibility to arrest all the cycle leakages and valves passing before start of initial operation. It will be endeavour of the bidder to keep the unaccounted for leakages below 0.1% of the design throttle flow at that load. In case the value of unaccounted for leakage, is more than 0.1% of design throttle flow at that load, the suitable correction for make-up shall be provided as per approved correction curve.			
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2.02.04	The tests shall be arranged in a manner that the EMPLOYER's operation is not disrupted. Duplicate test runs shall be performed at 800 MW and 440 MW unit loads. The results of corrected heat rate shall agree within 0.25%. If they differ by more than 0.25%, third test shall be run at the same point. The corrected result of any one of the three test runs, which deviates from the corrected averaged result of all the runs by more than 0.25%, shall be eliminated; otherwise the results of all the three tests runs shall be accepted.			
2.02.05	Performance test for Water Cooled Condenser (WCC) will be conducted in accordance with the latest edition of ASME PTC.			
2.03.00	TEST REPORTS The Contractor shall prepare test reports in which the methods followed, instrument readings, graphs, observations, final results obtained online, etc., shall be recorded. Soft copies of each test report shall be submitted to Employer for Approval.			
2.04.00	Performance Guarantee/ Acceptance Tests on the equipments / systems not covered in this Sub-section shall be carried out as per the procedure/ test codes/ specified in respective detailed specifications/ Sub-sections in Section-VI, Part-B.			
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CLAUSE NO.	GUARANTEE TEST PROCEDURE		
	Annexure-I 1.00.00 Worst Case Loading Conditions for Control System (Definition) The worst case loading conditions shall include the following tasks as a minimum: 1.01.00 All process inputs coming to Control System including SOE/annunciation inputs are being scanned, acquired, conditioned and processed. 1.02.00 All closed loop controls are in operation during a disturbed (non-steady) state of the process. 1.03.00 All open loop controls of DDCMIS are in operation during a disturbed (non-steady) state. 1.04.00 All data being transferred between control system, system bus and HMIPIS. 1.05.00 Three (3) alarms are being generated per second from each of the functional groups of Control System. 1.06.00 Twelve control commands from HMIPIS are being executed in one minute. 1.07.00 All processors (including hot standby) health being monitored. 1.08.00 All standby processors status being updated. 2.00.00 HMIPIS Worst Case Loading Conditions (See note below) The worst case loading conditions shall include the following tasks as a minimum: 2.01.00 Continuous data transfer between System Bus & HMIPIS. 2.02.00 All calculations including performance calculations being performed at the specified rates. 2.03.00 Alarms being reported at the rate of three (3) alarms per second for each of the Control System functional groups. 2.04.00 Two control operator commands for control/ information within a base period of one minute from each OWS & each LVS. 2.05.00 Data collection for all logs/reports in progress. 2.06.00 OWS/LVS displays are in operation as follows: LVS – 1, 4 - Sequence chain display with maximum number of dynamic data items.		
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	LVS - 2, 5 - Individual display with maximum number of dynamic data items. LVS – 3, 6 - Plant mimic display with one hundred and twenty (120) numbers of dynamic data items. OWS - 1 - Overview display with max. no. of dynamic data items. OWS - 2 - Group display (twenty points, current data). OWS - 3 - Alarm display of twenty (20) points. OWS – 4 - 4 Nos. Windows each running current trend. Unit Incharge - Plant overview display OWS All PC Stations X-T plots are displayed & updated. On Station WAN And unit LAN 2.07.00 All printers connected to HMIPIS are in operation at rated speed. 2.08.00 HMIPIS processors and all peripherals health being monitored. 2.09.00 Data collection for trend function and historical data storage in progress. 2.10.00 Four alarm acknowledgements within a base period of one minute from each OWS & LVS. 2.11.00 Calculations for long term storage of data being performed. 2.12.00 SOE printing in progress. 2.13.00 Data transfer with other DDCMIS sub-systems, all PLCs and SG/TG C&I Systems in progress for controls (commands) as well as for information. 3.00.00 <i>The Worst Case Loading Conditions For System Bus</i> The worst case loading condition shall mean continuous data transfer between the distributed modules (Control System/HMIPIS), at their individual worst case loading conditions defined at 1.00.00 & 2.00.00 above respectively. Note : This clause is generally for the unit DDCMIS. This shall be suitably modified for other DDCMIS subsection depending on actual configuration.			
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CLAUSE NO.	GUARANTEE TEST PROCEDURE			
	ANNEXURE-II 1.00.00 STANDARD GUARANTEE AND ACCEPTANCE TESTS AND TESTING PROCEDURE FOR COAL & BOIMASS HANDLING PLANT 1.01.01 Power Consumption Total power consumption for all the equipments including auxiliaries with single stream operation at its guaranteed flow path capacity except. - Lighting - Hoists - Coal sampling unit - Sump Pumps - Elevators - DS, DE, Ventilation, SW System, Potable water system 1.01.02 Performance Requirements to be Demonstrated Performance requirements of various individual equipments / systems as specified, including but not limited to certain minimum requirements as spelt out in the Guarantee Test procedure shall also be demonstrated during the Guarantee Tests to the full satisfaction of the Employer. 2.00.00 GUARANTEE TEST PROCEDURE In accordance with Section GTR placed at Part-C, on successful completion of System Trial Operation and commissioning, the plant shall be subjected to guarantee tests. Further, the guarantee tests shall be conducted as per the procedure specified in the following paragraphs. 2.01.00 Pre-Requisites to the Guarantee Tests 2.01.01 The prerequisites to be ensured by SCCL and the Contractor prior to start of the tests are placed at Appendix-I and Appendix-II respectively. 2.01.02 After successful completion of trial operation and commissioning the plant shall be jointly inspected by SCCL and the Contractor & a joint protocol shall be signed that the plant is fit for guarantee tests. 2.02.00 Testing for Guarantees 2.02.01 Flow Path Capacity Tests (a.) For each of the Flow Paths, two conveyor streams shall be formed with suitable CRISS-CROSS Combinations of 'A' or 'B' Conveyors/ intermediate equipments. Composition of each stream shall be decided by the Engineer and shall be recorded as per Appendix-III.			
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CLAUSE NO.	GUARANTEE TEST PROCEDURE			
	(b.) All above streams formed shall be independently tested for performance & guarantee. Further, the equipments/ conveyors (except common equipments) used for performance testing of one stream shall not be used for performance testing of the other stream.			
	(c.) In case of direct flow path, guarantee test should include operation of all the trippers. However, for measurement of guaranteed power consumption farthest tripper shall be operated.			
	(d.) Stacking and Reclaiming will be done near the drive house so that the conveyor is tested under fully loaded conditions.			
	(e.) While operating the guaranteed capacity of the flow paths, non-spillage of coal and non-choking of chutes/ equipments shall be demonstrated as indication of smooth continuous flow through the conveyor system.			
	2.02.02	Major Equipment Capacity Tests		
	(a.) Guaranteed capacity of all the major equipments as identified shall be established separately by operating only one equipment out of the two of a set at a time. Following equipments shall be considered:			
		Equipment	Capacity Requirement	
		Apron feeders and belt conveyors	Guaranteed capacity in T/Hr	
		Crushers	Guaranteed capacity in T/Hr	
		Stacker cum Reclaimer	Guaranteed capacity in T/Hr	
	Vibrating feeder	Guaranteed capacity in T/Hr		
	Travelling Tripper	Guaranteed capacity in T/Hr		
	No of tips/Hour for wagon tipplers with side arm chargers			
	Height and Base Width of Stockyard			
2.02.03	Power Consumption Measurement			
	(a.) The guaranteed power consumption as total sum of all the equipments as specified shall be measured during capacity test of the identified Flow Paths for both the streams separately.			
	The load of the following items shall not be considered during measurement of Power Consumption for guarantee:			
	Lighting			
	Hoists			
	Sump Pump			
	Coal/ Sampling Unit			
	Elevator			
	DS, DE, Ventilation, SW system, Potable water system			
	(b.) Measurement Terminal(s)			
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CLAUSE NO.	GUARANTEE TEST PROCEDURE		
2.02.04	The guaranteed power consumption for the entire Flow Path(s) shall be taken during capacity test as sum of the power measurements at the following terminals. (1.) 3.3/6.6/11 kV CHP incoming terminals (2.) 415 V CHP MCC incoming terminals. (3.) Switchgear terminal of any load connected to Employer's Switchgear. Further the power consumption for the equipments being fed from CHP board/LT board but not to be considered for guaranteed power consumption shall be measured separately at their respective MCC/LT & HT switchgear input terminals and shall be subtracted from the total power consumption measured. However, if conditions permit, such equipments may not be operated during power measurement duration. For Stacker/ Reclaimer machine, the average power consumption shall be measured through energy-meter at HT switchgear feeder of Stacker/ Reclaimer. For Conveyors, the power consumption shall be measured at their respective switchgear terminals. Guaranteed power consumption of the yard conveyor(s) shall be measured during flow path capacity test in stacking mode whereas for balance equipments (balance conveyors and S/R machine) the power consumption shall be measured during capacity test of reclaim flow path with boom of stacker reclaimer at lowest angle. Lighting, A/C & Ventilation loads on the Stacker/ Reclaimer shall not be considered for guarantee. (c.) Time Duration Power Consumption measurement shall be done only for 30 minutes after the conveyor flow rate stabilizes at the guaranteed capacity. However, for Stacker/ Reclaimer(s), the average power consumption shall be measured for entire duration of reclaim flow path capacity test. (d.) Meters Ammeter/Voltmeter readings shall be noted from the meters mounted on the control desk / LT switchgear / HT switchgear or if necessary by means of clamp type meters. For power measurement two wattmeter method / one wattmeter method (2 or 3 elements) shall be used. Accurate clamp type digital 3 phase wattmeters can also be used. Power measurement shall be taken after stable condition is achieved. Wattmeters shall have a min. accuracy class of $\pm 1\%$ Energy meter shall be of min $\pm 2\%$. CTs & VTs shall have accuracy of $\pm 1\%$. All meter readings shall be recorded. No corrective allowance shall be allowed over the measured values. The details of wattmeters and energymeter alongwith their calibration certificate shall be furnished to SCCL before start of tests. These measuring instruments shall be calibrated from govt. approved test house. Calibration certificates of all instruments must not be more than 1 year prior to test date. Seals of the instruments shall be opened at site in the presence of Engineer-in-charge. Zero error shall be checked before conducting the PG Test.		
	GENERAL		
	(a.) Test Duration (1.) Normal duration of the above capacity tests shall be four hours. However, minimum one (1) hour continuous & steady operation shall be required to establish the guaranteed capacities.		
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	(2.) In case of any minor interruption due to operation of electrical protection as well as stoppage due to safety reasons, the duration of test shall be extended by the time lost in such interruptions. In case of exceptionally longer interruptions calling for re-mobilization and re-preparation of plant the implications shall have to be mutually discussed and agreed upon. (b.) Weighing scales (1.) For measurement of flow capacity of a stream and individual equipments, weighing scales installed in the system shall be used. (2.) Belt weigher mounted on the luffable boom of Stacker/ reclaimer shall not be used for this purpose. (3.) Readings for flow rate capacity test shall be taken at intervals of every 3 minutes. (4.) Belt weighers accuracy as demonstrated/ observed jointly before the guarantee testing may be considered for allowing correction factor over the recorded flow capacity reading. (c.) The observations of guarantee test for various streams/ equipments shall be recorded in the formats at Appendix – III to XI.			
2.03.00	Testing for Demonstration Requirements			
	The specified performance parameters of various equipments/ system including but not limited to the following shall be demonstrated to the full satisfaction of the Employer.			
2.03.01	Wagon tippers			
	Smooth operation of wagon tippler without jerks			
	Demonstration of guaranteed capacity of unloading of wagons in terms of load, no. of wagons and tipping rate and entries to be made as per format.			
	Free flow of coal from the wagon tippler hopper even with wet coal having 20% moisture.			
	Demonstration of tipping rate of 25 wagons/hr.			
	Demonstration of side arm chargers for auto operation of full rake			
	Demonstration of DS spray system			
2.03.02	Conveyors			
	(a.) Conveyor Profile (1.) Check against lifting of Conveyor belts over concave curves at the time of start under empty belt condition. (2.) Check against wrapping/folding of belt over convex curves/transition zones. (3.) There should not be any roll back of coal/ pieces on moving or stopped conveyors			
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	(4.) There shall not be build up of coal/ in chutes , spillage of coal from skirt/conveyor/hoods while the belt is running. (5.) Smooth non-jerky running of conveyors with no spillage of coal etc and centric running of conveyors without vibrations of drives and galleries. (b.) Coasting Time Coasting down time of conveyors shall be measured and compared with design values. Check for spillage/blockage of coal from skirts/in chutes to be made. There shall not be build up of coal in chutes after stoppage of fully loaded conveyor so as to cause spillage of coal during next start. (c.) Belt Alignment To check against any sway during operation under different loadings and different conveyor criss-cross combinations_ (d.) Idlers and self aligning idlers To check for satisfactory performance of idlers and self-aligning idlers (e.) Control (a) Performance checks for specified controls including starting/ stopping of conveyors and other equipments as per approved control write-up. (b) Satisfactory operation of PLC and control systems including absence of spurious trips/communication failures of PLC to be demonstrated. (c) Demonstration for detection of operated pull cord/belt sway switch along with display in CRT of conveyor number and operated pull cord /belt sway number. (f.) Protection Switches Satisfactory operation of pull chord, belt sway, zero speed, chute blockage and other safety / protection switches. (g.) Load Start Demonstration of the ability of conveyor to start under full designed load. (h.) Simultaneous Operation Demonstration of simultaneous operation of both the streams under full load for 30 minutes in order to check healthiness of the system, electrical systems etc (i.) Vibration Level in Conveyors/Bucket Elevators Both velocity and amplitudes for all the conveyor/Bucket elevator drives and in each conveyor gallery under different conditions of conveyor operation as desired by site. Vibration limits of drive equipments shall be as per VDI 2056 / equivalent. Observations shall be recorded as per the format at Appendix-V. Vibration of conveyor galleries at trestles and pt. between trestles shall be measured and these values shall be within allowable limits. Vibrations of Crusher houses floors and transfer point floors shall also be measured and these shall be within allowable limits. (j.) Gear Boxes Temperature rise not to exceed design values. No leakages			
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CLAUSE NO.	GUARANTEE TEST PROCEDURE			
	No abnormal sound. Satisfactory performance of hold back devices in preventing running back of conveyor belts in case of conveyor being stopped in fully loaded (at design load) condition to be demonstrated. (k.) Fluid Coupling. No excessive rise of temperature. Satisfactory and quick operation of scoop in manual/remote modes with no oil leakages.			
2.03.03	Stacker cum Reclaimer (a.) Stacking at maximum boom height. (b.) Starting of Boom Conveyor/Intermediate conveyor at full load (at design load = rated capacity +25%) at maximum / minimum inclinations. (c.) Reclaiming at maximum and minimum stockpile heights (d.) Uniform to and fro travel speed and proper reeling / unreeling of flexible cables/energy chain system. (e.) Satisfactory operation of all limit switches, protections and other controls. (f.) No sway of Boom Conveyor during stacking and reclaiming at different loads and inclinations. (g.) Proper hoisting / luffing operation without jerks and operator cabin level adjustment. (h.) Check against folding of belt in spaces between horizontal and inclined troughing idlers at the start of Stacker Reclaimer. (i.) No leakage from hydraulic couplings, seals, heat exchangers, instrument tappings etc (j.) Demonstration of proper functioning of hydraulic and manual rail clamps and boom locking. (k.) Proper functioning of communication system on stacker reclaimer. (l) Demonstration of Stacker Reclaimer Unmanned Operation for total duration of 24 hrs, with atleast 4 operations of 4 hours of continuous operation each, with in a period of 7 days.			
2.03.04	Travelling Trippers (a.) Check for smooth to & fro travel (b.) Operation of brakes and rail clamps at full load. (c.) Check against dragging during start up or running (“over speed protection”). (d.) Check against blockage of discharge chutes at full load. (e.) Check against folding of belt in spaces between horizontal and inclined troughing idlers at the start of Tripper. (f.) Proper functioning of communication system on trippers.			
SINAGRENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID DOC. NO. CW-CM-11159-C-O-M-001	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 56 OF 71

CLAUSE NO.	GUARANTEE TEST PROCEDURE			
2.03.05	Package Air Conditioning (PAC) Unit (a.) Specified temperature and humidity of conditioned space under worst ambient conditions. (b.) Demonstration of rated capacity of PAC unit.			
2.03.06	Belt Weighers (a.) Demonstration of specified weighing accuracy of $\pm 0.25\%$ ($\pm 1\%$ in case of boom conveyor of stacker reclaimer) between 20% and 120% of rated capacity (b.) Satisfactory operation of flow rate indicator and totaliser etc.			
2.03.07	Crushers Output coal/ size to be sieve analyzed and (-) 20 mm coal/ to be more than 98% for ring granulator type crusher. Vibration measurement (velocity and amplitude) is to be recorded at bearings as per appendix. Vibration is to be within allowable limits. No excessive rise of temperature of bearings One crusher is to be tested for output and size. Proper functioning of vibration monitoring system to be checked.			
2.03.08	Noise Levels			
2.03.08.01	Noise level measurement, for conformance to specified levels, to be done around the following equipments/ areas: (a.) Conveyor Discharge Terminal (including discharge chute, gearbox, coupling & motor). (b.) Coal discharge chutes on intermediate floors in possible impact zones. (c.) Ventilation fans (d.) Water Supply & Dust Suppression Pumps. (f.) Coal crushers (g.) Vibrating Feeders// Vibrating Screening Feeder			
2.03.08.02	Noise level measurement shall be done around the specified equipment location in the following manner. (a.) The measurement shall be carried out with a calibrated integrating sound level meter meeting the requirements of IS:9779. (b.) Sound pressure level shall be measured all around the equipment at a distance of 1m from the vertical projected plan of the equipment as a whole (this shall include coupling, gear box, motor etc.) at a height of 1.5 m from floor level. Microphone positions shall be at horizontal separations of not more than 1.5m around the equipment.			
SINAGRENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID DOC. NO. CW-CM-11159-C-O-M-001		SUB-SECTION-IV FUNCTIONAL GUARANTEES
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CLAUSE NO.	GUARANTEE TEST PROCEDURE	
2.03.09	(c.) The measurement shall be done with slow or impulse response, as the case may be on the A-weighting scale. The average of the A-weighted sound pressure level measurements expressed in decibels to a reference of 0.0002 micro bar shall not exceed the guaranteed value indicated in the specification. (d.) The tests shall be carried out with the equipments operating at near rated speed & load Correction for background noise will be considered Inline with IS:4758. Noise level measurement shall be recorded as per format at Appendix-VI. Belt Scrappers Satisfactory operation of belt scrappers shall be demonstrated even with wet coal/Limestone/Gypsum/biomass as specified. Scrapping efficiency of belt scrapper shall be minimum 95%.	
2.03.10	Not Used	
2.03.11	Dust Suppression System (a) Measurement of head of pumps. (b) Pressure available at nozzle manifolds (on random basis) in running condition not to be less than 2.5 kg / cm² (Dry Fog) or 1000 psi (Cold Fog) (c) Satisfactory spray atomization and dust suppression effectiveness of all the DS systems as per Appendix-XI. (d) Measurement of SPM before and after DS system operation as per Appendix - XI. (e) To measure pressure available at inlet to sprinkler in coal yard in running conditions and this should not be less than 4.5 kg / cm² (f) Complete coverage of yard by spray units in stockyard. (g) Measurement of noise level and vibration (velocity and amplitude) at the bearing of motors and pumps APPENDIX-I GENERAL PREREQUISITES TO GUARANTEE TESTS TO BE ENSURED BY SCCL 1. Availability of adequate and uninterrupted supply of coal. Specifications of coal as per N.I.T and as observed during the test shall be recorded as per attached format (Appendix-IA). 2. Sufficiently empty bunkers to facilitate continuous tripper dumping of coal during the test. Sufficient space in stockyard towards drive end of yard conveyor during stacking. Sufficient heap of Coal towards tail end of yard conveyor during reclaiming of Coal. 3. Uninterrupted power supply within specified parameters for the duration of the test.	
SINAGRENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID DOC. NO. CW-CM-11159-C-O-M-001	PAGE 58 OF 71

CLAUSE NO.	GUARANTEE TEST PROCEDURE		
	4. Belt protection switches, local stop push buttons, hooters, brakes/rail clamps in working order. 5. Adequate and uninterrupted water supply. 6. Plant communication system 7. Proper lubrication and oil level of all equipments. 8. Free rotation of idlers and pulleys. 9. Cleanliness of plant and removal of coal spillage at the start and during Tests. 10. Power supply voltage and frequency shall be as per technical specifications. 11. Availability of dry coal during testing of DS system		
SINAGRENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID DOC. NO. CW-CM-11159-C-O-M-001	SUB-SECTION-IV FUNCTIONAL GUARANTEES
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CLAUSE NO.	GUARANTEE TEST PROCEDURE			
	APPENDIX-IA			
	COAL PARAMETERS			
	Project :			
	Package :			
	Date :			
	As specified, As observed			
	during the test			
	1. Size			
	2. HGI			
	3. Moisture			
4. Shale and sand-stone content				
SCCL		Contractor		
SINAGRENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID DOC. NO. CW-CM-11159-C-O-M-001		SUB-SECTION-IV FUNCTIONAL GUARANTEES
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CLAUSE NO.	GUARANTEE TEST PROCEDURE		
	APPENDIX-II PREREQUISITES TO GUARANTEE TESTS TO BE ENSURED BY CONTRACTOR 1. Deputation of team to site to associate with the Guarantee tests, 2. Calibration of belt weigher scales and accuracy of same to be demonstrated to SCCL. 3. Arrangement of wattmeters / energymeters calibrated and sealed from approved Govt. test house or SCCL site laboratory. Arrangement of any other instrument/ accessory for the test. 4. Proper adjustment of skirt boards and belt cleaners prior to the start of tests. 5. Arrangement of calibrated equipments for measurement of vibration & noise levels. 6. Protection Relays of LT/HT switchgears and all motor feeders shall be checked. 7. Belt protection switches, local push buttons, hooters, brakes/rail clamps to be in working order. 8. Free rotation of idlers and pulleys. 9. Protection relays of LT/HT switchgears and all motors/transformer feeders to be checked. 10. Sufficient illumination.		
SINAGRENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID DOC. NO. CW-CM-11159-C-O-M-001	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 61 OF 71

CLAUSE NO.	GUARANTEE TEST PROCEDURE 										
	ANNEXURE – IIA FORMAT FOR SUBMISSION OF GUARANTEE TEST PROCEDURE <table border="1"> <thead> <tr> <th> Clause No. as per LOA/ Tech. Specs. </th> <th> Provision of LOA / Tech. Specs. </th> <th> Name and Methodology of Test proposed by Vendor </th> <th> SCCL comments on the tests proposed by vendor </th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			Clause No. as per LOA/ Tech. Specs.	Provision of LOA / Tech. Specs.	Name and Methodology of Test proposed by Vendor	SCCL comments on the tests proposed by vendor				
Clause No. as per LOA/ Tech. Specs.	Provision of LOA / Tech. Specs.	Name and Methodology of Test proposed by Vendor	SCCL comments on the tests proposed by vendor								
SINAGRENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID DOC. NO. CW-CM-11159-C-O-M-001	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 62 OF 71								

CLAUSE NO.	GUARANTEE TEST PROCEDURE			
	APPENDIX-III GUARANTEE TEST PROFORMA FLOW PATH CAPACITY TEST Project : Package : Date : 1. Composition of Stream i) Conveyor Nos. ii) Stacker / Reclaimer iii) Traveling Tripper Nos. iv) Dust suppression pumps, service water pumps, Ventilation fan drives. v) 2. Location of Belt Weigher (s) : 3. Plant started (Time) : 4. Material started flowing over belt weigher (Time) : 5. Test period Completed (Time) : 6. Reading taken at three (3) minute intervals :			
SINAGRENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID DOC. NO. CW-CM-11159-C-O-M-001	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 63 OF 71	



Sl.No	Time	Flow Rate	Totaliser

Total plant run time :

Average Flow Rate :

SCCL

Contractor

POWER MEASUREMENT

Date :

1. Equipment/Stream Composition :
2. Motor Description :
3. Sr. No. of meters used :
4. Date of Calibration of instrument and name of test house :
5. Multiplying factor (M.F.) of the wattmeter :
6. Wattmeter Readings (to be taken at 1 minute intervals) :

[illegible]

CLAUSE NO.	GUARANTEE TEST PROCEDURE																												
	APPENDIX-IV 7. Energy meter Readings <table border="1"> <thead> <tr> <th rowspan="2">Sl.</th> <th rowspan="2">Equip- Ment</th> <th colspan="2">Time Duration</th> <th colspan="2">Energy meter Readings kWhr</th> <th>Equipment kw (R2-R1)/ (t2-t1)</th> <th>Remarks*</th> </tr> <tr> <th>Initial</th> <th>Final</th> <th>Initial</th> <th>Final</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> *Reason and duration for system trip/stop may be recorded in remarks column. SCCL Contractor							Sl.	Equip- Ment	Time Duration		Energy meter Readings kWhr		Equipment kw (R2-R1)/ (t2-t1)	Remarks*	Initial	Final	Initial	Final										
Sl.	Equip- Ment	Time Duration		Energy meter Readings kWhr		Equipment kw (R2-R1)/ (t2-t1)	Remarks*																						
		Initial	Final	Initial	Final																								
SINAGRENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID DOC. NO. CW-CM-11159-C-O-M-001			SUB-SECTION-IV FUNCTIONAL GUARANTEES		PAGE 66 OF 71																							



APPENDIX-V

GUARANTEE TEST PROFORMA

VIBRATION LEVEL MEASUREMENTS

Project :

Package :

Date :

Time :

Details of vibration Level Meter

1. Make
2. Model & SI.No.
3. Date of calibration with name of Test House

Sl.No.	Equipment	Pick *Point	Vibration level Amplitude/Velocity		
			Horizontal Micron/ mm/ sec.	Vertical micron/ mm/sec.	Axial Micron / mm/sec.

* Reading shall be taken at all the bearings of motor, gear box and driven equipment. In case of conveyor galleries, vibrations shall be measured at min. three locations, at midpoint of stringer between two short supports.

SCCL

Contractor

CLAUSE NO.	GUARANTEE TEST PROCEDURE 																
	APPENDIX-VI GUARANTEE TEST PROFORMA NOISE LEVEL MEASUREMENT Project : Package : Date : Details of Sound Level Meter - Make - Model - Date of calibration with name of Test House <table border="1"> <thead> <tr> <th>Sl.No</th> <th>Equipment with location</th> <th>Equipment load/capacity</th> <th>Measurement* point no.</th> <th>Sound level dBA.</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> SCCL Contractor * For each equipment location, a Projected Plan Diagram shall be made and the location of measurement points shall be identified.					Sl.No	Equipment with location	Equipment load/capacity	Measurement* point no.	Sound level dBA.	Remarks						
Sl.No	Equipment with location	Equipment load/capacity	Measurement* point no.	Sound level dBA.	Remarks												
SINAGRENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID DOC. NO. CW-CM-11159-C-O-M-001	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 68 OF 71														

CLAUSE NO.	GUARANTEE TEST PROCEDURE																											
	APPENDIX-VII PROFORMA FOR POWER MEASUREMENT OF STACKER / RECLAIMER - Stream composition - Description of following Motors - Boom Conveyor - Bucket Wheel - Long Travel - Main Hydraulic Pump - Sr. No. of Energy meter used - Date of Calibration of instrument and name of test house. - Multiplying factor of Energy Meter. - Energymeter Readings (to be taken at H. SWGR. FDR of S/R OR In comer of MCC on S/R) <table border="1"> <thead> <tr> <th>Sl. No.</th> <th>Equipment</th> <th>Time</th> <th>Duration</th> <th>Energy meter Readings KWHR</th> <th>Equipment KW</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td>Inti al T1</td> <td>Final T2</td> <td>Intial R1</td> <td>Final R2</td> <td>(R2-R1) / (T2-T1)</td> </tr> <tr> <td colspan="7" style="height: 50px;"></td> </tr> </tbody> </table> - Reason and duration for trip/ stop may be recorded in remarks Sd/ SCCL Sd/ CONTRACTOR							Sl. No.	Equipment	Time	Duration	Energy meter Readings KWHR	Equipment KW	Remarks			Inti al T1	Final T2	Intial R1	Final R2	(R2-R1) / (T2-T1)							
Sl. No.	Equipment	Time	Duration	Energy meter Readings KWHR	Equipment KW	Remarks																						
		Inti al T1	Final T2	Intial R1	Final R2	(R2-R1) / (T2-T1)																						
SINAGRENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID DOC. NO. CW-CM-11159-C-O-M-001		SUB-SECTION-IV FUNCTIONAL GUARANTEES		PAGE 69 OF 71																						

CLAUSE NO.	GUARANTEE TEST PROCEDURE 		
	APPENDIX - XI DUST SUPPRESSION SYSTEM Fixing of acceptance criteria of ambient air quality Acceptance criteria of ambient air quality shall be considered with respect to respirable dust only. Respirable dust is defined as particles having particle size less than 10 microns meter (Not even equal to 10 microns meters). The particle size analysis of dust at any one of the area shall be carried out as a sample by placing the High Volume Sampler in the designated test point (1.5 to 3 M radius of application point) for a period 8 hours without system in operation under load. The sample thus collected will be subjected to the particle size analysis by sieve Analysis method as a standard test laboratory. The quantity respirable dust shall thus be determined from particle size Analyzer, Percentage of quartz in respirable dust will be determined by X-ray diffraction Acceptable Norms : i) If the respirable dust fraction contain less than 5% quartz. The permissible concentration of respirable dust shall be less than 2 Mg/M³. ii) In case, respirable dust has more than 5% quartz, the permissible concentration of respirable dust shall be computed as per following formula. Threshold limit value for respirable coal dust in work environment (Mg/M³) = $\frac{10}{K(\% \text{ Quartz in respect Dust} + 2)}$ iii) % Quartz shall be determined by X-ray diffraction. TEST METHOD (Testing shall not be done during Monsoon) For determining the ambient respirable dust level average 4 hourly sample reading shall be taken with high volume sampler at each test point (1.5 to 3 Metre radius of application point) with DFDS system and material handling system in operation on load. The average of three such readings shall be taken for each test point to compute the respirable dust level. Respirable dust level will be determined by analysis of the sample using sieve analyzer		
SINAGRENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID DOC. NO. CW-CM-11159-C-O-M-001	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 70 OF 71

CLAUSE NO.	GUARANTEE TEST PROCEDURE			
	WAGON TIPPLER 1. Nos of Wagon Tipped : 2. Time of placement of first wagon on wagon tippler platform : 3. Time of removal of last wagon from wagon tippler platform : 4. Total no. of wagons tipped : 5. Total time take (3-2) : 6. No. of tips/hr. = $\frac{\text{Total wagon tipped}}{\text{Total time taken}}$ = $\frac{\text{Sr.No.4}}{\text{Sr.No.5}}$ = 7. Over all performance : Satisfactory / Not satisfactory 8. Date of testing : For SCCL For Vendor			
SINAGRENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-A BID DOC. NO. CW-CM-11159-C-O-M-001	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 71 OF 71



SUB-SECTION–V

ESSENTIAL DATA

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	ESSENTIAL DATA			
1.00.00	The information in this chapter has been identified by the Employer as the essential, which is to be provided by the bidders along with the techno – commercial bid necessarily. In case bidder does not fill these informations, their techno – commercial bid may be considered as non responsive.			
	Sl. No.	Description	Data to be filled by Bidder	
	1. MECHANICAL DATA			
	A) Turbine Generator			
	1.	Steam Generator output corresponding to BMCR flow under rated steam condition, turbine under VWO operation, condenser pressure of 77 mmHg(abs), 0% make up. Difference of BMCR flow and VWO steam flow through turbine shall be assumed to be drawn off from Main steam line. Same quantity of flow to be added to condenser as additional make up.	Heat Balance Diagram	
	2.	105% of rated load under rated steam condition at condenser pressure 77 mm Hg (abs), with zero make up (Output guarantee)	Heat Balance Diagram	
	3.	100% of rated load under rated steam conditions at condenser pressure of 77 mmHg (abs) with zero make-up (Heat Rate Guarantee)	Heat Balance Diagram	
	4.	55% of rated load under turbine throttle main steam pressure of 150 Kg/cm2 (abs) and rated main steam temperature / reheat steam temp. at turbine inlet of 600 deg. C / 600 to 610 deg. C (as selected) at condenser pressure of 77 mm Hg (abs) with zero make-up with one TDBFP in operation. (Heat Rate Guarantee)	Heat Balance Diagram	
	5.	105% of rated load at 0% make-up, design CW temperature and CW flow (Condenser Pressure Guarantee Condition)	Heat Balance Diagram	
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-V ESSENTIAL DATA	PAGE 1 OF 15

CLAUSE NO.	ESSENTIAL DATA			
	B) STEAM GENERATOR			
	(I) Details of furnace geometry			
	1	Ring Header Elevation	m	
	2	S-Panel Elevation	m	
	3	Elevation & various burners		
		i) CL of Burner Lower	m	
		ii) CL of Burner Top	m	
	4	In case of 2-pass boiler		
		i) Nose of Arch Turn Elevation	m	
		ii) Bottom Nose of Arch Elevation	m	
		iii) Top of Nose of Arch Elevation	m	
		iv) Nose of Arch to platen super heater	m	
		v) Angle of Nose of Arch	deg.	
	6	Furnace Dimensions		
		i) Furnace Roof Elevation	m	
		ii) Furnace Width	m	
		iii) Furnace Depth	m	
		iv) Furnace Bottom Opening	m	
		v) Furnace to front wall Platen SH Gap	m	
		vi) Angle of S panel	deg.	
		vii) Height of lowest tube of platen super heater above top burner	m	
		viii) Height below bottom burner	m	
		(II) Details of Economiser		
	i) ST Economiser	mm		
	ii) SL Economiser	mm		
	iii) OD Economiser	mm		
	iv) Surface Area of Economiser	sqm		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-V ESSENTIAL DATA	PAGE 2 OF 15

CLAUSE NO.	ESSENTIAL DATA		
	v)	No. of Tubes Deep Economiser	no
	vi)	Free Gas area of Economiser	te/m ²
	vii)	No. of Economiser Assy	no
	viii)	Economiser tube thickness	mm
	(ix)	Claer side spacing (Gas lane)	mm
	(III) Detail of Super Heaters		
	(a)	<u>Low Temp. Supher Heater (LTSH) horizontal</u>	
	i)	ST of LTSH horizontal, mm	
	ii)	SL of LTSH horizontal, mm	
	iii)	OD of LTSH horizontal, mm	
	iv)	Surface area of LTSH, horizontal, m ²	
	v)	No. of tubes deep LTSH horizontal	
	vi)	Free gas area of LTSH horizontal, m ²	
		<u>Low Temp. Supher Heater (LTSH) vertical</u>	
	i)	ST of LTSH vertical, mm	
	ii)	SL of LTSH vertical, mm	
	iii)	OD of LTSH vertical, mm	
	iv)	Surface area of LTSH, vertical, m ²	
	v)	No. of tubes deep LTSH vertical	
	vi)	Free gas area of LTSH vertical, m ²	
		<u>Low Temp. Supher Heater (LTSH) screen</u>	
	i)	ST of LTSH screen, mm	
	ii)	SL of LTSH screen, mm	
	iii)	OD of LTSH screen, mm	
	iv)	Surface area of LTSH, screen, m ²	
	v)	No. of tubes deep LTSH screen	
	(b)	Platen Super Heater	
	i)	Platen super heater width	m
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-V ESSENTIAL DATA
			PAGE 3 OF 15

CLAUSE NO.	ESSENTIAL DATA		
	ii) No. of platen super heater assemblies iii) ST Platen SH iv) SL Platen SH v) OD Platen SH vi) Height of Platen SH vii) FGA Platen SH viii) Surface Area Platen SH (c) Secondary of Final Super Heater (FSH) i) ST of FSH ii) SL of FSH iii) OD of FSH iv) Surface Area of FSH v) No. of Tubes Deep FSH vi) Free gas Area FSH vii) No. of Assy FSH (If super heaters have additional section than those covered above, then similar details for those shall also be furnished) (V) Details of Reheaters (RH) ST OF RH REAR SL OF RH REAR OD OF RH REAR SURFACE AREA OF RH REAR NO. OF TUBES DEEP RH REAR FREE GAS AREA RH REAR NO OF ASSY OF RH REAR ST OF RH FRONT MM SL OF RH FRONT MM OD OF RH FRONT MM	No. mm mm mm sqm no m² no mm mm mm sqm no m² no	
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-V ESSENTIAL DATA	PAGE 4 OF 15

CLAUSE NO.	ESSENTIAL DATA			
	SURFACE AREA OF RH FRONTmm NO OF TUBES DEEP RH FRONTsqm FREE GAS AREA OF RH FRONTno NO OF ASSY OF RH FRONTm2 HEIGHT OF REHEATER FRONT PANELm MEAN HEIGHT OF RH REAR ENCL DEPTH OF RH REAR ENCL DEPTH OF RH FRONT ENCL (VI)Air Pre heaters (a)Element DetailsSAPH PAPH Tri Sector Hot end element (Nos) Cold element (Nos) (b)Height of Element Cold end (Nos) Hot end (Nos) (c)Gas velocity at 100% BMCR (m/sec) (Design Coal) (d)Air Velocity at 100% BMCR (m/sec) (Design Coal) (e)Total effective area of heating surfaces (m²) (VI)Other Details : i)ST of Water wall hangersmm ii)Free gas area of Water wall hangersm² iii)O.D. of water wall hangersmm iv)Width of all SH/Cavities i)m ii)m v)Depth of all SH cavities i)m ii)m vi)Height of SH cavities i)m			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-V ESSENTIAL DATA PAGE 5 OF 15

CLAUSE NO.	ESSENTIAL DATA 		
	ii) m vii) Width of RH cavities i) m ii) m viii) Depth of RH cavities i) m ii) m ix) Height of RH cavities i) m ii) m (VII) Furnace Performance Data Description (As per Clause 1.05.00 Section-VI, Part B Sub-section-A-01) 100% BMCR (Design Coal) 100% BMCR (Worst Coal) i) Total heat duty (10⁶ Kcal/hr) ii) Efficiency (%) iii) Total heat generated (10⁶ Kcal/hr) iv) Net heat input (10⁶ Kcal/hr) (Unburnt) v) Furnace Plan area (M²) vi) Furnace EPRS (M²) vii) Furnace Volume (M³) viii) Net heat input/plan area (10⁶ Kcal/m²/hr) ix) Net heat input /EPRS (10⁶ Kcal/m²/hr) x) Volumetric Heat Release rate (10⁶ Kcal/m²/hr) xi) Furnace exit gas temp. (Deg.C) xii) Residence time* (Sec) * Bidder to furnish the residence time calculation along with the bid		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-V ESSENTIAL DATA	PAGE 6 OF 15

CLAUSE NO.	ESSENTIAL DATA					
	(IX) Maximum Mass velocity in evaporator (kg/m² sec.) at 100% BMCR for all the Specified coal(s)					
	i)	Maximum	.....	.....		
	ii)	Minimum	.....	.....		
	(X) Maximum Mass flow through (Kg/m² sec) at 100% BMCR for all the Specified coal(s)					
	i)	Front water walls	.....	.....		
	ii)	Rear water walls	.....	.....		
	iii)	Side Walls	.....	.....		
	(XI) Coal Pulverisers					
	i)	Design Data :				
	a)	Manufacturer	.....			
	b)	Type and model	.....			
	c)	Total Number of mills per boiler	.....			
			Standard* Rated Conditions	Design Coal	Worst Coal	Adequacy Coal
	d)	Mill maximum capacity T/Hr.	.....	.....	.....	.....
	e)	Size of raw coal at mill inlet	.....	.....	.....	.....
	f)	Moisture in raw coal (%)	.....	.....	.....	.....
	g)	HGI of raw coal	.....	.....	.....	.....
h)	Fineness of pulverized coal					
	Through 200 mesh	.....	.....	.....	.....	
	Through 50 mesh	.....	.....	.....	.....	
i)	Mill outlet moisture	.....	.....	.....	.....	
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-V ESSENTIAL DATA		PAGE 7 OF 15

CLAUSE NO.	ESSENTIAL DATA				
	j)	Temperature of fuel air mixture at classifier outlet	.....	.....	.....
	k)	Number of mills working at			
		100% BMCR	.....	.....	.....
		100% TMCR	.....	.....	.....
	l)	Capacity of each mill when no. of mills as per (k) are operating			
		100% BMCR	.....	.....	.....
		100% TMCR	.....	.....	.....
	m)	Mill loading of working mills (% of maximum capacity at respective coals) when no of mills as per k) are operating			
		100% BMCR	.....	.....	.....
		100% TMCR	.....	.....	.....
	n)	90% of Mill maximum capacity when raw coal size at mill inlet, Moisture in raw coal, HGI of raw coal & fineness of pulverised coal same as that indicated at e), f), g) & h) respec-			
	Note: * This is the base capacity of mill for standard coal considered by the mill supplier.				
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-V ESSENTIAL DATA	
				PAGE 8 OF 15	

CLAUSE NO.	ESSENTIAL DATA																																																																																																																												
	 (XII) PA Fan Sizing data as per sizing criteria specified in clause 1.05.11.02, Sub-section A-01, Part B, Section VI <table border="1"> <thead> <tr> <th>Description</th> <th></th> <th>BMCR Worst Coal</th> <th>Test Block (1) Worst coal (max Moisture)</th> <th>Test Block (2) Worst coal (max Moisture)</th> </tr> </thead> <tbody> <tr> <td>a. Total Pressure Drop</td> <td>mmwc</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Margin</td> <td>mmwc</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Total Head Used</td> <td>mmwc</td> <td></td> <td></td> <td></td> </tr> <tr> <td>b. Volume handled by Fan</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Gas entering AH</td> <td>t/h</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Total AH Leakage</td> <td>t/h</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Duct leakage</td> <td>t/h</td> <td></td> <td></td> <td></td> </tr> <tr> <td>ESP leakage</td> <td>t/h</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Gas weight per fan</td> <td>t/h</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Gas temperature</td> <td>°C</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Volume / fan</td> <td>m³ / sec</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Margin</td> <td>m³ / sec</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Volume / fan Used</td> <td>m³ / sec</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Gas temperature</td> <td>°C</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Density</td> <td>kg /m³</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> (XIII) FD Fan Sizing data as per sizing criteria specified in clause 1.05.13, Sub-section A-01, Part B, Section VI <table border="1"> <thead> <tr> <th>Description</th> <th></th> <th>BMCR Design Coal</th> <th>Test Block (1) Best Coal</th> <th>Test Block (2) Best Coal</th> </tr> </thead> <tbody> <tr> <td>a. Total Pressure Drop</td> <td>mmwc</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Margin</td> <td>mmwc</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Total Head Used</td> <td>mmwc</td> <td></td> <td></td> <td></td> </tr> <tr> <td>b. Volume handled by Fan</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Gas entering AH</td> <td>t/h</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Total AH Leakage</td> <td>t/h</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Duct leakage</td> <td>t/h</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>					Description		BMCR Worst Coal	Test Block (1) Worst coal (max Moisture)	Test Block (2) Worst coal (max Moisture)	a. Total Pressure Drop	mmwc				Margin	mmwc				Total Head Used	mmwc				b. Volume handled by Fan					Gas entering AH	t/h				Total AH Leakage	t/h				Duct leakage	t/h				ESP leakage	t/h				Gas weight per fan	t/h				Gas temperature	°C				Volume / fan	m ³ / sec				Margin	m ³ / sec				Volume / fan Used	m ³ / sec				Gas temperature	°C				Density	kg /m ³				Description		BMCR Design Coal	Test Block (1) Best Coal	Test Block (2) Best Coal	a. Total Pressure Drop	mmwc				Margin	mmwc				Total Head Used	mmwc				b. Volume handled by Fan					Gas entering AH	t/h				Total AH Leakage	t/h				Duct leakage	t/h			
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SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-V ESSENTIAL DATA	PAGE 9 OF 15																																																																																																																								

CLAUSE NO.	ESSENTIAL DATA				
	ESP leakage	t/h			
	Gas weight per fan	t/h			
	Gas temperature	°C			
	Volume / fan	m ³ / sec			
	Margin	m ³ / sec			
	Volume / fan Used	m ³ / sec			
	Gas temperature	°C			
	Density	kg /m ³			
	(XIV) ID Fan Sizing data as per sizing criteria specified in clause 1.05.13, Sub-section-A-01, Part B, Section VI				
	Description		BMCR Design Coal	Test Block (1) Worst Coal	Test Block (2) Worst Coal
a.	Total Pressure Drop	mmwc			
	Margin	mmwc			
	Total Head Used	mmwc			
b.	Volume handled by Fan				
	Gas entering AH	t/h			
	Total AH Leakage	t/h			
	Duct leakage	t/h			
	ESP leakage	t/h			
	Gas weight per fan	t/h			
	Gas temperature	°C			
	Volume / fan	m ³ / sec			
	Margin	m ³ / sec			
	Volume / fan Used	m ³ / sec			
	Gas temperature	°C			
	Density	kg /m ³			
	(XV) ESP collection area (m²) & Electrode Pitching (mm)				
a)	Minimum load with separator running dry: _____ % TMCR.				
b)	Minimum flow through economiser: _____ T/hr.				
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-V ESSENTIAL DATA	PAGE 10 OF 15

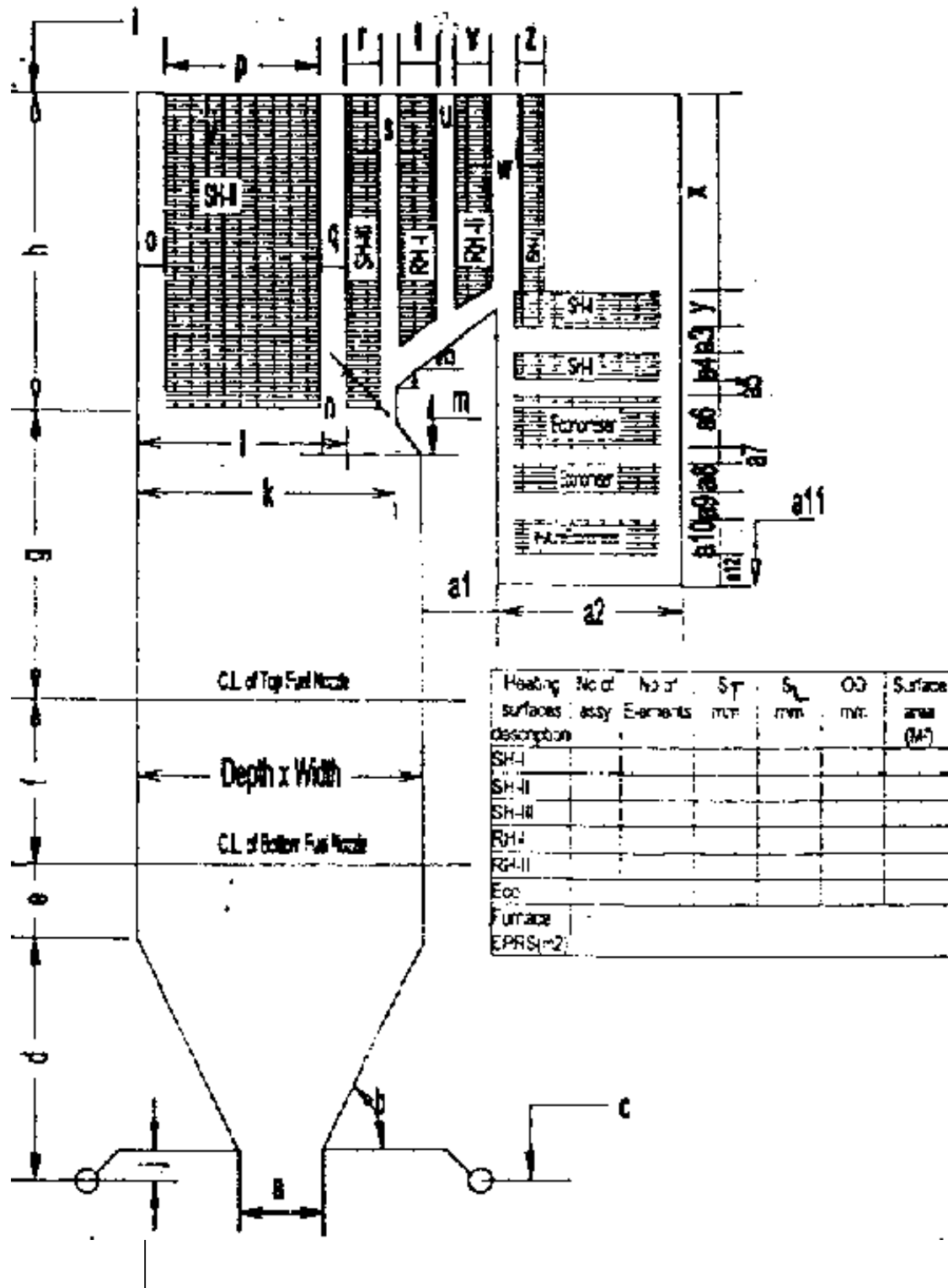
CLAUSE NO.	ESSENTIAL DATA 		
	(XVI) DATA/DRAWINGS TO BE SUBMITTED ALONGWITH THE BID (A) Performance Data Reference Drg. i) Correction curves for steam generator efficiency for variation in parameters as specified in Functional Gurantee section: ii) Characteristic curves for FD, ID & PA Fans indicating operating & Test Block points iii) Comprehensive information design basis and calculations for the furnace cooling factor, Proposed Heat Liberation Rate, Max. Net heat Input per unit plan area of the furnace, furnace residence time, Burner zone heat release rate, residence time and other design parameters of the proposed design and how they are arrived at		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-V ESSENTIAL DATA	PAGE 11 OF 15

CLAUSE NO.	ESSENTIAL DATA 					
	PERFORMANCE DATA CORRESPONDING TO 100%BMCR AND 100%TMCR LOADS					
		Design Coal		Worst Coal		Best Coal
		100% BMCR	100% TMCR	100% BMCR	100% TMCR	100% BMCR 100% TMCR
	Mill Combination in service					
	Main steam Pressure KSCG					
	Hot reheat Pressure KSCG					
	Cold reheat Pressure KSCG					
	Main steam Temp. Deg. C					
	HRH steam Temp. Deg. C					
	LTSH out Steam Temp Deg C					
	Platen SH in Steam Temp (after DESH) Deg. C					
	Platen SH out Steam Temp Deg. C					
	CRH DESH in steam Temp Deg. C					
	CRH DESH out steam Temp Deg. C					
	Main steam Flow T _E /Hr					
	Total Air flow T _E /Hr					
	SH spray flow T _E /Hr					
	RH spray flow T _E /Hr					
	Each Mill Coal flow in T/hr					
	Each Mill air flow in T/hr					
	ID Fan Current					
	FD Fan Current					
	PA fan Current					
	Final HPH FW in Temp Deg. C					
	Final HPH FW out Temp. Deg. C					
	Economic in fw temp					
	Feed water flow tones /hr					
	ID Fan out oxygen					
	SAH in Flue Gas Temp.					
	SAH out Flue Gas Temp.					
	SAPH in air Temp.					
	PAPH in Air Temp.					
	SAPH out Air Temp.					
	PAPH out Air Temp.					
	ECO out Oxygen					
	ECO out flue gas temp					
	PAH in flue Gas temp.					
	PAH out flue Gas temp.					
	Air HTR common Duct out FG Temp.					
	Note: In case the bidder offers RAPH of Tri-sector type, the relevant data as required to be filled in the datasheet is to be submitted accordingly.					
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-V ESSENTIAL DATA		PAGE 12 OF 15



TWO PASS FURNACE DETAILS

Bidder name:-



CLAUSE NO.	ESSENTIAL DATA		
	Essential Data w.r.t ESP and FGD System		
	A. ESP SYSTEM		
		Design Point	Guarantee Point
	A. FLUE GAS TEMP AT BOILER OUTLET		
	B. GAS FLOW (WET) (IN M³/SEC) CORRESPONDING TO TEMP INDICATED AT ABOVE		
	C. GAS FLOW (WET) (IN NM³/SEC) CORRESPONDING TO TEMP INDICATED AT ABOVE		
	D. INLET DUST CONCENTRATION (gm/NM³)		
	E. MOISTURE IN FLUE GAS AT BOILER OULET (% BY WEIGHT)		
	F. FLY ASH PARTICLE DISTRIBUTION AT BOILER OUTLET:		
	i. LESS THAN 10 MICRONS (%)		
	ii. 10-20 MICRONS (%)		
	iii. 20-30 MICRONS (%)		
	iv. 30-40 MICRONS (%)		
	v. GREATER THAN 40 MICRONS (%)		
	G. FLUE GAS ANALYSIS (BY WEIGHT) AT BOILER OUTLET		
H. LAYOUT DRAWINGS:			
i. PLAN & ELEVATION DRAWINGS OF FLUE GAS DUCT FROM APH OUTLET TO INLET FLANGES OF ESP INDICATING FLANGE DIMENSIONS.			
ii. PLAN & ELEVATION DRAWINGS OF FLUE GAS DUCT FROM OUTLET FLANGES OF ESP TO THE INLET OF CHIMNEY INDICATING FLANGE DIMENSION.			
B. FGD SYSTEM			
1) All HT Loads along with rating.			
2) Requirement of DG and DC supply for drives along with ratings.			
3) Auxiliary Steam requirement			
4) Cooling water requirement and temperature rise along with breakup for each auxiliary			
5) Process water requirement			
6) Instrument & Service air requirement			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-V ESSENTIAL DATA	PAGE 14 OF 15

CLAUSE NO.	ESSENTIAL DATA												
	7) Waste water generated 8) Write up on FGD internals including spray system, oxidation system, mist eliminators, supporting structures, etc. 9) General arrangement drawing (Plan and elevation) with appropriate dimensions 10) Gas flow at the FGD inlet when firing respective coal (Nm3/sec)* 11) Gas temperature at FGD inlet (deg.C) 12) Flue Gas Composition at FGD system inlet & Outlet: (i) O₂ (% v/v wet) (ii) CO₂ (% v/v wet) (iii) H₂O (% v/v wet) (iv) SO₂ (% v/v wet) (v) N₂ (% v/v wet) (vi) Inlet SO₂ (mg/Nm₃-wet) (vii) NO_x (viii) Dust (mg/Nm₃) 13) Gas Flow at Absorber Outlet Outlet (Nm₃/hr.) 14) Gas Temperature at Absorber Outlet (°C) 15) Gas Pressure at Absorber Outlet (mmwc) 16) SO₂ removal Efficiency (%) 17) L/G Ratio 18) Gypsum Bleed Solid Concentration (% w/w) 19) SO₂ removal efficiency with one spray level out of service (for multiple levels of spray) OR SO₂ removal efficiency with one spray pump out of service (for single level spray) 20) Waste Water Analysis 21) Lime consumption for waste water neutralization (kg/hr.). 22) Power consumption (KW)												
<table><tr><th colspan="3">C) Layout</th></tr><tr><td>1.</td><td>Equipment layout drawings for various floors of Main Plant building.</td><td></td></tr><tr><td>2.</td><td>Main Plant equipment Layout Plan at EL (+/-) 0.0 m.</td><td></td></tr></table>					C) Layout			1.	Equipment layout drawings for various floors of Main Plant building.		2.	Main Plant equipment Layout Plan at EL (+/-) 0.0 m.	
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SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-V ESSENTIAL DATA	PAGE 15 OF 15



SUB-SECTION–VI

MANDATORY SPARES

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 			
1.03.00	START-UP & COMMISSIONING SPARES Start-up and commissioning spares are those spares which may be required during the start-up and commissioning of the equipment/system. All spares used till the plant is handed over to the employer shall come under this category. The Contractor shall provide for an adequate stock of such start up and commissioning spares to be brought by him to the site for the plant erection and commissioning. They must be available at site before the equipments are energized. The unused spares, if any, should be removed from there only after the issue of Taking Over certificate. All start up spares which remain unused at the time shall remain the property of the Contractor.			
1.04.00	The Bidder shall include in his scope of supply all the necessary Mandatory spares, start up and commissioning spares and recommended spares and indicate these in the relevant schedules of the Bid Form and Price Schedules. The general requirements pertaining to the supply of these spars is given below.			
2.00.00	The Contractor shall indicate the service expectancy period for the spares parts (both mandatory and recommended) under normal operating conditions before replacement is necessary.			
3.00.00	All spares supplied under this contract shall be strictly inter changeable with the parts for which they are intended for replacements. The spares shall be treated and packed for long storage under the climatic conditions prevailing at the site e.g. small items shall be packed in sealed transparent plastic with desecrator packs as necessary.			
4.00.00	All the spares (both recommended and mandatory) shall be manufactured alongwith the main equipment components as a continuous operation as per same specification and quality plan.			
5.00.00	The contractor will provide Employer with cross-sectional drawings, catalogues, assembly drawings and other relevant documents so as to enable the Employer to identify and finalise order for recommended spares.			
6.00.00	Each spares part shall be clearly marked or labelled on the outside of the packing with its description. When more than one spares part is packed in a single case, a general description of the content shall be shown on the outside of such case and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purposes of identification.			
7.00.00	All cases, containers or other packages are to be opened for such examination as may be considered necessary by the Employer.			
8.00.00	The contractor will provide the Employer with all the addresses and particulars of his sub suppliers while placing the order on vendors for items/components/equipments covered under the contract and will further ensure with his vendors that the Employer, if so desires, will have the right to place order for spares directly on them on mutually agreed terms based on offers of such vendors.			
9.00.00	The Contractor shall warrant that all spares supplied will be new and in accordance with the contract Documents and will be free from defects in design, material and workmanship.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB SECTION-VI MANDATORY SPARES PAGE 2 OF 3

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
10.00.00	In addition to the recommended spares listed by the contractor, if the employer further identifies certain particular items of spares, the contractor shall submit the prices and delivery quotation for such spares within 30 days of receipt of such request with a validity period of 6 months for consideration by the Employer and placement of order for additional spares if the Employer so desires.			
11.00.00	The Contractor shall guarantee the long term availability of spares to the Employer for the full life of the equipment covered under the contract. The Contractor shall guarantee that before going out of production of spares parts of the equipment covered under the Contract, he shall give the Employer atleast 2 years advance notice so that the latter may order his bulk requirement of spares, if he so desires. The same provision will also be applicable to sub-contractors. Further, in case of discontinuance of manufacture of any spares by the Contractor and/or his sub contractors, Contractor will provide the Employers, two years in advance, with full manufacturing drawings, material specifications and technical information including information on alternative equivalent makes required by the Employer for the purpose of manufacture/ procurement of such items.			
12.00.00	Material Codification The bidder to provide datasheets/ assembly drawings of the manufacturer/ any other relevant document showing Bill of Material(s), Make, Model Number, Part Number etc. through which mandatory spares to be supplied can be uniquely identified. This would facilitate the Employer to assign a unique code to each of the mandatory spare as brought out in GCC. The bidder shall extend all necessary assistance in this regard.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB SECTION-VI MANDATORY SPARES	PAGE 3 OF 3



CHAPTER-1	STEAM TGENERATOR & AUXILIARY
CHAPTER-2	STEAM TURBINE GENERATOR
CHAPTER-3	ASH HANDLING PLANT
CHAPTER-4	COAL HANDLING PLANT
CHAPTER-5	MILL REJECT
CHAPTER-6	PIPING
CHAPTER-7	WS-PLANT UTILITY
CHAPTER-8	WATER SYSTEM
CHAPTER-9	FUEL OIL UNLOADING SYSTEM
CHAPTER-10	ELECTRICAL
CHAPTER-11	CONTROL & INSTRUMENTATION



CHAPTER-1

STEAM GENERATOR & AUXILIARY

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
1.00.00	STEAM GENERATOR & AUXILIARIES		
1.01.00	PRESSURE PARTS		
	A. Economiser		
	1. Economiser coils*	5% of each size, type of coil of one unit	
	* the coils and panels are to be fabricated and supplied in dismantled condition		
	2. Straight Tube	150 Mtrs of each size, type, thickness & material	
	3. Coil end bends	20 Nos of each size, type, thickness, radius & material.	
	4. Coil Saddle Clamp/Alignment band / Male & Female sliding Spacers / Sliding Hooks /Straight Shields for boiler tubes & Profile Shields for Boiler tube bends/ Tube clamps	50 nos of each type, size, material 5% of population tube clamps of each type and size	
	B. Water Wall / Evaporator		
	1. Straight tube/Spiral tube	150 m of each type, thickness, size and material.	
	2. Bends for Burner elevation	02 Nos for each size, type, thickness, radius and material	
	3. Screen water wall tube (if applicable)	150 m of each size, type, thickness and material	
	4. Screen water wall tube bends (if applicable)	10 Nos. for each size, type, thickness, radius and material	
	5. Bends for S-panel Area	20 Nos for each size, type, thickness, radius and material	
	6. Forged Elbow and Other Forged item forming integral part of pressure parts		
	7. Swage tube (if applicable)	10 Nos. for each size, type, thickness, radius and material	
	8. Profile Shield bends for Screen water wall tube bends	20 Nos for each size, type and material	
	C. Low Temperature Super Heater (LTSH)		
	1. Straight tube of 8-10 m length	150 mtrs of each size, thickness, types & material	
	2. Bends	20 Nos of each size, type, thickness, radius and material. 50 Nos supply tubes, bends/offset	
	3. Connection tube Bends/ Antlers in penthouse	10 Nos. of each type and size	
	4. Coil Saddle Clamp/alignment band / Male & Female sliding Spacers / Male and Female connectors/ Sliding Hooks/ Shields for boiler tubes & Profile Shields for Boiler tube bends/ Swage tube/ Forged items forming integral	100 nos. of each type, size, material	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
	part of pressure parts		
	D. Low Temperature Reheater (LTRH)		
	1. Straight tube of 8-10 m length	100 mtrs of each size, thickness, types & material	
	2. Bends	± 20 Nos of each size, type, thickness, radius and material. 20 Nos supply tubes, bends/offset	
	3. Coil saddle clamp/alignment Band / Male & Female sliding Spacers / Male and Female connectors/ Sliding Hooks/ Shields for boiler tubes & Profile Shields for Boiler tube bends/ Swage tube/ Forged items forming integral part of pressure parts/ Expansion bellow	100 nos. of each type, size, material	
	E. Intermediate Temperature Superheater (ITSH) / Platen Super Heater		
	1. Straight tube of 8-10 m length	100 m of each size, thickness, type & material	
	2. Straight tube above roof	100 m of each size, thickness, type & material	
	3. Bends below roof	20 nos of each size, thickness, radius, type and material	
	4. Bends which are integral part of header (above roof)	20 Nos of each size, thickness, radius, type and material	
	5. Male & Female connectors, male female couplings spacers and alignment bands	10% of total population of each type and size in one boiler	
	6. Dissimilar joint spot pcs.	20 Nos of each size, thickness, type, radius & material	
	7. Acromat Tube with acromat	10% of each type, size thickness and radius	
	8. Spacer Tube for Superheaters	100 mtr each type and size.	
	9. Spacer Tube connectors and stoppers	50% of population of one boiler	
	10. Alignment Band / Male & Female sliding Spacers / Male and Female connectors/ Sliding Hooks/ Shields for boiler tubes & Profile Shields for Boiler tube bends/ Swage tube/ Forged items forming integral part of pressure parts/ Expansion Bellow	50 nos. of each type, size, material	
	F. High Temperature Superheater (HTSH)/ Final Superheater		
	1. Straight tube of 8-10 m length	100 mtr. of each size, thickness, type & material	
	2. Straight tube above roof	50 m of each size, thickness, type & material	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
	3. Bends below roof	20 nos of each size, thickness, type, radius & material	
	4. Bends which are integral part of header (above roof)	20 Nos of each size, thickness, radius, type and material	
	5. Male & Female connectors, male female couplings spacers and alignment bands	50% of total population of each type and size in one boiler	
	6. Dissimilar metal weld joint spot pcs.	50 Nos. of each size, thickness, type, radius & material	
	7. Acromat tube with Acromat	10% of each type, size thickness and radius	
	8. Spacer Tube for Superheaters	50 mtrs each type and size	
	9. Spacer Tube connectors and stoppers	50% of population of one boiler	
	10. Alignment Band / Male & Female sliding Spacers / Male and Female connectors/ Sliding Hooks/ Shields for boiler tubes & Profile Shields for Boiler tube bends/ Swage tube/ Forged items forming integral part of pressure parts/ Expansion Bellow	50 nos. of each type, size, material	
	G. Reheater		
	1. Straight tube of 8-10 m length	150 mtrs of each size, thickness, type & material	
	2. Straight tube above roof	50 m of each size, thickness, type & material	
	3. Bends below roof	50 Nos. of each size, thickness, type, radius & material (including offset bend)	
	4. Bends which are integral part of header (above roof)	40 Nos. of each size, thickness, radius, type and material	
	5. Male & Female connectors, male female couplings spacers and alignment bands	50% of total population of each type and size in one boiler	
	6. Dissimilar joint spot pcs.	50 Nos. of each size, thickness, type, radius & material	
	7. Acromat tube with acomat	10% of each type, size, thickness and radius	
	8. Spacer Tube for Superheaters	100 mtr each type and size	
	9. Spacer Tube connectors and stoppers	50% of population of one boiler	
	10. Alignment Band / Male & Female sliding Spacers / Male and Female connectors/ Sliding Hooks/ Shields for boiler tubes & Profile Shields for Boiler tube bends/ Swage tube/ Forged items forming integral part of pressure parts/ Expansion Bellow	50 nos. of each type, size, material	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
	H. Boiler roof and steam cooled wall		
	1. Straight tube of 8-10 m length	150 mtr. of each size, thickness, type & material	
	2. Bends	20 Nos of each size, thickness, type, radius & material (including offset bend)	
1.02.00	Spares for Header		
	A. Water wall Header		
	1. Hand hole plate with cap / Inspection nozzle with end plate	1 nos of each type	
	2. Yoke plate with fasteners	1 set* of each type	
	B. Spares for Superheater Header		
	3. Hand hole plate with cap / Inspection nozzle with end plate	1 Nos of each type	
	4. Radiographic plug	4 nos. (wherever applicable)	
	C. Spares for Reheater Header		
	5. Hand hole plate assembly / Inspection nozzle with end plate	3 nos. of each type	
	6. Radiographic plug	4 nos. (wherever applicable)	
1.03.00	Superheater / Reheater		
	Attemperation System		
	1. Desuperheater liners	1 set of each type	
	2. Positioning screws for liners	1 set of each type	
1.04.00 A	Steam Generator startup re-circulation pump (for once through boiler)		
	1. Complete Pump & Motor Assembly	1 Nos.	
	2. Journal bearing	2 sets *	
	3. Thrust bearing	3 sets *	
	4. Casing wear rings	3 sets *	
	5. Impeller wear rings	4 sets *	
	6. Set of gaskets (All gaskets including heat exchanger)	4 sets*	
	7. Set of 'O' rings	4 sets *	
	8. Gland packings	4 sets *	
	9. Motor heat exchanger	2 set	
	10 . Strainers of BRP system	02 nos. of each type and size	
	* One set means one complete replacement for one equipment.		
1.04.00 B	Condensate Transfer Pumps and accessories		
	a) Impeller of Pump	1 No.	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES						
SI. NO.	PARTICULARS	QUANTITY					
	b) Impeller Wear Ring	2 Nos.					
	c) Casing Wear Ring	2 Nos.					
	d) Pump Gaskets and packings	3 Sets*					
	e) Pump Mechanical Seal	3 Sets*					
	f) Suction & Discharge expansion bellow	2 Nos. of each type, size					
	* One set means one complete replacement for one equipment.						
1.05.00	Fans						
	A. ID Fans						
	1. Fan rotor assembly (excluding servo motor, blade & coupling)	1 no.					
	2. ID fan motor complete	1 no.					
	3. ID fan motor bearing	1 set					
	4. Fan bearings including bearing housing						
	4.1 Fan Bearing	1 set					
	4.2 Fan bearing Housing	1 set					
	5. Spares for blade bearing Assembly						
	5.1 Bearings	1 set					
	5.2 'O' rings	2 sets					
	5.3 Bushes	2 sets					
	5.4 Metallic rings	2 sets					
	5.5 Intermediate piece (if applicable)	2 sets					
	6. Lube Oil / Hydraulic Oil system						
	6.1 Pump assembly	1no of each type					
	6.2 Motor	1 No of each type and rating					
	6.3 Pressure regulator	3 nos.					
	6.4 Filters	4 nos.					
	6.5 Coupling between oil pump & motor	4 nos.					
	6.6 Pump Mechanical Seal	4 Nos.					
	7. Fan Blades	2 sets					
	8. Coupling between Fan & Motor	1 set					
	9.0 Hydraulic servomotor						
	9.1 Hydraulic servomotor assembly with link rods	1 no					
	9.2 Hydraulic servomotor Seal ring kit(complete)	10 nos.					
	10.ID fan impeller liner	2 sets					
	11. ID fan casing liner	2 sets					
	12. Lub Oil Cooler	1 sets					
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
	B. FD Fans		
	1. Fan rotor assembly (excluding servomotor, blade & coupling)	1 no.	
	2. Fan bearings including bearing housing		
	2.1 Fan Bearing	1 sets	
	2.2 Fan bearing Housing	1 set	
	3. Spares for blade bearing Assembly		
	3.1 Bearings	2 sets	
	3.2 'O' rings	2 sets	
	3.3 Bushes	2 sets	
	3.4 Metallic rings	2 sets	
	3.5 Intermediate piece (if applicable)	2 set	
	4. Lube Oil / Hydraulic Oil system		
	4.1 Pump assembly	2 nos. of each type	
	4.2 Motor assembly	1 no. of each type and rating	
	4.3 Pressure regulator	4 nos.	
	4.4 Filters	4 nos.	
	4.5 Coupling between oil pump & motor	4 nos.	
	4.6 Pump Mechanical Seal	4 Nos.	
	5. Fan Blades	2 sets	
	6. Coupling between Fan & Motor	1 Set	
	7. Hydraulic servomotor/ Hydraulic Actuator device	1 nos	
	8 Hydraulic servomotor Seal ring kit(complete)	10 Nos	
	9. FD fan motor complete	1no	
	10. FD fan motor bearings	1 set	
	11. Lub Oil Cooler	1 Set	
	C. PA Fan		
	1. Fan rotor assembly (excluding servomotor, blade & coupling)	1 no.	
	2. Fan Bearings including bearing housing	1 sets	
	2.1 Fan Bearing	1 sets	
	2.2 Fan bearing Housing	1 set	
	3. Coupling between fan & motor	2 nos.	
	4. Fan blades	1 sets	
	5. Spares for blade bearing Assembly		
	5.1 Bushes	2 sets	
	5.2 Bearings	2 sets	
	5.3 'O' rings	2 sets	
	5.4 Metallic rings	2 sets	
	5.5 Intermediate piece (if applicable)	2 set	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
	6. Lube Oil / Hydraulic Oil System		
	6.1 Pump assembly	1 nos of each type	
	6.2 Motor	1 No. of each type and rating.	
	6.3 Pressure regulator	4 nos.	
	6.4 Filters	4 nos.	
	6.5 Pump & motor coupling	4 nos.	
	6.6 Pump Mechanical Seal	4 Nos.	
	7. Hydraulic Servomotor/Hydraulic Actuator device	1nos	
	8 Hydraulic servomotor Seal ring kit(complete)	10 Nos	
	9. PA fan motor complete	01	
	10. PA fan motor bearing	1set	
	11. Lub Oil Cooler	1 Sets	
	Note : In Clause 1.05.00 (A), (B) & (C) above, one set means one complete replacement for one fan		
	D. Scanner Air Fan		
	1. Fan assembly (excluding fan body)	1 No. of each type	
	2. Motor for AC scanner air fan	1 no	
	3. Motor for DC scanner air fan	1 no	
1.06.00	Coal Pulverizers		
	1. Grinding elements		
	1.1 Rollers/tyres/grinding balls / roller liners	2 sets	
	1.2 Bull ring segments/ bowl / rings / Table liners	2 sets	
	Note: One set of grinding element at (1.1) & (1.2) above is defined as under :		
	1 Set = (Grinding elements needed for complete replacement of one mill) X A		
	Where		
	A= $[8000 \times N]/\text{GWL}$, rounded off to nearest higher whole number.]		
	GWL = Guaranteed wear life of grinding element (1.1) & (1.2) as offered by the bidder.		
	N = Number of mills installed for one Steam generator unit.		
	2. Gear box internals (except bearings & seals)	1 set *	
	3. Complete Gear Box	2 sets *	
	4. Bearings for mills	5 sets *	
	5. Seals & rings for gear box	2 sets *	
	6. Seals & rings for mills	2 sets *	
	7. Liners with brackets & fasteners	2 sets*	
	8. Discharge valve assembly	2 sets *	
	9. Multiport outlet & liners	2 sets	
	10. Mill main shaft/yoke	2 nos.	
	11. Spring	2 nos.	
	12. Roller Journal Assembly (without grinding roll)	2 sets	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
	13 . Hydraulic loading cylinder	2 nos.	
	14. Filter Cartridges	10 nos.	
	15 4. Mill Bottom	1 no.	
	16 4. Bowl hub assembly/Ring seat	1 no.	
	17. Lube Oil System		
	17.1 Pump & Motor coupling	2 nos.	
	17.2 Pump assembly	2 nos.	
	17.4 Filters	12 nos.	
	17.5 Pressure regulator	4 nos.	
	18. Oil cooler assembly for coal mills	1 no.	
	19. Bearings for gear box	2 sets *	
	20. Coupling between mill and motor	4 Nos.	
	21. Mill motor complete	2 no	
	22. Mill motor bearing	2 set	
	23. Mill lube oil motor	02 nos.	
	24. VFD assembly for dynamic classifier	4 sets	
	25. Mill lower skirt	2 sets	
	26. Labyrinth seal assembly	5 sets	
	27. Classifier blades	1 set	
	28. Mill Scrapper assembly	2set	
	* One set means one complete replacement of one mill		
1.07.00	Feeders		
	1. Belt	6 sets *	
	2. Belt drive reducer	2 nos.	
	3. Clean out conveyor reducer	2 nos.	
	4. Counter assembly (complete)	2 nos.	
	5. Head pulley assembly (complete)	2 nos.	
	6. Weight sensing system		
	6.1 Weighing roll	2 nos.	
	6.2 Weighing spare roller assembly	2 nos.	
	6.3 Drag link assembly	2 nos.	
	7. Tension roll	2 nos.	
	8. Worm	2 nos.	
	9. Worm wheel	3 nos.	
	10. Feeder gate	2 nos.	
	11. Mill feeder motor	2 nos. of each type	
	12. Mill feeder COC motor (if applicable)	2 nos.	
1.08.00 A)	Coal Burners/ Coal Pipe Bends(for tangential firing)		
	1. Coal compartment assembly	2 sets**	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
	2. Inter air compartments	1/2 set**	
	3. Oil compartments/oil nozzle tips	1/2 set**	
	4. End air compartment	1/2 set**I	
	5. Coal nozzle castings	1 set**	
	6. Adjustable coal nozzle tips	1 set**	
	7. Coal pipe bends with liners	50% of population for each type size, thickness & radius for one unit.	
	8. Coal pipe couplings	50 nos. of each type & size	
	9. Coal pipe coupling gasket	60 nos. of each type & size	
	** One set means one complete replacement for a unit		
1.08.00 B)	Coal Burners/ Coal Pipe Bends (for front / rear wall firing)		
	1. Complete Coal compartment assembly	2 sets**	
	2. Adjustable coal nozzle tips	1 set**	
	3. Coal pipe bends with liners	50% of population for each type size, thickness & radius for one unit.	
	4. Coal pipe couplings	50 nos. of each type & size	
	5. Coal pipe coupling gasket	60 nos. of each type & size	
1.08.00C	COFA/SOFA/AA Air nozzle assembly		
	1. COFA/SOFA/AA assembly	50% of total quantity of one unit	
	** One set means one complete replacement for a unit		
1.09.00	Seal Air Fan		
	1. Fan assembly (excluding fan body)	1 no.	
	2. Bearings & seals	2 sets *	
	3. Seal air fan motor	1 no.	
	4. Seal air fan motor bearing	1 set	
	* One set means complete replacement of one fan		
1.10.00 A)	Regenerative Air Preheater (Primary & Secondary APH)		
	1. Support Bearing	Half of the total population	
	2. Guide Bearing	Half of the total population	
	3. Lubricating system of support & Guide Brg		
	3.1 Pump assembly	1nos each for PAPH & SAPH	
	3.2 Pressure regulator	1nos each for PAPH & SAPH	
	3.3 Filters	6 nos. each for PAPH & SAPH	
	3.4 Pump Motor coupling	3 nos each for PAPH & SAPH	
	4. Radial seals	2 sets* each for PAPH & SAPH	
	5. Axial Seals	2 sets* each for PAPH & SAPH	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES			
SI. NO.	PARTICULARS	QUANTITY		
	6. Circumferential or bypass seals	2 sets* each for PAPH & SAPH		
	7. Rotor post seals	2 sets* each for PAPH & SAPH		
	8. Air Motor	2 nos. each for PAPH & SAPH		
	8.1 Bearings & seals for air motor	2 sets*		
	9. Complete Speed reducer	1 sets* each for PAPH & SAPH		
	9.1 Speed reducer Gears, pinions & shaft	1 sets* each for PAPH & SAPH		
	9.2 Speed reducer Bearings	1 sets *		
	9.3 Speed reducer Seals & gaskets	2 sets* each for PAPH & SAPH		
	9.4 Speed reducer Clutch assembly	2 nos. each for PAPH & SAPH		
	10. Fluid coupling	-2 nos. each for PAPH & SAPH		
	11. Other couplings with inserts & fasteners	2 nos. each for PAPH & SAPH		
	12. Spare for cleaning device			
	12.1 Worm & worm wheel for gear reducer	1 set* each for PAPH & SAPH		
	12.2 Coupling	1 set* each for PAPH & SAPH		
	12.3 Bearing & seals for spec reducer	1 set* each for PAPH & SAPH		
	12.4 Bearing for cleaning device	1 set* each for PAPH & SAPH		
	12.5 Poppet valve assembly	1 No		
	12.6 Carriage assembly	1No		
	12.7 Rotary Chain Box Assembly	1No		
	12.8 Lance and feed pipe	1 No		
	13. Spare kit for fire sensing device.	2 Set		
	14. Bushings for worm gear reducer	2 set*		
	15. Cold, intermediate & hot end baskets	1 set each type and size*		
	16. Rack & pinion assembly	1 set* each for PAPH & SAPH		
	17. Motor Bearing for all motors in APH	1 set each type for PAPH & SAPH		
	18. Complete drive unit	1 no of each for PAPH & SAPH		
	19. Air pre heater motor	1 no. of each type and rating for PAPH and SAPH		
	20. Air pre heater guide bearing and support bearing lube oil pump motor	1 no. of each type and rating for PAPH and SAPH		
	21. Air pre heater blower motor	1 no. of each type and rating for PAPH and SAPH		
	22 VFD system (if applicable)	1 no. of each type and rating for PAPH and SAPH		
	23. Support bearing Housing	1 no. of each type and rating for PAPH and SAPH		
	24. Guide bearing Housing	1 no. of each type and rating for PAPH and SAPH		
	25. Seal Tube for Guide bearing	1 no. of each type and rating for PAPH and SAPH		
	26. Sleeve for guide bearing	1 no. of each type and rating for PAPH and SAPH		
	27. Lub oil Cooler	1 no. of each type and rating for		
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
		PAPH and SAPH	
	* One set means one complete replacement each for Primary & Secondary APH.		
	OR		
1.10.00 (B)	Regenerative Air Preheater –Trisector type		
	1. Support Bearing	2 nos.	
	2. Guide Bearing	2 nos.	
	3. Lubricating system of support & Guide Brg.		
	3.1 Pump assembly	1nos	
	3.2 Pump Motor	1nos	
	3.3 Pressure regulator	2 nos.	
	3.4 Filters	2 nos	
	3.5 Pump Motor coupling	2 nos.	
	4. Radial seals	2 sets*	
	5. Axial Seals	2 sets*	
	6. Circumferential or bypass seals	2 sets*	
	7. Rotor post seals	2 sets*	
	8. Air Motor	2 nos.	
	8.1 Bearings & seals for air motor	2 sets*	
	9 Complete Speed reducer	1 sets*	
	9.1 Speed reducer Gears, pinions & shaft	1 sets*	
	9.2 Speed reducer Bearings	1 sets*	
	9.3 Speed reducer Seals & gaskets	1 sets*	
	9.4 Speed reducer Clutch assembly	1 no	
	10 Fluid coupling (if NA then other applicable coupling)	2 nos	
	11 Other couplings with inserts & fasteners	2 nos	
	12 Spare for cleaning device		
	12.1 Worm & worm wheel for gear reducer	1 set*	
	12.2 Coupling	1 set*	
	12.3 Bearing & seals for spec reducer	1 set*	
	12.4 Bearing for cleaning device	1 set*	
	12.5 Poppet valve assembly	1 no.	
	12.6 Carriage assembly	1 no.	
	12.7 Rotary Chain Box Assembly	1 no.	
	12.8 Lance and feed pipe	1 no.	
	13. Spare kit for rotor stoppage alarm	2 sets	
	14. Bushings for worm gear reducer	2 sets*	
	15 Cold, intermediate & hot end baskets	1 set each type and size*	
	16 Rack & pinion assy	1 set	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES						
SI. NO.	PARTICULARS	QUANTITY					
	17 APH Main drive Motor complete	~~2 nos.~~ 1 nos of each type and rating					
	18 Air pre heater guide bearing and support bearing lube oil pump motor (if Applicable)	1 no. of each type and rating					
	19 VFD system (if applicable)	1 no. of each type and rating					
	20 Air preheater blower motor	1 no. of each type					
	21 Support bearing Housing	1 no. of each type and rating for APH					
	22 Guide bearing Housing	1 no. of each type and rating for APH					
	23 Seal Tube for Guide bearing	1 no. of each type and rating for APH					
	24 Sleeve for guide bearing	1 no. of each type and rating for APH					
	25 Lub oil Cooler	1 no. of each type and rating for APH					
	* One set means one complete replacement of one APH.						
1.11.00	Fuel Oil System						
	Light Fuel Oil System						
	1. Light Oil gun	1 Set **					
	2. Oil gun nozzle (with back plate, mixing plate & cap nut)	2 sets**					
	3. Oil gun flexible hoses (including for guide pipe, air line)	2 sets**					
	4. Complete Pump & Motor Assembly	1 nos					
	5. Light Oil pump						
	5.1 Complete cartridge assembly	2 sets* 1 sets*					
	5.2 Bearings including that of motor	2 sets* 1 sets*					
	5.3 Mech. Seals	2 sets*					
	5.4 Set of 'O' rings & seals	4 sets*					
	5.5 Set of all types of bushes & sleeves	2 sets*					
	5.6 Set of gaskets	4 sets*					
	6. LDO pump relief valve complete accessories	2 nos.					
	7. Spares for LDO pump relief valve						
	7.1 Valve spindle & disc	2 nos.					
	7.2 Set of gasket	4 sets*					
	7.3 Sealing ring	2 sets*					
	7.4 Springs	2 sest*					
	8. Burner isolation valve	12 nos or 10% which is less					
	8.1 Gaskets for above valves	4 sets					
	8.2 Gland packing for above valves	4 sets					
	9. Light oil pressure control valve	1 no.					
	10. Light oil main trip valve	1 no.					
	11. Valves (each type & size)	1 no. where total quantity of particular type and size of valve is less than or equal to 10.					
<table border="1"> <tr> <td>SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE</td> <td>TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001</td> <td>SUB-SECTION-VI CHAPTER -1 SG & AUXILIARIES</td> <td>PAGE 12 OF 32</td> </tr> </table>				SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-VI CHAPTER -1 SG & AUXILIARIES	PAGE 12 OF 32
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
		(b) 2 Nos. where total quantity of a particular type & size of valve is less than 40 but more than 10	
	12. Strainers of LDO System	02 of each type & Size	
	* One set means one complete replacement of one pump		
	** One set means one complete replacement of one Unit		
1.12.00	HEA Ignitors		
	1. HEA retractor assembly (including power cylinder, HEA spark rod tip, solenoid valve, limit switches etc.	4 nos.	
	2. HEA spark rod (including special cables from exciter)	8 nos.	
	3. HEA spark tip	8 nos.	
	4. HEA exciter	8 nos.	
1.13.00	Soot Blowers		
	1. Complete assembly of water wall deslagger with motor	4 nos.	
	1a Motor for water wall deslagger	01 (one no of each type)	
	2. Complete valve assembly for water wall deslagger.	4 nos.	
	3. Complete valve assembly for long retractable soot blower.	4 nos.	
	3 a) Motor for long retractable soot blower	1 no.	
	4. Reduction gear box & motor for air preheater soot blower oscillation	2 nos of each type (If separate type & rating of SB are envisaged for primary & secondary APH, then 2 Nos. of each type.)	
	5. Complete valve assembly for air preheater soot blower	2 nos of each type (If separate type & rating of SB are envisaged for primary & secondary APH, then 2 Nos. of each type.)	
	6. Bearings & oil seals for		
	6.1 Long retractable soot blower	3 sets*	
	6.2 Water wall deslagger	3 sets*	
	7. Complete steam safety valve assembly	1 no.	
	8. Steam control valve assembly	2 nos. of each type	
	9. Long retractable soot blower assemblies complete with motor	2 nos. of each type (1 no. motor)	
	10. Sweep action/ swing arm/Long retractable non rotating blower for Air Preheater	3 nos. each for PAPH and SAPH or 3 nos. for Tri-sector APH	
	11. Limit switches	4 nos. of each type & ratings.	
	12. Complete power pack assembly for Long Retractable soot blower	(Two no. for rotary + Two no. for transverse)	
	13. Spare set of rotary & transverse chain for long retractable soot blowers	2 nos. of each type and size	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
	14. Spares for rack gear assembly		
	14.1 Set of Gears & shaft (Spur & worm)	4 sets	
	14.2 Rack & pinion	4 sets	
	15. LRSB lance tube (SS)	05 nos.	
	* One set means one complete replacement of one valve/Equipment.		
1.14.00	VALVES		
	A. Spares for Steam Separator / Separator outlet/ Primary Superheater Safety valves		
	1. Complete separator/ Separator outlet/ Primary SH safety valve assy	2 Nos. of each type	
	2. Upper adjusting ring	2 nos of each type	
	3. Lower adjusting ring	2 nos of each type	
	4. Locking pin set	2 nos of each type	
	5. Safety valve Disc	4 nos of each type	
	6. Safety Valve Spindle	2 nos of each type	
	7. Disc Holder	2 nos of each type	
	8. Guide	2 nos of each type	
	9. Cotter Pins (If applicable)	10 nos. of each type	
	10. Set of Washer	1 no. of each Type	
	B. Spares for SH Safety Valves		
	1. Complete separator safety valve assy	2 nos. of each type	
	2. Upper adjusting ring	2 nos of each type	
	3. Lower adjusting ring	2 nos of each type	
	4. Locking pin set	2 nos of each type	
	5. Safety valve Disc	4 nos of each type	
	6. Safety Valve Spindle	2 nos of each type	
	7. Disc Holder	2 nos of each type	
	8. Guide	2 nos of each type	
	9. Cotter Pins (If applicable)	10 nos. of each type	
	10. Set of Washer	4 nos. of each Type	
	C. Spares for Hot RH safety Valves		
	1. Complete separator safety valve assy	1 no. of each type	
	2. Upper adjusting ring	2 nos. of each type	
	3. Lower adjusting ring	2 nos. of each type	
	4. Locking pin set	4 nos. of each type	
	5. Safety valve Disc	2 nos. of each type	
	6. Safety Valve Spindle	1 no. of each type	
	7. Disc Holder	2 nos. of each type	
	8. Guide	2 nos. of each type	
	9. Cotter Pins (If applicable)	10 nos. of each type	
	10. Set of Washer	1 no. of each Type	
	D. Spares for Cold RH safety Valves		
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
	1. Complete separator safety valve assy	1 no. of each type	
	2. Upper adjusting ring	2 nos. of each type	
	3. Lower adjusting ring	2 nos. of each type	
	4. Locking pin set	2 nos. of each type	
	5. Safety valve Disc	4 nos. of each type	
	6. Safety Valve Spindle	2 nos. of each type	
	7. Disc Holder	2 nos. of each type	
	8. Guide	2 nos. of each type	
	9. Cotter Pins (If applicable)	10 nos. of each type	
	10. Set of Washer	1 no. of each Type	
	E-1. Spares for Electromatic Relief Valves		
	1. Complete Electromatic relief valve	1 Nos. of each type	
	2. Spares for above:		
	2.1 Disc for main valve	2 Nos. of each type	
	2.2 Spring for main valve	2 Nos. of each type	
	2.3 Seal rings for main valve	4 nos. of each type	
	2.4 Seal bushing for main valve	4 nos. of each type	
	2.5 Disc and stem assembly for pilot valve	2 Nos. of each type	
	2.6 Bushing for pilot valve	4 nos. of each type	
	2.7 Spring for pilot valve	4 nos. of each type	
	2.8 Seal ring	4 nos. of each type	
	3. Isolation valve for ERV	2 nos. of each type	
	E-2. Spares for Electromatic Ball Valves		
	1. Complete Electromatic ball valve	2 nos. of each type	
	2. Spares for above:		
	2.1 Ball and seat assembly	2 nos. of each type	
	2.2 Gasket	4 nos. of each type	
	2.3 Packing Gland Flange	2 nos. of each type	
	2.4 Packing ring	4 nos. of each type	
	F. Spares for Superheater spray control Valves		
	1. Complete superheater spray control valve	1 nos of each type	
	2. Spares for above:		
	2.1 Gland packing set	5 sets of each type	
	2.2 Pressure seal gasket	2 nos. of each type	
	2.3 Stem	2 nos of each type	
	2.4 Valve Plug	2 nos of each type	
	G. Spares for Reheater spray control Valves		
	1. Complete Reheater spray control valve	1 nos of each type	
	2. Spares for above:		
	2.1 Gland packing set	5 sets of each type	
	2.2 Pressure seal gasket	5 nos of each type	
	2.3 Stem	2 nos. of each type	
	2.4 Valve Plug	2 nos of each type	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
1.15.00	Superheater Spray Block Valve Spares		
	1. Gland packing set	5 sets of each type*	
	2. Pressure seal gasket	5 nos of each type	
	3. Stem	2 nos. of each type	
	4. Valve plug	2 nos. of each type	
	Note: 1 set means complete replacement for one valve		
1.16.00	Reheater Spray Block Valve Spares		
	1. Gland packing set	5 sets of each type*	
	2. Pressure seal gasket	5 nos of each type	
	3. Stem	2 nos. of each type	
	4. Valve plug	2 nos. of each type	
	Note: 1 set means complete replacement for one valve		
1.17.00	Spares for boiler main steam stop valve		
	1. Boiler main stop valve assy		
	2. Set of gland packings	4 sets	
	3. Pressure seal gaskets	4 sets*	
	4. Stem	2 nos. of each type for main valve & 2 nos. of each type for integral bypass valve.	
	5. Disc	2 sets*	
	6. Seat rings	2 sets*	
	7. Fasteners	2 sets*	
	Note: 1 set means complete replacement for one valve including integral bypass valves.		
1.18.00	Boiler Feed Check Valve		
	1. Body seat rings	2 nos.	
	2. Flap	2 nos.	
	3. Pressure seal ring for main body and Hinge Pin	4 nos. for each type	
	4. Gland packings	4 sets* for each type	
	5. Fasteners	2 sets*	
	Note: 1 set means complete replacement for one valve		
1.19.00	Start up vent valve		
	1. Stem	1 no.	
	2. Disc	2 nos.	
	3. Body seat rings	4 sets*	
	4. Gland packings	6 sets*	
	5. Pressure seal rings	4 nos.	
	6. Fasteners	2 set*	
	Note: 1 set means complete replacement for one valve		
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
1.20.00	Auxiliary Steam Pressure Reducing & Desuperheating System		
	A. High Capacity PRDS System (MS)		
	1. Steam pressure reducing cum desuperheating valves		
	1.1 Stem	2 no.	
	1.2 Disc	2 nos.	
	1.3 Body seat rings	4 nos. for each type, size and rating of valves	
	1.4 Gland packings	4 nos. for each type, size and rating of valves	
	1.5 Pressure seal ring	4 nos.	
	1.6 Gasket	4 nos.	
	B. Low Capacity PRDS System (CRH)		
	1. Steam pressure reducing valve		
	1.1 Stem	2 nos.	
	1.2 Disc	4 nos.	
	1.3 Body seat rings	2 nos. for each type/size	
	1.4 Gland packings	4 nos. for each size, type & rating of valves	
	1.5 Pressure seal ring	4 nos.	
	1.6 Gaskets	2 nos.	
1.20.00 A	Valve trim set for all control valves supplied under this package (except for SH/RH spray, HCPRDS & LCPRDS CV for which spares are covered under separate clause)		
	Valve trim (including cage, plug, stem, seat rings, guide bushings, gland packing, gaskets etc.)	1 set for each type, class, size of control valve. 5 Sets* each for gland packing and gaskets for all control valves.	
	Note: 1 set means complete replacement for one valve		
1.20.00 B	Valves (Manual valves, Motor operated valves, Plug valves and any other valves type except control valves as under 1.20.00 A) supplied under this SG package and is not covered under separate clause		
	Valve Stem, Disc and Seat	1 Set for each size, class and type of valve	
	Gland Packings, Gaskets	2 Sets* each for gland packing and gaskets for each size, type of valves.	
	Pressure seal rings	2 Sets* for each size, type of valves	
	Actuator nut for Motor operated valve	2 sets* for each type, size and class of valve	
	Needle Bearings/ Plain bearing of actuator nut	2 sets* for each type, size and class of valve	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
	Complete Manual valves upto 50 NB	10% of population of each type, size and class of valve	
	Complete Motor Operated valves upto 50 NB	10% of population of each type, size and class of valve	
	Complete Plug Valve	10% of each type, size and class of valve	
	Note: 1 set means complete replacement for one valve		
1.20.00 C	Gear Box of Valves, Gates (Gear Box of valve actuator and valve of motor operated valve and Gear Box of manual valve, plug valve etc., Gear box of Gates)		
	1. Complete Gear Box	1 No. of each type, size	
	2. Bearings for Gear Box	2 Set* of each type, size of gear box.	
	3. Gaskets for Gear Box	4 Set* of each type, size of gear box.	
	4. Oil seal and any other applicable packings for gear box	4 Set* of each type, size of gear box.	
	Note: 1 set means complete replacement for one valve		
1.22.00	FGD System		
1.22.01	Booster Fans (if applicable)		
	1. Fan rotor assembly (excluding servo motor and blade)	2 nos.	
	2. Booster fan motor complete	1 no.	
	3. Booster fan motor bearing	1 set	
	4. Fan bearings	2 sets	
	5. Spares for blade bearing Assembly		
	5.1 Bearings	4 sets	
	5.2 'O' rings	4 sets	
	5.3 Bushes	4 sets	
	5.4 Metallic rings	2 sets	
	5.5 Intermediate piece (if applicable)	2 sets	
	6. Lube Oil / Hydraulic Oil system		
	6.1 Pump assembly	2 nos. of each type	
	6.2 Motor	1 no. of each type and rating	
	6.3 Pressure regulator	4 nos.	
	6.4 Filters	6 nos.	
	6.5 Coupling between oil pump & motor	2 nos.	
	6.6 Pump Mechanical Seal	4 Nos.	
	7. Fan Blades	2 sets	
	8. Coupling between Fan & Motor	2 sets.	
	9. Hydraulic servomotor	2 nos.	
	10. Booster fan impeller liner	2 sets	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
	11. Booster fan casing liner	2 sets	
1.22.02	Gates/Damper in Flue Gas System of Air Flue gas path of Boiler including FGD.		
	1. Seals	1 set of each type and size (Set means complete replacement for one gate)	
	2. Actuator	1 no. of each type	
1.22.03	Absorber		
	1. Liner Material	5% coverage of each material and thickness for one Unit/Absorber	
	2. Absorber Spray/Oxidation nozzles	10% of each type	
	3. Absorber Mist Eliminator Washing Nozzles	10% of each type	
	4. Absorber Mist Eliminator	5% of each type	
1.22.04	Oxidation Air Compressor		
	1. Impeller Assembly	1 no.	
	2. Bearings	1 no. of each type	
	3. Motor	1 no. of each type and rating	
1.22.05	Agitators (if applicable) (For Absorber Oxidation Tank, and any other tank provided with agitators)		
	1. Impeller Assembly	1 no. of each type	
	2. Bearing Assembly	2 no. of each type	
	3. Motor	1 no. of each type and rating	
	4. Belt and Pulley (If applicable)	2 nos. of each type	
	5. Gear Box Assembly (If Applicable)	1 no. of each type	
1.22.06	Slurry Pumps (if applicable) (Absorber Slurry Recirculation Pump, Gypsum Bleed Pumps, , Limestone Supply Pumps and any other slurry pumps)		
	1. Impeller Assembly	1 no. of each type	
	2. Casing Liners	2 no. of each type	
	3. Seals	3 sets of each type	
	4. Bearings	2 nos. of each type	
	5. Motor	1 no. of each type and rating	
	6. Motor-Pump Coupling	1 no. of each type	
	VFD TRANSFORMER (If applicable)		
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
	a) VFD Transformer, one of each type and rating	1 set	
	b) Primary Bushings with metal parts and gaskets (if applicable)	1 no. each rating	
	c) Secondary Bushings with metal parts and gaskets	1 no. each rating	
	d) Winding temperature indicator with alarm & trip contacts	1 no.	
	e) Oil temperature indicator with alarm & trip contacts	1 no.	
	f) Magnetic oil level gauge	1 no.	
	g) Pressure relief device	1 no.	
	h) Diaphragm for explosion vent	1 no.	
	i) Buchholz relay/sudden pressure relay	1 no.	
	j) Silca gel charge	1 no.	
	k) Pressure gauge (applicable for sealed tank)	1 no. each type	
1	Electronic cards		
	(a) Control modules	1 nos. of each type & rating	
	(b) I/O module	1 nos. of each type & rating	
	(c) Power supply modules	1 nos. of each type & rating	
	(d) Thyristor gate module including gate transformer	100% of one channel	
	(e) Exciter module	1 no.	
2	Thyristor bridge leg	1 no. (Qty. for one ph.)	
3	Over voltage limiter and surge suppressor network	1 set	
4	Semi conductor fuses for thyristor	1 set	
5	Power & Control fuse	25% of installed quantity	
6	Control Transformer	1 nos. of each type & rating	
7	Contactors/Breaker	1 no.	
8	CT/VT	1 no. of each type & rating	
9	Indicating lamps	100% of each type & rating	
10	Auxiliary contactors & relays	1 no. of each type & rating	
11	Panel mounted printer	1 no.	
12	Indicating lamp holder full set	15% of each type and colour	
13	Panel mounted meters	1 no. of each type & rating	
14	Current Sensor	1 no. of each type & rating	
15	Ground fault sensing card	1 no. of each type & rating	
16	Fiber cable with connectors	1 set	
1.22.07	Hydro-cyclones (if applicable) Gypsum Primary Dewatering, Secondary Waste Water and any other Hydrocyclone)		
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
	1. Hydro-cyclone Isolation Valve	10% of each type OR 1 no. whichever is higher	
	2. Hydro-Cyclone	10% of each type OR 1 no. whichever is higher	
	3. Hydro-Cyclone rubber lining	10% of each type OR 1 no. whichever is higher	
1.22.10	Slurry Valves	2 no. of each type and size	
1.22.11	Slurry Line Bends	2 no. of each type and size	
1.22.14	Sump Pumps		
	1. Complete Impeller Assembly	1 no. of each type	
	2. Casing Liners	1 set [*] of each type	
	3. Bearing	2 set [*]	
	4. Motor	1 no. of each type and rating	
	5. Pump discharge valve assembly	1 no. of each type	
1.22.15	Horizontal Centrifugal Pumps		
	1. Complete Impeller Assembly	1 no. of each type	
	2. Casing Liners	1 set [*] of each type	
	3. Bearing	2 set [*]	
	4. Motor	1 no. of each type and rating	
	5. Pump discharge valve assembly	1 no. of each type	
1.23.00	Goods cum passenger elevator for FGD (if applicable)		
23.1	Over current relay	2 Nos. of each type and rating	
23.2	Auxiliary relays	3 Nos. of each type	
23.3	Friction block	2 Nos.	
23.4	Guide roller of each type	20% of total population or 3 nos. of each type whichever is high	
23.5	Contactors of each type and rating	2 nos.	
23.6	Control transformer	1 no. of each type and rating	
23.7	Time device	2 nos. of each type and rating	
23.8	Rectifiers	2 nos. of each type and rating	
23.9	Resistor	3 nos. of each type and rating	
23.10	Fuses of each rating	20 % of the total population	
23.11	Limit switches of each type and rating	3 nos.	
23.12	Push button	3 nos. of each type and rating	
23.13	Contact device (if applicable)	3 nos. of each type and rating	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
23.14	Brake motor	2 nos. of each type and rating	
23.15	Transmitters (if applicable)	2 nos. of each type and rating	
23.16	Switches of each type and rating (if applicable)	3 nos.	
23.17	Receiver	2 nos. of each type and rating	
23.18	Bearings of each type & size	2 nos.	
23.19	Roller of each type	3 nos.	
23.20	Worm gear spares		
	a) 'O' rings	3 Sets	
	b) Sealing ring of each type	3 Sets	
23.21	Spares for brake		
	a) Fan	2 nos. of each type and rating	
	b) Magnetic coil	3 nos. of each type and rating	
	c) Brake disc	2 Sets	
	d) Brake pad	2 Sets	
23.22	Bushing (for door front)	2 Sets	
23.23	Pinion	2 nos. of each type	
23.24	Lift main Drive motor	1 no. of each type & rating	
23.25	Door Operating Motor	1 no. of each type & rating	
23.26	Landing Door complete	1 set. of each type & rating	
23.27	Car Door Complete	1 set. of each type & rating	
23.28	VFD drive	1 no. of each type	
1.24.00	(NA)		
1.25.00	CC (BCW) pump motor assembly complete with cooler (if applicable)	1 no. of each type and rating	
2.00.00	CONTROL AND INSTRUMENTATION (APPLICABLE FOR STEAM GENERATOR AND AUXILIARIES INCLUDING FUEL OIL PRESSURISATION AND HEATING SYSTEM, DOZING System, ECW, FGD		
2.01.00	OTHER RELATED CONTROL AND INSTRUMENTATION SYSTEMS / EQUIPMENTS		
	Other SG related sub-systems		
	1. Flame Monitoring System		
	1.1 Complete Flame Scanner Assembly including scanner head assembly, scanner housing, and fiber optic cables.	20 % or 4 nos., whichever is more	
	1.2 Electronic cards including power supply modules for scanners	10 nos. of each type	
	2. Coal Feeders		
	2.1 Motion monitor	2 nos.	
	2.2 Speed pick-up	4 nos.	
	2.3 Load Cell	2 nos of each type	
	2.4 Electronic cards & Power Supply cards	4 nos of each type	
	2.5 Limit switch assembly for coal-on-belt, no coal	2 nos of each type	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
	flow, shear pin failure, etc.		
	2.6 Coupling (eddy current type etc., VFD as applicable)	2 nos.	
	2.7 Relay/Contactor of each type make and model and rating	2 nos. of each type	
	3. Electromatic Safety Valves / Electromatic Ball valve Pressure switches and solenoid Valves.	1 nos of each type	
	4. Furnace Temperature Probes Thermocouple	1 Nos	
	5. Acoustic Pyrometers		
	5.1 Signal Processor and interface modules	2 nos of each type and model	
	5.2 Sensors	2 nos of each type and model	
	5.3 All Electronic Cards including Power Packs	2 nos of each type and model	
	5.4 Seal kit for Sound Generator	= 2 nos of each type and model	
	6. Furnace and Flame viewing system	LOT	
	6.1 Flame Cameras	1 nos.	
	6.2 Video Recording Unit (DVR)	1 nos. of each type	
	6.3 Filter	40 nos. of each type	
	7. Conductivity type level monitoring system (for drip legs)		
	7.1 Electrodes	10 nos.	
	7.2 Electronic Cards	2 nos.	
	8. Acoustic steam Leak Detection system (ASLD) (if applicable)	LOT	
	(i) Processor and Interface modules	5 nos. of each type	
	(ii) Sensors and Transceivers	5 nos.	
	9. level monitoring system for Coal bunker, fly ash silo and ESP hopper (first field)		
	a) Acoustic 3D Level scanner	2 nos. of each type, make and model	
	b) Local indicator	2 nos. per unit	
	10. Any other instruments (If applicable)	1 no. per unit	
	11. Any other control system (If applicable)	1 no. per unit	
2.02.00	MEASURING INSTRUMENTS (for all systems supplied under this chapter including, FOPH, Dosing System, ECW, Air compressor system, FGD,)		
a)	Transmitters		
(i)	Transmitters of all type, range and model no. (For the measurement of Pressure, differential pressure flow, level, temperature etc.)	10%- of each type and model whichever is more	
b)	Temperature elements		
(i)	RTD's	10% or 2 nos. of each type and length, whichever is more	
(ii)	Thermocouples	10% or 2 nos. of each type and length, whichever is more	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
(iii)	Thermo well for above applications	10% or 2 nos. of each type and length, whichever is more	
d)	Density meter	1 no. of each type and model	
2.03.00	PROCESS CONNECTION PIPING (FOR IMPULSE PIPING/TUBING, SAMPLING PIPING / TUBING AND AIR SUPPLY PIPING AS APPLICABLE)	LOT	
X` 1.	Valves of all types and models	20 Nos. of each type and model	
2.	2 way, 3way, 5way valve manifolds	10 Nos. of each type, class, size and model	
3.	Fittings	100 Nos. of each type	
4.	Purge meters	20 nos. of each type and model	
5.	Filter regulators	20 nos. of each type and model	
2.04.00	INSTRUMENTATION CABLE, INTERNAL WIRING & ELECTRICAL FIELD		
1.	Pre fabricated cable with connector of each type (other than DDCMIS application) (if applicable)	2 nos. of each type	
2.	Other cables (Instrumentation and Control cable)	5% or 500 mtrs whichever is more for each type, pair and size of actual supplied quantity	
2.05.01	CONTROL VALVES, ACTUATORS & ACCESSORIES (FOR ALL SERVICES UNDER THIS CHAPTER)		
1	Pneumatic and electro-hydraulic actuator assembly	1 No. of each type, model and rating	
2	Diaphragms, O' rings, seals etc. of all types make etc.	5 Nos.	
3	Solenoid valves (if applicable)	1 No.	
4	Positioner units /smart positioners (complete unit) & accessories (link assembly)	2 Nos.	
5	Pneumatic air-filter/Regulator of each type, make rating etc.	2 Nos. of each type, model and rating	
6	Air lock relays	1 No. of each type, model and rating	
2.05.02	PNEUMATICALLY OPERATED ISOLATION / BLOCK VALVES, ACTUATORS & ACCESSORIES (FOR ALL SERVICES UNDER THIS CHAPTER)		
1.	Pneumatic actuator assembly	1 No. of each type, model and rating,	
2.	Diaphragms, O' rings, seals etc. of all types make etc.	5 Nos.	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
3.	Limit switches (complete unit) & accessories (link assembly)	2 nos.	
4.	Pneumatic air-filter/Regulator of each type, make rating etc.	2 nos.	
2.06.00	MICROPROCESSOR BASED / PLC BASED /ELECTRONIC BASED CONTROL PANEL (IF APPLICABLE)		
1.	Fully programmed controllers and electronic module of each type (as applicable)	10% or 1 no. whichever is more	
2.	Power supply Module (If applicable)	10% or 1 no. whichever is more	
2.07.00	FGD (SOx)		
a	Analyzer for SOx, pH	1 no complete instrument of each type and model.	
b	Electronic card assembly/ PCBs, moisture/condensate monitor, power supply modules	2 Nos. of each type	
c	Set of gaskets/O-rings/ seals	4 Nos. of each type	
d	Temp. Sensor	1 No of each type	
e	Heater assembly, Cooler assembly	1 No of each type	
f	Complete Probe with shield assembly (Not applicable for Insitu- path).	1 no. of each type and model	
g	Solenoids	2 nos. of each type, model and rating	
h	Filters, light source, sensor, detector, etc.	2 Nos. of each type	
i	Calibration gases, Calibration cell and other consumables for calibration: - of all types and ranges	2 Nos. of cylinders of each type of calibration gas	
j	Heavy duty blower assembly	1 no. of each type, size and rating.	
k	Rota meter/Air flow meter	2 nos. of each type, model and rating	
2.08.00	Electrical Actuators		
1	Actuators	1 no. of each type and rating	
2	Power unit for modulating actuator	2 nos. of each type	
3	DC-DC unit / Power Units	2 nos. of each type	
4	Electronic cards	2 nos. of each type	
5	Position feedback transmitters	2 nos. of each type	
6	Control Unit	2 nos. of each type	
7	Torque And limit switch assembly of each unit	2 nos. of each type	
8	Electronic PCB of all types	10% of each type & model	
9	Absolute Encoder (replaceable part)	5% of each type & model	
10	Electronic Torque sensor	5% of each type & model	
3.00.00	Not Applicable		
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
SI. NO.	PARTICULARS	QUANTITY	
4.00.00	EQUIPMENT COOLING SYSTEM, CHEMICAL DOZING, PLATE TYPE EXCHANGER		
A	DMCW Pumps		
i	Impeller	1 no.	
ii	Shafts	1 no.	
iii	Shaft Sleeve	2 nos.	
iv	Casing wearing rings (if applicable)	2 Sets	
v	Impeller wearing rings (If applicable)	2 Sets	
vi	Bearings for the pumps	2 Sets of each type	
vii	Motor and motor bearings	1 Set of each type	
viii	Thrust Bearings (if applicable)	2 Sets of each type & size	
ix	Sleeve nuts and O-rings	1 Sets of each type & size	
x	Gland & Gland Packing (if applicable)	2 Sets of each type & size	
xi	Fastners	1 Set of each type and size	
xii	Complete Coupling (Pump & Motor)	1 Set of each type and size	
xiii	Mechanical seals (if applicable)	1 Set of each type and size	
B	Plate Type Heat Exchangers		
i	Gaskets	1 Lot comprising 30% of total requirement of each type & size	
ii	Fastners	1 Lot comprising 10% each type	
iii	Plates	1 Lot comprising 20% of each type	

CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
5.01.00	Electrostatic precipitator (ESP)		
1	Support insulator	2 nos Of each type & rating	
2	Shaft insulator	3 nos of each type & rating	
3	Emitting electrodes		
	(a) Helical wire type	3% of the installed quantity in one ESP	
	(b) Wire pipe in rigid frame	5% of the installed quantity in one ESP	
	(c) Mast type	2 % of the installed quantity in one ESP	
4	Collecting electrode	2% of the installed quantity in one ESP	
5	Inner arm assembly	10 nos each for collecting & emitting system.	
6	Outer arm assembly	10 nos. each for collecting & emitting system.	
7	Plain bearing	10 nos of each type & size.	
8	Shock bar/anvil	10 nos of each type & size.	
9	Shock Bar Guide	50 nos of each type and size	
10	Big Pin Wheel and Small pin wheel	5 nos each type and size	
11	Rappers		
	(a) For electric rappers		
	(i) Assembled rapper/drop rods	10 nos of each type & size.	
	(ii) Coil assembly along with sleeve	2 nos	
	(iii) Casing	2 nos	
	(iv) Gaskets & packing	5 nos of each type & size.	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
	(b) For tumbling rappers		
	(i) Hammers	10 nos of each type & size.	
	(ii) Bearing components	2 nos	
	(iii) Shafts	2 nos	
	(iv) Gear motors	2 nos of each type & rating	
10	Gaskets (One set means complete replacement for all TR sets, one ESP pass)	1 set	
11	Control system		
	(a) Push buttons for		
	(i) TR set controller	5 nos Of each type & rating	
	(ii) Others	2 nos Of each type & rating	
	(b) Indicator lamps	5 nos Of each type & rating	
	(i) Control fuse	5 nos Of each type & rating	
	(c) Power fuse	5 nos Of each type & rating	
	(d) Thyristor fuse	2 nos. Of each type & rating	
	(e) Thyristor of transformer controller rectifier	2 nos Of each type & rating	
12	Ash level indicator for ESP	10 nos. Of each type & rating	
13	Opacity monitor	2 Nos.	
14	Power supply modules for remote control unit of opacity monitor	2 nos. Of each type, make & model.	
15	Transformer rectifier set (Complete)	2 nos of each type and rating	
16	Control system		
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
	(a) Transformer-rectifier set controller	2 nos	
	(b) Rapper controller complete (if applicable)	2 Nos.	
	(c) Communication controller complete (if applicable)	2 nos	
	(d) Disconnecting Switch assembly	3 nos.	
17	High Frequency/Mid Frequency Transformer Rectifier set (If applicable)		
	a) Complete HFTR/MFTR Set	2 nos	
	b) Gaskets for HFTR sets (One set means complete replacement for all TR sets, one ESP pass)	1 set	
	c) Control system		
	1.) High voltage unit	One set.	
	2.) Power electronic unit	One set.	
	3.) Board for power Electronic Controller Unit	One no.	
	4.) Cooling fans	One no.	
	5.) Measurement module for HV unit	One no.	
	6.) Fuses	One set.	
5.02.00	Passenger Elevator for ESP Rapper Panel room on Roof (Not Applicable)		
5.03.00	Passenger Elevator for ESP Control Room		
	1) Friction block	2 nos. of each type	
	2) Guide roller of each type	20 of total population or 3 nos. whichever is higher	
	3) Contactors	2 nos. of each type and rating	
	4) Bushing (for door front)	2 sets* of each type	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR SG & AUXILIARIES		
	5) Pinion	2 nos. of each type	
	6) Worm gear spares of each type		
	7) 'O' rings	4 sets *	
	8) Sealing ring of each type	4 sets *	
	9) Time device/Timer card (as applicable)	2 nos. of each type and rating	
	10) Rectifiers	2 nos. of each type and rating	
	11) Resistor (if applicable)	3 nos. of each type and rating	
	12) Fuses/MCB/Switches (as applicable)	2 nos. of each type & rating	
	13) Limit switches	3 nos. of each type and rating	
	14) Push button	Complete replacement of one elevator	
	15) Contact device (if applicable)	3 nos. of each type and rating	
	16) Brake motor/ magnet (as applicable)	01 no. of each type and rating	
	17) Bearings	01 nos. of each type & size	
	18) Magnetic coil	03 nos.	
	19) Floor indicator Display unit	01 no. of each type	
	20) Lift Main drive motor	03 nos. of each type & size	
	21) Door opening motor	01 no. of each type & size	
	22) Landing door complete	01 set	
	23) Car door complete	01 set	
	24) VFD drive	01 no of each type and rating	
	* One set means one complete replacement for an equipment		
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CHAPTER-2

STEAM TURBINE GENERATOR

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

C	CLAUSE NO.	MANDATORY SPARES		
		LIST OF MANDATORY SPARES		
A.	GROUP-A: MANDATORY SPARES			
S. NO.	ITEM DESCRIPTION	QUANTITY		
1	Complete HPT module -Includes inner bladed casing and bladed rotor including all internals in assembled condition and fitted in outer casing along with inlet pipe Breach nuts with inlet inserts (if applicable).	Not Applicable		
	Or			
	If design is such that stationery blades is provided in diaphragms, then full set of bladed diaphragms/ carriers and nozzle along with mounting arrangement (as applicable) for all stages of HP turbine, bladed HP Rotor, inner and outer casing with applicable sealing, diaphragm packing's, stationary gland seals, pipes/casing sealing rings along with casing fasteners for complete HP turbine assembly.	Not Applicable		
2	Complete IPT module-Includes inner bladed casing and bladed rotor including all internals in assembled condition, along with full set of both ends of stationery gland seal segments (Finned).	Not Applicable		
	Or			
	If design is such that stationery blades is provided in diaphragms, then full set of bladed diaphragms/ carriers and nozzle along with mounting arrangement (as applicable) for all stages of IP turbine, bladed IP Rotor, inner and outer casing with applicable sealing, diaphragm packing's, stationary gland seals, pipes/casing sealing rings along with casing fasteners for complete IP turbine assembly.	Not Applicable		
3.	LP Turbine bladed rotor assembly (Please see note in the description) Note: a) If configuration has one LP Rotor OR two LP	Not Applicable		
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C CLAUSE NO.	MANDATORY SPARES	
	rotors which are identical, then one LP Rotor only is required. b) If the configuration has two LP rotors but not identical then one each of both non identical LP rotors are required, i.e two LP Rotors	
4	LP turbine rotor last two stage moving blades along with fastening material (Clamping pieces, Rivets, snubbers ,sleeves, springs, locking strips, locking pins etc. whichever are applicable) Note: a) If configuration has one LP Rotor, two sets for each stage of last two stage moving blades of both side flow is required (Total=8 sets) b) If configuration has two LP Rotors (Identical or non-identical) then one set for each stage of last two stage moving blades of both side flow is required (Total=8 sets)	Please see note in the description
5	Drive Turbine bladed rotor for TD BFP	Not Applicable
6	Aux oil pump/startup oil complete assembly for Main Turbine along with complete coupling (Mounted on oil tank)	1 No.
7	Main oil pump complete assy (Turbine shaft Driven). (If turbine driven MOP is not there then no requirement).	1 No.
8	AC jacking oil pump complete assembly for Main Turbine along with complete coupling and Motor	1 No.
9	DC jacking oil pump assembly for Main Turbine along with complete coupling and Motor	1 No.
10	EOP along with motor for Main Turbine lubricating system along with complete coupling	1 No.
11	BFP Booster Pump	
11 (a)	Turbine Driven BFP booster pump complete assembly. including casing, rotor assembly along with bearings, complete coupling and seal assembly Note: If booster pump assembly for pump A and pump B orientation are not identical then for each orientation 1 no complete assembly to be provided.	Not Applicable
11(b)	Motor Driven BFP booster pump complete assembly. including casing, rotor assembly along with bearings, complete coupling and seal assembly	Not Applicable
12	BFP	
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C CLAUSE NO.	MANDATORY SPARES	
12(a)	Turbine Driven BFP cartridge complete assembly which includes DE, NDE bearing assembly, seals assembly, shaft, impellers, inlet ring sections, diffusers along with gaskets , O-rings , soft parts etc required for complete assembly replacement in barrel.	2 Nos.
12(b)	Motor Driven BFP cartridge complete assembly which includes DE, NDE bearing assembly, seals assembly, shaft, impellers, inlet ring sections, diffusers along with gaskets , O-rings , soft parts etc required for complete assembly replacement for replacement in barrel.	1 No.
12 (c)	Complete Gear box assy. between BFP Drive Turbine & Booster pump including complete coupling for both ends.	1 No.
13	CEP complete with bowl assembly, discharge head (excluding canister and base) but including complete coupling	1 No.
14	Main Turbine Condenser Vacuum Pump complete assembly including complete coupling with casing.	1 No.
15	Generator & Auxiliaries	
15.1	Turbo generator rotor complete with stand	Not Applicable
15.2	Generator Rotor fan/ compressor blades assembly(Fixed blades mounted on carrier & moving blades)	1 set
15.3	Brushless Excitation system (if applicable)	
a)	Thyristor assembly with semiconductor fuses	100% for one channel
b)	Exciter complete assembly including PMG , Main exciter & rotating diode wheel etc.	Not Applicable
c)	Exciter Cooler	1 no
15.4	Gas System	
15.4.1	Refrigeration type hydrogen drier assembly Complete	1 set
15.5	Seal Oil System	
15.5.1	Complete motor and Pump assembly for AC seal oil pump	1 no. of each type
15.5.2	Motor pump set for DC seal oil pump along with resistance & Control Box	1 set
15.5.3	Vacuum pump assembly (If applicable)	1 set
15.6	Stator Water Cooling System	
15.6.1	Stator water pump motor assembly.	1 set
16	Motors	
a)	Condensate Extraction Pump motor and motor bearing	1 no motor and 1 Set brg
b)	ACW Pumps and DMCW Pumps motor with motor bearing	1 no motor of each type and 1 Set brg of each type
c)	Condenser air evacuation pump motor	1 No. of each type
d)	Drip pump Motor (If applicable)	1 no.
e)	Boiler Feed Pump motor (BFP)	1 no. and 1 Set brg of each type
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C CLAUSE NO.	MANDATORY SPARES			
B.	Group-B: Mandatory Spares:			
I.	TG Items			
1	Complete set of all bearings including thrust bearings for complete turbine rotor system (Complete set of bearing assembly including torous / spherical pieces , cylindrical / spherical supports matched with spherical / tourus pieces , intermediate pieces & all other fixing/assembly materials required to complete one bearing assembly	1 Set		
2	High Pressure (HP) rotor seals including seals of balancing drum (if applicable). (Complete set of interstage seals of all the stages of moving blades of HP rotor including , fins , caulking wire , etc)	1Set		
3	Assembly of HP casing seals including seals of balancing drum (if applicable) (1 set should comprise of sealing fins, segments, fitted keys, pins, caulking material, springs of interstage sealing of all the stationary rows	1 Set		
4	HP Gland sealing (Complete set for replacement of front, rear, middle sealing both rotating / stationary components) It should include segments, sealing fins ,caulking wire ,springs and fixing material etc)	1 Set		
5	Assembly of IP casing Seals (1 set should consist of seal fins, segments, fitted keys, caulking material, pins, springs, cap screws for interstage sealing's of all the stationary rows)	1 Set		
6	IP rotor seals (1 set should consist of seal fins , caulking material , for all the interstage sealing of the rotating stages)	1 Set		
7	IP Gland seals (Complete set for replacement of front & rear sealing which includes seal segments, seal fins, caulking material, springs, fitted keys, screws, corresponding to both rotating / stationary component)	1 Set		
8	LP Turbine rotor/rotors seals (Complete set of interstage seals of all the stages of moving blades of LP rotor containing sealing fins, caulking wire etc),	1 Set		
9	LP Gland seals (Complete set for replacement of front & rear with fixing material which includes seal segments, seal fins, caulking material, ,fitted keys, pins, springs, screws corresponding to both rotating & stationary components)	1 Set		
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C CLAUSE NO.	MANDATORY SPARES	
10	LP Casing/casings stationery seals (1 set should comprise of segments, sealing fins ,springs fitted keys, pins, caulking material for interstage sealing of stationary rows)	1 Set
11	MS and HRH strainers elements	1 Set
12	Turning Gear assembly complete (including gear internal with shafts, bearing, bushes, lock washers, oil seals, "O" rings, housing). If hydraulically operated Turning gear assembly complete (includes all nozzle segments & moving blades / rotor assembly and complete set of sealing strips with caulking material)	1 Set
13	Emergency stop valve (Set of all internals required to complete one valve assembly excluding body)	1 No.
14	Emergency stop valve servomotor complete assembly	Not Applicable
15	IP stop valve (Set of all internals required to complete one valve assembly excluding body)	1 No
16	IP stop valve servomotor complete assembly	Not Applicable
17	HP control valve (Set of all internals required to complete one valve assembly except valve body)	1 No of each type. (If Valves are similar then only one No)
18	HP control valve servomotor complete assembly	Not Applicable
19	IP control valve (Set of all internals required to complete one valve assembly except valve body)	1 No of each type (If Valves are similar then only one No)
20	IP control valve servomotor complete assembly including actuator, yoke and its control.	Not Applicable
21	LP Bypass control valve (Set of all internals required to complete one valve assembly except valve body)	1 No.
22	LP Bypass control valve servomotor ~~complete assembly~~ (Set of all internals required to complete one valve assembly except valve body)	1 No.
23	LP Bypass stop valve (Set of internals required to form one valve assembly except valve body)	1 No.
24	LP Bypass stop valve servomotor ~~complete assembly~~ (Set of all internals required to complete one valve assembly except valve body)	1 No.
25	Water Injection valve for LP bypass system complete	1 No.
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C CLAUSE NO.	MANDATORY SPARES	
	assembly including actuator, yoke and its control.	
26	HP Bypass Valve complete assembly	1 No.
27	HP Bypass Valve servomotor complete assembly including actuator, yoke and its control.	1 No.
28	Spray water injection valve for HP Bypass system ~~complete assembly including actuator, yoke and its control.~~ (Set of all internals required to complete one valve assembly except valve body)	1 No.
29	Control fluid pump assembly including motor and complete coupling	1 No.
30	Turbine Cylinders drain valves (complete replacement for an unit)	1 Set (Requirement for one Unit)
31	Tube nest/PHE assembly of Vacuum pump cooler	1 No.
32	Deaerator safety relief valves	1 Set
33	Vacuum breaker valve complete assembly along with actuator	1 No.
34	Electro-hydraulic convertor assembly of Main turbine Governing system	One no of each type
35	Extraction bellow/ Compensator assembly for all the Turbine extraction lines.	All bellows/ Compensators required for 1 unit
36	Bellow/Compensator assemblies for COP/CAP pipelines(From IP turbine outlet to LP Turbine inlet)	All bellows/compensators required for 1 Unit.
37	Bellow/Compensator assemblies for LP cylinder/cylinders exhaust connecting with LP rotor gland Box (Both front and Rear) IF APPLICABLE	All bellows/ Compensators required for 1 unit
38	HP Turbine Overload valve with servomotor assembly (if applicable)	1 No.
II.	CONDENSATE EXTRACTION PUMP	
1.	Complete Bearing assembly including bearing housing, thrust bearing, carrier, journal bearing, cooling coil & thrust collar, etc.)	1 Set (Requirement for one Pump)
2.	Set of impellers & shafts	1 Set (Requirement for one Pump)
3.	Thrust Bearing of CEP	1 Set (Requirement for one Pump)
III.	BOILER FEED PUMP	
1	Turbine Driven Boiler Feed Pump	
1.1	Complete Thrust bearing assembly with housing, carrier	1 Set (Requirement for one Pump)
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C CLAUSE NO.	MANDATORY SPARES	
	& thrust collar & Thrust Pads etc	
1.2	Journal bearing / bearing liners	1 Set (Requirement for one Pump)
1.3	Set of thrust pads of thrust bearing	1 Set (Requirement for one Pump)
1.4	Recirculation control valve complete assemblies	1 Set (Requirement for one Pump)
2	Motor Driven Boiler Feed Pump	
2.1	Complete Thrust bearing assembly with housing, carrier & thrust collar & thrust pads etc.	1 Set (Requirement for one Pump)
2.2	Journal bearing / bearing liners	1 Set (Requirement for one Pump)
2.3	Set of thrust pads of thrust bearing	1 Set (Requirement for one Pump)
2.4	Recirculation control valve complete assemblies	1 Set (Requirement for one Pump)
IV.	BOILER FEED BOOSTER PUMP	
1	Turbine Driven Boiler Feed Booster Pump	
1.1	Thrust bearing with housing, carrier & thrust collar & pads etc.	1 Set (Requirement for one Pump)
1.2	Journal bearings / bearing liners	1 Set (Requirement for one Pump)
1.3	Set of thrust pads of thrust bearing	1 Set (Requirement for one Pump)
1.4	Boiler Feed Booster pump rotating assembly (with impeller and shaft assembled & balanced) Note: If booster pump assembly for pump A and pump B orientation are not identical then for each orientation 1no complete rotating assembly to be provided.	1 No or as per note applicability
2	Motor Driven Boiler Feed Booster Pump	
2.1	Thrust bearing with Housing , carrier & thrust collar & pads etc.	1 Set(Requirement for one Pump)
2.2	Journal bearings / bearing liners	1 Set(Requirement for one Pump)
2.3	Set of thrust pads of thrust bearing	1 Set (Requirement for one Pump)
2.4	Boiler Feed Booster pump rotating assembly (with impeller and shaft assembled & balanced)	1 No.
V.	DRIVE TURBINE OF BFP	
1	Emergency Stop valve assembly without outer body	1 No
2	Emergency stop valve servomotor assembly	1 No
3	Main control valves (Set of all internals required to complete one valve assembly except valve body)	1 No of each type (If valves are similar then only one no)
4	Main Control valve Servomotor assembly	1 No of each type
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C CLAUSE NO.	MANDATORY SPARES	
	(Set of all internals required to complete one valve assembly except valve body)	(If servomotors are same then only one no)
5	Auxiliary Control valve complete assembly	1 no
6	Auxiliary control valve servomotor complete assembly (Set of all internals required to complete one valve assembly except valve body)	1 No
7	One set of Journal bearings and Thrust bearing (complete assembly) with carrier, Collar and pads	1 Set (Requirement for one drive turbine)
8	Auxiliary/Lube oil pump complete assembly including complete coupling	1 No
9	Emergency oil pump complete assembly including complete coupling	1 No
10	Electrohydraulic assembly for governing system of TDBFP's	1 no of each type.
VI	Drip Pump (If applicable)	
1.	Complete drip pump assembly with coupling sets (Without Motor)	1 no
2.	Complete Bearing assembly including bearing housing, thrust bearing, carrier, journal bearing, cooling coil & thrust collar, thrust pads etc)	1 set (Requirement for one pump)
VII	NOT USED	
VIII	MD BFP Hydraulic coupling	
1	Aux. lube oil pump assembly	1 No
2	Complete Pump Insert (gear driven) of Lub oil & working oil pump assembly	1 No
3	Bearing set for hydraulic coupling	1 Set (Requirement for one hydraulic coupling)
4	Input and output shaft with gears	1 Set (Requirement for one hydraulic coupling)
IX.	Generator & Auxiliaries	
1.	Generator bearings for TE and EE (complete with torous, intermediate pieces and all other fixing/assembly/ insulating material required to complete one TG unit except housing)	1 set
2.	Exciter bearings / slip ring stabilizer (as applicable) including oil guard (complete with torous, intermediate pieces and all other fixing/assembly/ insulating material required to complete one TG unit except housing)	1 Set
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C CLAUSE NO.	MANDATORY SPARES		
3.	Jacking oil hoses or connecting metallic pipes for all Generator & Exciter bearings (if applicable)	1 Sets	
4.	NRV's on Jacking oil line to all Generator & Exciter bearings (if applicable)	1 Set	
5.	Oil guard rings/Oil deflectors for all generator and exciter bearings.	1 Set	
6.	Hydrogen Seal Assly (Seal body, oil catcher/guard, seal rings of Exciter End and Turbine End) including inner & Outer oil catchers/gaurd	1 Set	
7.	Hydrogen cooler assembly	1 Set	
8.	Brush- holder assembly with housing for exciter for rotor winding E/F sensing (if applicable)	1 Set	
9.	Brush Gear assembly complete with brushes for slip ring (if applicable)	1 Set	
10	Brushless Excitation system (if applicable)		
a	Relays	1 Nos. of each type	
b	Electronic modules of automatic voltage regulator	1 Nos. of each type	
c	Rotating Diode assembly with heat sinks, RC network and fuses	25% of one unit	
d	DC field breaker	1 No	
e	Over voltage suppressor (Thyristor based)	1 Sets	
f	Control transformers of each type/rating	1 Set	
11	Static excitation system (if applicable)		
a	Static rectifier element with heat sink and fuse assembly	1x100% of one bridge	
b	Relays	1 Nos. of each type	
c	Electronic modules of automatic voltage regulator	1 Nos. of each type	
d	Excitation Transformer	1 No	
e	Complete DC field breaker (or AC field breaker)	1 No	
f	Field flashing breaker	1 No	
g	Over voltage suppressor (Thyristor based)	1 Set	
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C CLAUSE NO.	MANDATORY SPARES		
12	Seal Oil System		
i)	Differential pressure regulator	1 No.	
ii)	Pressure equalizing valve (if applicable)	1 No.	
13	Motors		
i)	AC AOP motor for main turbine	1 No	
ii)	AC JOP motor for main turbine	1 No	
iii)	All DC Motor with DC contactor and resistance box	1 no of each type & rating (along with its control cubical and resistance box)	
C.	Group C: Mandatory Spares		
1	MAIN TURBINE		
i.)	HP outer & inner casing fasteners & fixing material	1set (100 % of each type & size)	
ii.)	HP/IP shaft coupling bolts, nuts, lock washers, pins, screws	1 Set	
iii.)	IP outer & inner casing fasteners & fixing material	1set (100 % of each type & size)	
iv.)	IP/LP shaft coupling bolts, nuts, lock washers, pins, screws	1 Set	
v.)	LP/LP shaft coupling bolts, nuts, lock washers, pins, screws (applicable if 2 LP's are there in one unit)	1 set	
vi.)	LP outer & inner casing fasteners & fixing materials	1set(100 % of each type & size)	
vii.)	a) LP turbine atmospheric diaphragm (Complete set for replacement of one diaphragm assembly) with studs	1 No	
	b) LP diaphragm sheets	6 Nos.	
viii.)	LP/Generator shaft coupling bolts, nuts, lock washers, pins, screws	1 Set	
ix.)	Complete set of fitted keys and packers (Radial & Axial) of Turbine Sets which includes pedestal to base plate, pedestal to casing, casing to casing, casing to supports axial keys / radial keys / palm packers / lubrite plates	1 Sets	
x.)	Jacking oil hoses or connecting metallic pipes for all TG bearings (if applicable)	1 Sets	
xi.)	NRV's on Jacking oil line to all TG bearings (if applicable)	1 Set	
xii.)	Duplex lube oil filter / Control Fluid regeneration system filter (Complete set consisting of cartridges / filter elements	2 Sets	
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C CLAUSE NO.	MANDATORY SPARES		
	/ dry filter / fine mesh. Filter / fuller earth filter, gaskets, 'O' rings except housing) for lube oil and for all control Fluid systems (if applicable)		
xiii.)	Turbine gland steam supply valve complete ~~assembly~~ (Set of all internals required to complete one valve assembly except valve body)	1 No	
xiv.)	Turbine gland steam leak-off valve complete ~~assembly~~ (Set of all internals required to complete one valve assembly except valve body)	1 No	
xv.)	NRV's on CRH line (Complete set of internals for one valve consisting of disc, shaft, gasket, gland packings, lever arm, stopper, hinge)	1 Set	
xvi.)	NRV's on extraction lines (Complete set of internals required to form the valve assembly & soft parts like gaskets, gland packings excluding outer body)	1 Set of each type & size	
xvii.)	LP exhaust hood spray control valve plus spray nozzles	1 No. valve with 1 Set of spray nozzles	
xviii.)	Vapour extractor fan for lube oil with motor	1 No	
xix.)	Sealing strips for oil guard rings of Turbine pedestals	2 Sets (to meet requirement of each bearing pedestal for two Units)	
xx.)	Basket strainer/ Filter for Lube oil / Control Fluid system in tank – if applicable	1 set	
xxi.)	Duplex filter for Jacking oil system consisting of filter elements / cartridges, O-rings, gaskets except housing	2 Sets	
xxii.)	Jacking oil pump pressure relief valve & startup valve (if applicable)	2 Nos.	
xxiii.)	Jacking oil header pressure regulating valve (if applicable)	2 Nos.	
xxiv.)	High-density balancing weights for HP/IP/LP/Generator/Exciter turbines for all balancing planes for field trim balancing.	20 Nos. for each type & size	
xxv.)	Valve seat for HPSV,HPCV,IPSV, IPCV, HPBYPASS VALVE, HPBYPASS SPRAY VALVES, HP BYPASS SPRAY ISOLATION VALVE	1 No. of each kind of valve	
xxvi.)	HPSV, IPSV, spindle with cone	1 No. of each	
xxvii.)	Seal kit for Electrohydraulic actuators for HP and LP bypass system	2 Sets of each	
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C CLAUSE NO.		MANDATORY SPARES		
	xxviii.)	Interface Seal kit for HP/LP bypass servo/proportional valve and blocking unit	2 Sets	
	xxix.)	IP/LP shaft coupling guards, LP/LP shaft coupling guards, LP/Generator shaft coupling guards (if applicable), as well as guard for any exposed surface of TG shaft.	1 Set	
2	Governing System Spares (High pressure governing system) for Main turbine, LP bypass, HP Bypass			
	i.	Coupling assembly between valve & servomotor for HPSV, HPCV, IPSV, IPCV, HPBYPASS VALVE, HPBYPASS SPRAY STOP & CONTROL VALVE, LPBYPASS SV, LPBYPASS CV	1 No for each kind of valve	
	ii.	Soft packing like gaskets/pressure seal/sealing ring, gland packing rings for HPSV, HPCV, HPBYPASS VALVE, HP BYPASS SPRAY STOP & CONTROL VALVE, IPSV, IPCV, LP BYPASS SV, LPBYPASS CV	2 Sets for each kind of valve	
	iii.	Servomotor spindle with piston for servomotors of HPSV, HPCV, IPSV, IPCV, HPBYPASS VALVE, LPBYPASS SV, LPBYPASS CV	1 Set of each kind of valve	
3	VACUUM PUMP FOR MAIN TURBINE CONDENSER			
	i.	Complete rotating assembly with Impeller, rotor and Coupling	1 No	
	ii.	Radial bearing and Thrust bearing	1 Sets (Requirement for one pump)	
	iii.	Complete set of soft parts like gaskets, O-rings etc. for cooler	2 Sets (Requirement for two pump)	
	iv.	Mechanical sealing assembly (DE&NDE)/ Gland Packing assembly (As applicable)	2 Sets (Requirement for two pump)	
	v.	Vacuum pump recirculation seal water pump assembly with Motor	1 No	
4	CONDENSATE EXTRACTION PUMP			
	i.	Bowl assembly wear rings, neck rings, casing wear ring for all stages	1 Set (Requirement for one pump)	
	ii.	Coupling between motor and pump with bolts, bush, locking pin etc.	1 Set (Requirement for one pump)	
	iii.	Suction strainer element (without body)	2 Set (Requirement for TWO pump)	
	iv.	Set of line rubber / carbon bearings. For column pipe / riser pipe / bowl assembly	2 Sets (Requirement for two pumps)	
	iv.	Set of shaft couplings	1 Set (Requirement for one pump)	
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C CLAUSE NO.	MANDATORY SPARES	
v.	Set of sleeves, guide bushes	1 Set (Requirement for one pump)
vi.	Set of O- rings, gaskets for bowl assembly, riser pipes, sleeves, bearings required for making complete assembly of pump	2 Sets (Requirement for two pump)
vii.	Mech. Seal complete assembly	2 Sets (Requirement for two pump)
viii.	Set of rotary & stationary faces for mech. Seal	3 Nos. each
ix.	Set of soft parts i.e. O-rings, gaskets for mech. Seal	4 Sets (Requirement for four pumps)
x.	CEP recirculation valve trim which includes spindle with cone, seat ring, guide bush, cage	1 Set (Requirement for one pump)
xi.	CEP recirculation valve soft parts i.e. gland packing, seals, O-rings, gaskets etc.	3 Sets (Requirement for three pump)
5	Shell side safety relief valve for the following:	
i.	All HP heater	1 Set
ii.	All LP heater	1 Set
6	Tube side sentinel/ Relief valve for the following:	
i.	All HP heater	1 Set
ii.	All LP heater	1Set
7	Tube plugs for all HP heater	30 Nos. of each type
8	Tube plugs for all LP heater	20 Nos. of each type
9	Tube plugs for Gland steam condenser	10 Nos.
10	Trays & spray nozzle for Deaerator (set of spray nozzles and trays including fixing material)	50% each required for one unit
10.1	Tube plugs for main condenser	100 nos. of each type
11	BOILER FEED PUMP (BFP) / BFP RECIRCULATION VALVE	
11a	TURBINE DRIVEN BOILER FEED PUMP (BFP)	
i.	Complete set of wear ring / neck rings (Rotating and stationary)	1 Set (Requirement for one pump)
ii.	Balancing drum and balancing drum bush & nut	2 Nos. each
iii.	Mech. Seal (both DE/NDE) complete assembly (If offered)	4 Sets (Requirement for four pump)
iv.	Complete set of soft parts i.e., O-rings, gaskets for BFP	4 Sets (Requirement for four
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C CLAUSE NO.		MANDATORY SPARES		
		required for assembly of cartridge & assembly of cartridge in barrel (except for mechanical seal)	pump)	
v.		Set of oil catcher, oil thrower (DE & NDE)	2 Sets of each type (Requirement for two pump)	
vi.		Set of filter elements / cartridges, O-rings, gaskets for Duplex Lube oil filter for both MDBFP & TDBFP	2 Sets each (Requirement for two pump)	
vii.		Complete coupling assembly. Between BFP to Turbine, Turbine to Gear box, Gear box to Booster pump	1 No. each type	
viii.		Rotary & Stationary faces of mechanical seal (DE & NDE) (If offered)	4 Nos. each (Requirement for Four pump)	
ix.		Complete set of soft parts for mechanical seal including O-rings, gaskets, springs (DE & NDE) (If offered)	8 Sets (Requirement for Eight pumps)	
x.		Throttle type shaft sealing (Both DE & NDE, complete requirement for one pump) (If offered,): Control Valves, Pump (If applicable), Floating rings (if applicable), All Soft Parts	1 set (complete requirement for one pump)	
11b		BFP Recirculation Valve spares		
i.		Valve stem with plug assembly.	2 No.	
ii.		Seat ring / valve seat	2 No.	
iii.		Stack / Cage assembly.	2 No.	
iv.		Set of soft parts which includes all gaskets, O-rings, tech ring, gland packing	4 Sets (Requirement for four valves)	
12		MOTOR DRIVEN BOILER FEED PUMP (BFP) / BFP RECIRCULATION VALVE		
i.		Complete set of wear ring / neck rings (Rotating and stationary)	1 Set (Requirement for one pump)	
ii.		Balancing drum and balancing drum bush & nut	1 Nos. each	
iii.		Mech. Seal (both DE/NDE) complete assembly (If offered)	1 Sets (Requirement for one pump)	
iv.		Complete set of soft parts i.e., O-rings, gaskets for BFP required for assembly of cartridge & assembly of cartridge in barrel (except for mechanical seal)	2 Sets (Requirement for two pump)	
v.		Set of oil catcher, oil thrower (DE & NDE)	2 Sets of each type (Requirement for two pump)	
vi.		Set of filter elements / cartridges, O-rings, gaskets for Duplex Lube oil filter for both MDBFP & TDBFP	2 Sets (Requirement for two pump)	
vii.		Complete coupling assembly Booster pump to BFP motor,	1 No. each	
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C CLAUSE NO.	MANDATORY SPARES		
	BFP motor to Hydraulic coupling, Hydraulic coupling to BFP		
viii.	Rotary & Stationary faces of mechanical seal (DE & NDE)	4 Nos. each (Requirement for Four pumps)	
ix.	Complete set of soft parts for mechanical seal including O-rings, all gaskets (DE & NDE)	4 Sets (Requirement for four pumps)	
x.	Throttle type shaft sealing (Both DE & NDE, complete requirement for one pump) (If offered,): Control Valves, Pump (If applicable), Floating rings (if applicable), All Soft Parts	1set (Complete requirement for ONE pump)	
13	BFP Recirculation Valve spares		
i.	Valve stem with plug assembly.	2 Nos.	
ii.	Seat ring / valve seat	2 Nos.	
iii.	Stack / Cage assembly.	2 Nos.	
iv.	Set of soft parts which includes gaskets, O-rings, tech ring, gland packing	2 Sets (Requirement for two valves)	
14	BOOSTER PUMP FOR BOILER FEED PUMP		
14.1	TURBINE DRIVEN BOOSTER PUMP FOR BOILER FEED PUMP		
14.1.1	Wear rings, Neck rings (rotating and stationary)	1 Set (Requirement for one pump)	
14.1.2	Mechanical seal (Both DE /NDE)	2 Sets for each DE & NDE (Requirement for two pump)	
14.1.3	Rotary & stationary faces of mechanical seal (DE & NDE)	2 Sets for each (Requirement for two pump)	
14.1.4	Complete set of soft parts which includes O-rings, gaskets for mechanical seal	2 Sets (Requirement for two pump)	
14.2	MOTOR DRIVEN BOOSTER PUMP FOR BOILER FEED PUMP		
14.2.1	Wear rings, Neck rings (rotating and stationary)	2 Set (Requirement for two pump)	
14.2.2	Mechanical seal (Both DE /NDE)	2 Sets for each DE & NDE (Requirement for two pump)	
14.2.3	Rotary & stationary faces of mechanical seal (DE & NDE)	2 Sets (Requirement for two pump)	
14.2.4	Complete set of soft parts which includes O-rings, gaskets for mechanical seal	2 Sets (Requirement for two pump)	
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C CLAUSE NO.	MANDATORY SPARES	
15	DRIVE TURBINE FOR BFP and Gear Box between Turbine & Booster Pump	
15.1	One set of emergency over speed governor assembly	1 Set (Requirement for one turbine)
15.2	Jacking oil pump complete assembly. (if applicable)	1 No
15.3	Jacking oil pump relief valve & Jacking oil header regulating valve (if applicable)	1 No. each
15.4	Vapour Extractor Fan with motor for lube oil	1 No
15.5	Set of drive & driven gears for Gear Box	1 Set (required for one gear box)
15.6	Set of journal & Thrust bearings. For Gear box	1 Set (required for one gear box)
15.7	Set of filter elements / cartridges, O-rings, gaskets for Governing system of TDBFP	2 Sets (Requirement for two turbines)
16.1	Valve trim for stop valve of drive turbine (including cage, plug, stem, seat rings, guide bushings etc.)	1 set (Requirement for one turbine)
16.2	Valve trim for control valve of drive turbine (including cage, plug, stem, seat rings, guide bushings etc.)	1 set (Requirement for one turbine)
17	EOT CRANES-Main TG Hall / BFP (if applicable)	
17.1	Mechanical: Main TG Hall	
(a)	Bearings for long travel wheels	1 Set (Requirement for one Crane)
(b)	Bearings for cross travel wheels	1 Set (Requirement for one Crane)
(c)	Bearings for Gear Boxes for each type of Hoist & travel (Main and aux hoist (if applicable), LT and CT travel))	1 Set (Requirement for one Crane)
(d)	Brake Liner for all the brakes (main and aux hoist, LT and CT travel))	2 Sets (Requirement for two Crane)
(e)	Hydraulic thruster for all Brakes (Main and aux hoist, CT and LT travel)	1 Set (Requirement for one Crane)
(f)	Oil Seals (both main and aux hoist, CT and LT)	2 Sets (Requirement for two Crane)
(g)	Brake springs for all brakes (both main and aux hoist, LT and CT travel)	1 Set (Requirement for one Crane)
(h)	Wire Rope for Aux. Hook	1 No
(i)	Wire Rope for Main Hook	1 No
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C CLAUSE NO.		MANDATORY SPARES		
17.2	Electrical:			
i)	Solenoid Coils for Brakes		2 sets	
ii)	MCBs/MCCBS/Fuse links for the whole crane		1 set	
iii)	Contactors and overload Relays for Motors of the EOT		1 set of each type, size & rating	
iv)	Timers of each type, size & rating		1 set	
v)	Limit Switches for			
a	Main Hoist		1 set	
b	Aux. Hoist		1 set	
c	Cross Travel		1 set	
d	Long Travel		1 set	
vi)	Master Controller for Aux. Hoist		1 set each	
vii)	Drive for MH, AH, CT&LT		1 no. of each type& rating	
17.3	BFP EOT CRANES (If Applicable)			
(a)	Bearings for long travel wheels		1Set (Requirement for one Crane)	
(b)	Bearings for cross travel wheels		1Set (Requirement for one Crane)	
(c)	Bearings for Gear Boxes for each type of Hoist & travel (Main and aux Hoist (if applicable), LT and CT travel))		1 Set (Requirement for one Crane)	
(d)	Brake Liner for all the brakes (main and aux hoist (if applicable) ,LT and Ct travel))		2Sets (Requirement for two Crane)	
(e)	Hydraulic thruster for all Brakes (Main and aux hoist (if applicable), CT and LT travel)		1 Set (Requirement for one Crane)	
(f)	Oil Seals (both main and aux hoist (if applicable), CT and LT)		2Sets (Requirement for two Crane)	
(g)	Brake springs for all brakes (both main and aux hoist (if applicable), LT and CT travel)		1 Set (Requirement for one Crane)	
(h)	Wire Rope for Aux. Hook (if applicable)		1 No	
17 (A).	Blade Vibration monitoring system (if applicable):			
S. No.	Description of items	Unit of items	Quantity	
i.	Sensors	No.	20 % of full set or minimum 2, whichever is more	
ii.	Brackets, Fixtures	No.	20 % of full set or minimum 2, whichever is more	
iii.	Internal cabling	Length, M	20 % of full set or minimum 1 run of each type, corresponding to maximum length used in the system.	
iv.	External cabling	Length, M	20 % of full set or minimum 1 run of each type, corresponding to maximum length used in the system.	
v.	Special conduits/ vacuum pass through or equivalent	Length, M	20 % of full set or minimum 1 run of each type, corresponding to maximum length used in the system.	
vi.	Input card	No.	10 % of full set or 1 number, whichever is more	
vii.	Output card	No.	10 % of full set or 1 number, whichever is more	
•		Full set means, Quantity corresponding to Integrated system for L-0 stage and L-1 stage (Turbine and Generator end)		
18	NOT USED			
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C CLAUSE NO.	MANDATORY SPARES	
19	Generator & Auxiliaries	
a)	Gaskets of all types (one set should include all types and sizes of gaskets for one generator, hydrogen seals for TG and EE hydrogen coolers)	1 Set
c)	Hydrogen seals rings TE, EE	1 Set each
d)	Teflon Hoses with connectors (for stator water cooling system)	25 % of the total population (minimum 3 Nos of each type).
e)	Brush- holder assembly for shaft earthing	1 set
f)	Generator phase and neutral bushings complete for one machine	1 set
g)	Stator winding bars and connectors (complete set of winding bars and connectors)	1 set
k	Stator wedges of (one set comprises 25% of each variant of one unit)	1 set
l	Packing liners for stator bars (one set comprises 25% of each variant of one unit)	1 set
19.1	Static excitation system (if applicable)	
a)	Shunt trip and closing coil for field circuit breaker	2 Sets
b)	Initial excitation diode	2 Sets
c)	Thyristor cooling fan	1 Set complete for one unit
d)	Control transformers, current transformers, auxiliary transformers of each type/rating	1 set
e)	Compatible HMI / Laptops for excitation system	1 no. of each type
f)	Software & Programmes / programmed EPROMs with necessary hardware/software keys for multiple use.	1 set of each type for one unit
g)	Network switches / ethernet switches with connectors, cables and all accessories complete for one unit.	1 no. of each type
19.2	Gas System	
a)	Diaphragm valve	1 No. of each type
b)	Gas valves of all type & sizes	1 No. of each type & size
d)	Safety valve	1 No.
e)	H2 gas regulator from cylinder to manifold	10 nos.
f)	CO2 gas regulator from cylinder to manifold	3 Nos.
g)	Temperature and Pressure switches	1 No. of each type
h)	Thermostat for gas drier	1 No.
i)	Thermometers	1 No. of each type & range
j)	Filter for gas analyser	2 Sets
k)	Compressor for gas drier	01 set complete for one unit
l)	Pressure reducer Each Type & Rating	1 No each
19.3	Seal Oil System	
a)	Float valve	1 No. of each type
b)	Non-return valve	1 No. of each type
c)	Vacuum pressure gauge	1 No. (if applicable)
d)	Differential pressure gauge	3 Nos.
e)	Filter elements	1 set
f)	Float for level regulator	1 No. (if applicable)
g)	Flow indicator	1 Set
h)	Level Signaling device	1 Set
i)	Insulators for stator water header	1 Set
J)	Filter element of stator water cooling system	1 set
k)	Valves for Stator water cooling system (one set comprises of one no of each variant)	1 set
l)	All types Filter element of stator water cooling system	1 Set
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001 SUB-SECTION-VI CHAPTER-2 STEAM TURBINE GENERATOR PAGE 18 OF 29

C CLAUSE NO.	MANDATORY SPARES		
19.4	Motors		
a)	DM Water Regeneration Pumps motor and motor bearing (if applicable)	1 No.	
b)	Alkali Transfer cum Recirculation Pump motor and motor bearing (if applicable)	1 No.	
c)	Waste recirculation cum Disposal Pumps motor and motor bearing (if applicable)	1 No.	
d)	Acid Unloading Pumps (if included in scope) and motor bearing	1 No.	
e)	AC AOP motor for TDBFP	1 No.	
f)	AC JOP motor for TDBFP (if applicable)	1 No.	
g)	Control fluid oil vapour exhaustor motor (if applicable)	1 no.	
h)	MOT centrifuge motor (if coalescer type of purification unit is offered , then this will not be applicable)	1 no.	
i)	MOT oil vapour exhaustor motor	1 no.	
j)	TDBFP centrifuge motor (if coalescer type of purification unit is offered , then this will not be applicable)	1 no.	
k)	TDBFP oil vapour exhaustor motor	1 no.	
l)	TDBFP transfer oil pump motor (if applicable)	1 no.	
m)	MDBFP lub oil pump motor	1 No.	
20	Passenger Elevator		
20.1	Over current relay	2 Nos. of each type	
20.2	Auxiliary relays	3 Nos. of each type	
20.3	Friction block	2 Nos.	
20.4	Guide roller of each type	20% of total population or 3 Nos. of each type whichever is high	
20.5	Contactors of each type	2 Nos.	
20.6	Control transformer	1 No. of each type	
20.7	Time device	2 Nos. of each type	
20.8	Rectifiers	2 Nos. of each type	
20.9	Resistor	3 Nos. of each type	
20.10	Fuses of each rating	20% of the total population	
20.11	Limit switches of each type	3 Nos.	
20.12	Push button	3 Nos. of each type	
20.13	Contact device (if applicable)	3 Nos. of each type	
20.14	Brake motor	2 Nos. of each type	
20.15	Transmitters	2 Nos. of each type	
20.16	Switches of each type	3 Nos.	
20.17	Receiver	2 Nos. of each type	
20.18	Bearings of each type & size	2 Nos.	
20.19	Roller of each type	3 Nos.	
20.20	Worm gear spares		
	a) 'O' rings	3 Sets	
	b) Sealing ring of each type	3 Sets	
20.21	Spares for brake		
	a) Fan	2 Nos. of each type	
	b) Magnetic coil	3 Nos. of each type	
	c) Brake disc	2 Sets	
	d) Brake pad	2 Sets	
20.22	Bushing (for door front)	2 Sets	
20.23	Pinion	2 Nos. of each type	
20.24	Lift Main drive motor	01 no of each type & rating.	
20.25	Door opening motor	01 no of each type & rating.	
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C CLAUSE NO.	MANDATORY SPARES		
	20.26	Landing door complete	01 no.
	20.27	Car door complete	01 no
	20.28	VFD drive	01 no of each type & rating.
	21	Not Used	
	22	Not Used	
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C CLAUSE NO.		MANDATORY SPARES			
1.00.00		C&I MANDATORY SPARES			
		MEASURING INSTRUMENTS			
		Sl. No.	ITEM	QUANTITY	
		1 Not USED			
		2. NOT USED			
		3	Measuring Instruments		
		a)	Transmitters	Not Applicable	
		b)	Temperature elements		
		(i)	RTD's	10% of each type and length	
		(ii)	Thermocouples	10% of each type and length	
2.00.00		NOT APPLICABLE			
3.00.00		STEAM AND WATER ANALYSIS SYSTEM (SWAS)			
Sl. No.	Item	Quantity			
(i)	PCB assemblies including power supply cards.	2 nos. of each type and model			
(ii)	Rubber tubes & capillary tubes of all types & sizes	2 nos. of each type & sizes			
(iii)	Pressure reducing assembly	2 nos. of each type			
(iv)	Valves	2 nos. of each type, class and size			
(v)	Filter/filter elements of all types	2 Nos. of each type			
(vi)	Power supply assemblies	2 nos. for each type of analysers			
(vii)	Electrodes & cells	2 Nos. of each type			
(viii)	Back pressure regulator	2 nos. of each type			
(ix)	Replacement cartridges for ion exchange columns.	2 nos. of each type			
(x)	Rotameter glass tube indicators	2 nos. of each type			
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C CLAUSE NO.		MANDATORY SPARES		
4.00.00	(xi)	Primary & secondary Cooler Assemblies	2 nos. of each type	
	(xii)	Flexible Tygon tubing for grab sampling	1 set	
	(xiii)	Solenoid valve with coils	2 nos. of each type and rating	
	(xiv)	Motors	1 no. of each type and size	
	(xv)	Switches	1 no. of each type (temperature/flow/pressure for chiller system and SWAS panel)	
	OTHER TG AND TD BFP RELATED SUB-SYSTEMS			
	A. EHC System related instrumentation			
	1.	a. Electro-Hydraulic Converter/Servo unit/ proportional valve for main turbine b. Blocking unit for main turbine (as applicable) c. Position feedback transmitter of EHC & Position feedback transmitter of Stop Valves & Control Valves for main turbine (as applicable)	1 Set	
	2.	a. Electro-Hydraulic Converter/Servo unit/ proportional valve for LPBP b. Blocking unit for LPBP (as applicable) c. Position feedback transmitter for LPBP d. Positioner for LPBP	1 Set	
	3.	a. Electro-Hydraulic Converter/Servo unit/ proportional valve for HPBP b. Blocking unit for HPBP (as applicable) c. Position feedback transmitter for HPBP d. Poitioner for HPBP	1 Set	
	4	High pressure hoses for HPBP, High Pressure LPBP etc	2 complete sets	
	5.	a. Electro-Hydraulic Converter/Servo unit/ proportional valve for BFP Drive Turbine b. Blocking unit for BFP Drive Turbine (as applicable) c. Position feedback transmitter of EHC & Position feedback transmitter of Stop Valves & Control Valves for BFP Drive Turbine (as applicable)	1 Set	
	NOTE: All the governing spares are meant for EHC type governing system, in case of HP governing being offered, its equivalent spares should be offered			
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C CLAUSE NO.		MANDATORY SPARES			
5.00.00	B	Turbine Supervisory System for both TG & BFP Turbine			
	1	Power Supply assemblies of all types	4 Nos. of each type		
	2	Electronic Cards/PCB's/interface units etc. of all types used in TSS	4 Nos. of each type		
	3	Sensors of all types, range, model etc. for vibration, eccentricity, proximity, differential expansion, axial shift etc. * If prefab cable or prefab extension cable is used same should be supplied in proportion.	4 Nos. of each type		
	C	Speed Monitoring related system for TG, TD-BFP & MDBFP			
	1	Power Supply assemblies of all types	Not Applicable		
	2	Electronic Cards/PCB's/interface units etc. of all types	Not Applicable		
	3	Speed sensor * If prefab cable or prefab extension cable is used same should be supplied in proportion.	2 Nos. of each type and rating		
	D	Load Transducers, frequency transducers & any other transducers (as applicable)	2 Nos.		
	E	Auto Synchroniser	1 No.		
	F	(i) Solenoid valves in the Electrohydraulic governing & protection circuit of main turbines, BFP turbines, HPBP & LPBP (ii) Solenoid valves to be used in extraction NRVs (as applicable)	10 % or 1 no. of each type and model whichever is more.		
	Not Applicable				
	6.00.00	Electrical Actuators			
		1	Actuators	Not Applicable	
		2	Power unit for modulating actuator	2 nos. of each type	
3		DC-DC unit / Power Units	2 nos. of each type		
4		Electronic cards	2 nos. of each type		
5		Position feedback transmitters	2 nos. of each type		
6		Control Unit	2 nos. of each type		
7		Torque And limit switch assembly of each unit	2 nos. of each type		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-VI CHAPTER-2 STEAM TURBINE GENERATOR	PAGE 23 OF 29	

C	CLAUSE NO.	MANDATORY SPARES											
	<table border="1"><tr><td>8</td><td>Electronic PCB of all types</td><td>10% of each type & model</td></tr><tr><td>9</td><td>Absolute Encoder (replaceable part)</td><td>5% of each type & model</td></tr><tr><td>10</td><td>Electronic Torque sensor</td><td>5% of each type & model</td></tr></table>				8	Electronic PCB of all types	10% of each type & model	9	Absolute Encoder (replaceable part)	5% of each type & model	10	Electronic Torque sensor	5% of each type & model
	8	Electronic PCB of all types	10% of each type & model										
	9	Absolute Encoder (replaceable part)	5% of each type & model										
	10	Electronic Torque sensor	5% of each type & model										
Note: In case the main population of any item is only one no., then the spare quantity shall also be one no., overriding requirements indicated in clause 1.00.00 to 6.00.00 above.													
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-VI CHAPTER-2 STEAM TURBINE GENERATOR	PAGE 24 OF 29									

^C CLAUSE NO.	MANDATORY SPARES			
1.00.00	CONDENSATE POLISHING UNIT (CPU)			
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C CLAUSE NO.	MANDATORY SPARES			
	CONTROL & INSTRUMENTATION –CPU			
SI. No.	ITEM	QUANTITY		
1.00.00	MEASURING INSTRUMENTS			
1)	Electronic Transmitters			
(i)	Transmitters of all types and model. (for the measurement of Pressure, differential pressure, flow, level, etc.) including local indication (if applicable)	10 % or 1 no. of each type and model whichever is more		
2)	Temperature elements			
(i)	Temperature Transmitter	10 % or 1 no. of each type and model whichever is more		
(ii)	RTD's*	1 no. of each type		
(iii)	Thermo well**	1 no. of each type		
	* (With head assembly, terminal block and nipple) ** (to be divided into various insertion lengths in proportion to main population)			
3)	Local Indicators (Non-Electrical type) - As applicable for the package as per the following items			
(i)	Temperature gauges	1 no. of each range and type		
(ii)	Pressure gauges	1 no. of each range and type		
(iii)	Differential Pressure Gauges,	1 no. of each range and type		
(iv)	Level gauges	1 no. of each range and type		
(v)	Flow gauges excluding Rota meters	1 no. of each range and type		
(vi)	All types of Rota meters	1 no. of each range and type		
4)	Process Actuated Switch Devices -As applicable for this package, as per the following items			
(i)	Temperature switches	1 no. of each range and type		
(ii)	Pressure switches	1 no. of each range and type		
(iii)	Differential Pressure switches	1 no. of each range and type		
(iv)	level switches	1 no. of each range and type		
(v)	Flow switches	1 no. of each range and type		
5)	Solenoid Valves	10 % or 1 no. of each type and model whichever is more		
6)	Limit Switches (for Pneumatic Valves and Manual valves)	2 no. of each type		
7)	ANALYSERS			
1)	Complete PH Analyzer (including Flow through type cell and electrode, Electronic transmitter unit, Pre-fabricated cable with connector as minimum)	1 Set of each type		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-VI CHAPTER-2 STEAM TURBINE GENERATOR PAGE 26 OF 29

C CLAUSE NO.		MANDATORY SPARES		
Sl. No.	ITEM	QUANTITY		
2)	Complete Conductivity Analyzer (including Flow through type cell and Electrode, electronic Transmitter unit, Pre-fabricated cable with connector as minimum)	1 Set of each type		
3)	Complete Silica Analyzer (including sensing unit, Electronic Transmitter unit, Pre-fabricated cable with connector Rubber Tubes & Capillary Tubes, solenoid valves, as minimum) along with sample sequencing unit	1 Set of each type		
4	Complete Turbidity Analyzer (including sensing unit, Electronic Transmitter unit, Pre-fabricated cable with connector as minimum)	1 Set of each type		
5	Dissolved O₂ Analysers (including sensing unit, Electronic Transmitter unit, Pre-fabricated cable with connector as minimum) (if applicable)	1 Set of each type		
6	Turbidity analysers (including sensing unit, Electronic Transmitter unit, Pre-fabricated cable with connector as minimum) (if applicable)	1 Set of each type		
Note	Reagents for analysers of SWAS and DM/CPU systems should be supplied at the time of commissioning of the analysers			
2.00.00	NOT USED			
3.00.00	CONTROL VALVES, ACTUATORS AND ACCESSORIES			
1	Pneumatic and electro-hydraulic actuator assembly	1 no. of each type, model and rating.		
2	Diaphragms, O' rings, seals etc. of all types make etc.	5 Nos.		
3	Solenoid valves (if applicable)	2 nos.		
4	Positioner units /smart positioners (complete unit)& accessories (link assembly)	1 no.		
5	Pneumatic air-filter/Regulator of each type, make rating etc.	2 Nos.		
6	Air lock relays	2 nos. of each type		
3.00.01	PNEUMATICALLY OPERATED ISOLATION / BLOCK VALVES, ACTUATORS & ACCESSORIES (For all ON/OFF valves supplied under this package even if one or more of these items are also specified elsewhere under mandatory spares)			
1.	Pneumatic actuator assembly.	1 no. of each type, model and rating.		
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C	CLAUSE NO.	MANDATORY SPARES		
		Sl. No.	ITEM	QUANTITY
		2.	Diaphragms, O' rings, seals etc. of all types make etc.	5 Nos.
		3.	Limit switches (complete unit)& accessories (link assembly)	2 nos.
		4.	Pneumatic air-filter/Regulator of each type, make rating etc.	2 nos.
		MANDATORY SPARES FOR VFD for CEP		
		S.no.	Item Description	Quantity
		1	HV Bushing with metal parts and gaskets for VFD Transformer	1 No. of each rating
		2	LV Bushing with metal parts and gaskets for VFD Transformer (if applicable)	1 No. of each rating
		3	WTI with contacts for VFD transformer Electronic cards	1 No. of each rating
		4	(a) Control modules (b) I/O module (c) Power supply modules (d)Gate module including gate transformer	1 nos. of each type & rating
		5	Power device (Thyristor, IGBT etc.)	1 Set of devices in one bridge leg
		6	Over voltage limiter and surge suppressor network Semi conductor fuses for Power device (Thyristor, IGBT etc.)	1 Set 1 Set
		7	Power & Control fuse	25% of installed quantity
		8	Control Transformer	1 nos. of each type & rating
		9	Contactor/Breaker	1 no.
		10	CT/VT	1 nos. of each type & rating
		11	Indicating lamps	100% of each type & rating
		12	Auxiliary contactors & relays	1 no. of each type & rating
		13	Panel mounted meters	1 no.
		14	Indicating lamp holder full set	15% of each type and colour
		GENERAL NOTE: 1. Unless stated otherwise a 'Set', it will include the total requirement of the item for a unit module or the station as specified. Also, set for the particular equipment e.g. 'set' of bearings for a pump would include the total number of bearings in a pump. Also the 'set' would include all components required to replace the item; for example a set of bearing shall include all hardware normally required while replacing the bearings. It is further, intended that the assembly/sub-assembly which have different orientation (like left hand or right hand, top or bottom), different direction of rotation or mirror image positioning or any other reasons which result in maintaining two different sets of the spares to be used for the subject assembly/sub-assembly, these shall be considered as different types of assembly/sub-assembly.		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB-SECTION-VI CHAPTER-2 STEAM TURBINE GENERATOR PAGE 28 OF 29

C CLAUSE NO.	MANDATORY SPARES	
	2. Wherever the quantities have been indicated for each type, size, thickness, material, radius, range etc. these shall cover all the items supplied and installed and the break up for these shall be furnished in the bid. 3. Bidder shall not indicate "Not Applicable" against any of the spare (except for those items for which "if applicable" is specified). In case of not applicability, functionally equivalent spare to be mentioned with price in the relevant price schedules. 4. Wherever quantity has been specified as percentage (%), it shall mean percentage (%) of the total population of the item in the station (project), unless specified otherwise and the fraction will be rounded off to the next higher whole number. 5. Interchangeability and Packings: All spares supplied under this contract shall be strictly interchangeable with parts for which they are intended for replacements. These spares should include all mounted accessories like components, boards, add or items, fitting, connectors etc. and be complete in all respects so that the replacement of the main items by these spares does not require any additional item. The vendors must conform the pair to pair compatibility of each electrical spares modules with the modules should be supplied in the original package. All electronic modules should be pre-set and/or preprogrammed for ready use at site. Alternatively, suitable instruction sheet indicating the details of required PCB jumper position, BCD which is setting, EPROM/PROM listing etc. should be packed along with each module. Also, a caution mark sign should be put on all such module which needs pre-setting/pre-programming before putting them in to service. The spare shall be treated and properly packed for long term storage. 6. Identification: Each spare shall be clearly marked and labeled on the outside of the packing with its description. When more than one spare part is packed in single case, a general description of the contents shall be shown on the outside of such case and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purpose of identification. 7. Control & Instrumentation Mandatory Spares for specific sub-systems such as hydrogen generation plant and Condensate Polishing Unit (if applicable), the spares shall be governed by the spares indicated against the corresponding specific clauses only. For all remaining systems / equipments offered under the present scope of work, the spares shall be offered in totality as per the complete C&I items supplied in accordance with the applicable clauses of C&I items. 8. If any item appears in more than one place (Group A, B, C) same shall be considered by the bidder irrespective of duplicity and price shall be considered accordingly 9. Wherever set is mentioned under quantity same shall mean the complete requirement of that item. 10. Wherever servomotor is mentioned, it means servomotor/complete actuator along with yoke & its control.	
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CHAPTER-3

ASH HANDLING PLANT

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	MANDATORY SPARES 			
1.00.00	BOTTOM ASH SYSTEM (JET PUMPS / WATER IMPOUNDED SYSTEM)			
1.01.00	Bottom Ash Hopper			
1.01.01	Bottom Ash Hopper Refractory Wall Cooling Assembly including cooling pipes, pipe fittings, nozzles			
1.01.02	Bottom Ash Hopper Liners			
1.02.00	Hopper Discharge Gate			
1.02.01	Gate Wear Liners			
1.02.02	Gate and Shaft Assembly including pneumatic cylinder			
1.02.03	Gate Housing Liners			
1.02.04	Roller & Roller shaft assembly			
1.03.00	Ash Crusher/Clinker Grinder			
1.03.01	Complete Ash Crusher Assembly			
1.03.02	Ash Crusher Liners			
1.03.03	Ash Crusher Gear Box			
1.03.04	Ash Crusher Rolls (Drive roll & driven rolls)			
1.03.05	Bearing for Crusher Motor along with the housing			
1.03.06	Lantern Rings			
1.03.07	Wearing Rings 4 Sets			
1.03.08	Motor for ash crusher			
1.03.09	Drive fluid coupling			
1.04.00	Jet Pumps			
1.04.01	Nozzle Assembly (nozzle along with nozzle tip)			
1.04.02	Complete jet pump assembly			
1.04.03	Jet pump discharge section			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.: CW-CM-11159-C-O-M-001	SUB-SECTION-VI CHAPTER - 3 ASH HANDLING PLANT	PAGE 1 OF 13	

CLAUSE NO.	MANDATORY SPARES 			
3.00.00	ASH WATER PUMPS			
3.01.00	Bottom Ash High Pressure Water Pumps			
3.01.01	Pump Bearings	1 set		
3.01.02	Pump/Motor Couplings with pin & bush assembly	2 Set		
3.01.03	Impeller along with wear parts	2 Sets		
3.01.04	Casing wearing rings	3 Sets		
3.01.05	Pump Shaft	2 Nos.		
3.01.06	Gland	4 Sets		
3.01.07	Shaft Sleeve	4 Sets		
3.01.08	Motor Bearings	2 Sets		
3.01.09	Motor of each type and rating for BAHP water pumps may be included	01 no.		
3.02.00	Low Pressure Water Pumps			
3.02.01	Pump bearings	1 sets		
3.02.03	Impeller along with wearing Parts	2 sets		
3.02.04	Casing wearing rings	3 Sets		
3.02.05	Pumps Shafts	2 Nos.		
3.02.06	Gland	4 Sets		
3.02.07	Shaft Sleeve	3 Sets		
3.02.08	Motor bearings	2 Sets		
3.02.09	Motor of each type and rating for LP Water Pumps may be included	01 no.		
3.03.00	Fly Ash Water Pumps			
3.03.01	Pump bearings	1 set		
3.03.02	Pump/Motor coupling with pin& bush assembly	2 Sets		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.: CW-CM-11159-C-O-M-001		SUB-SECTION-VI CHAPTER - 3 ASH HANDLING PLANT PAGE 2 OF 13

CLAUSE NO.	MANDATORY SPARES		
3.03.03	Impeller along with wear Parts	2 Sets	
3.03.04	Casing wearing rings	3 Sets	
3.03.05	Pump shaft	2 Nos.	
3.03.06	Glands	4 Sets	
3.03.07	Shaft Sleeve	3 Sets	
3.03.08	Motor Bearings	3 Sets	
3.03.09	Motors for Fly Ash Water Pumps may be included	02 nos.	
3.04.00	Flushing Water Pumps/BA Hopper Overflow Water Pumps/Surge Tank Overflow Pumps (Quantities as specified shall be applicable for each type of pumps separately)		
3.04.01	Pump bearings	1 set	
3.04.02	Pump/Motor coupling with pin& bush assembly	2 Sets	
3.04.03	Impeller along with wear parts	2 Sets	
3.04.04	Casing wearing Rings	2 Sets	
3.04.05	Pump Shaft	2 Nos.	
3.04.06	Glands	3 Sets	
3.04.07	Shaft Sleeve	3 Nos.	
3.04.08	Motor Bearings	3 Sets	
3.04.09	Motor for Flushing water pump/BA Hopper overflow pump/Surge tank overflow pump may be included	01 no.	
3.05.00	Seal water pumps (Quantities as specified shall be applicable for each type of seal water pumps separately)		
3.05.01	Pump bearing	1 set	
3.05.02	Pump/Motor coupling with pin& bush assembly	2 Sets	
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.: CW-CM-11159-C-O-M-001	SUB-SECTION-VI CHAPTER - 3 ASH HANDLING PLANT PAGE 3 OF 13

CLAUSE NO.	MANDATORY SPARES			
3.05.03	Pump impeller along with wearing rings	2 Sets		
3.05.04	Pump shaft	2 Nos.		
3.05.05	Shaft sleeves	2 Sets		
3.05.06	Glands	2 Sets		
3.05.07	Motor bearings	2 Sets		
3.05.08	Motor for seal water pumps	01 no.		
3.06.00	Economizer Water Pumps			
3.06.01	Pump bearings	1 Set		
3.06.02	Pump/Motor coupling with pin& bush assembly	1 Set		
3.06.03	Impeller along with wear Parts	1 Set		
3.06.04	Casing wearing rings	2 Sets		
3.06.05	Pump shaft	1 No.		
3.06.06	Glands	2 Sets		
3.06.07	Shaft Sleeve	2 Sets		
3.06.08	Motor Bearings	1 Set		
3.06.09	Motor for Economizer Water Pumps	01 no.		
4.00.00	FLY ASH PNEUMATIC CONVEYING SYSTEM			
4.02.00	Airlock/Blow Tank System	For first stage Pressure Conveying (if applicable)	For second stage conveying	
4.02.01	Airlock/pump tank inlet valve	16 Nos.	6 Nos.	
4.02.02	Air lock/pump tank outlet valve	16Nos.	6 Nos.	
4.02.03	Air lock/pump tank inlet/outlet valve seats (each)	16 Nos.	6 Nos.	
4.02.04	Airlock/pump tank air injector nozzles	16 Nos.	6 Nos.	
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CLAUSE NO.	MANDATORY SPARES 		
4.02.05	Air line valve solenoid	16 Nos.	6 Nos.
4.03.00	VACUUM CONVEYING SYSTEM		
4.03.01	Vacuum Breaker valves	03 Nos	
4.03.02	Buffer hopper bag filter spares (each set shall Consist of total no. of bags in one filter assembly)	03 Nos	
4.03.03	Buffer hopper bag filter pulsation solenoid Valve complete assembly	05 Nos	
4.03.04	Air Intake Valve	6 Nos.	
4.04.00	SCREW COMPRESSOR [Transport Air compressors (TAC) & Conveying Air Compressor (CAC)] (Quantities as specified shall be applicable for TAC & CAC separately)		
4.04.01	Air Filter element	6 Nos.	
4.04.02	Oil Filter	4 Nos.	
4.04.03	Main Shaft Oil Seal	4 Nos.	
4.04.04	Discharge check valve	2 Nos.	
4.04.05	Intercooler/After cooler parts (including O-rings, gaskets, washer)	2 Sets	
4.04.06	Solenoid valve	2 Nos.	
4.04.07	Coupling element	1 Set	
4.04.08	LP/HP Safety Valve	2 Nos. each	
4.04.09	Motor DE bearing	2 Nos.	
4.04.10	Motor NDE bearing	2 Nos.	
4.04.11	Oil stop valve	2 Nos.	
4.04.12	Minimum pressure valve	2 Nos.	
4.04.13	Oil separator	2 Nos.	
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CLAUSE NO.	MANDATORY SPARES 			
4.04.14	Compressor Motor		1 No. of each type.	
4.04.15	Lub oil pump motor		1 No. of each type	
4.05.00	Air Blowers (Buffer Hopper Aeration Blower & Storage Silo aeration blower) (Quantities as specified shall be applicable for each type of blower separately)			
4.05.01	(i) Intake filters		2 sets	
	(ii) Silencer		2 Nos.	
4.05.02	Seals		4 Sets	
4.05.03	Bearing Housing		2 Sets	
4.05.04	Couplings		2 Sets	
4.05.05	Air blower motor bearings		2 Sets	
4.05.06	Air blower motor		2 Nos.	
4.05.07	Impeller/rotor complete with bearings, shaft, seals, thrust blocks etc.		3 Nos.	
4.05.08	Lubricating Oil Filter		3 Sets	
4.06.00	Vacuum pump			
4.06.01	(a) Vacuum pump internals (each set shall consist of all components inside the casing of vacuum pump including rotor, shaft necessary packings, glands etc. for replacement of complete rotating assembly)		4 sets	
	(b) Vacuum pump bearings		4 sets	
	(c) Silencer		2 sets	
	(d) Bearing housing		2 sets	
	(e) Couplings		2 sets	
	(f) Vacuum pump motor bearings		2 sets	
	(g) Vacuum pump motor		2 Nos.	
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CLAUSE NO.	MANDATORY SPARES 			
4.07.00	Refrigerant Air Dryer (Conveying Air Compressor dryer & Transport air compressor Dryer) quantities applicable for CAD & TAD separately)			
4.07.01	Inner ring plate for discharge valve	2 Nos		
4.07.02	Ring plate for suction valve	2 Nos		
4.07.03	Compressor shaft seal assembly	2 Nos.		
4.07.04	Piston ring/Guide ring	6 Sets		
4.07.05	V-belts for compressor	2 Sets		
4.07.06	Oil pressure failure safety switch	2 Nos.		
4.07.07	Crank case heater	2 Nos.		
4.07.08	Gaskets	2 Sets		
4.07.09	Set of "O" rings and oil seals each type	2 Sets		
4.07.10	Suction filter elements	4 Sets		
4.07.11	Bearings	2 Sets		
4.07.12	Complete set of suction valves	2 Sets		
4.07.13	complete set of Discharge valves	2 Sets		
4.07.14	Thermostatic Expansion Valve	2 Sets		
5.00.00	FLY ASH CONVEYING LINE / ISOLATION VALVES/ FITTINGS COUPLINGS			
5.01.00	Material handling valve/Ash intake valve Below ESP	40 nos		
5.02.00	Fly ash extraction line segregating valve seats	16 nos		
5.03.00	Fly ash extraction line isolation valve Gates/Flaps	20 nos		
5.04.00	Fly ash extraction line couplings	16 Nos.		
5.05.00	Fly ash extraction line fittings (Bends/laterals)	4 Nos for each degree & type bend & fittings		
5.06.00	Fly ash Conveying Pipe lines and fittings	10% of population for each type		
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CLAUSE NO.	MANDATORY SPARES 			
6.00.00	FLY ASH STORAGE SILO (quantities as specified shall be applicable for fly ash Storage silo and HCSD silo separately)			
6.01.00	Storage Silo filter spares (each set shall consist of total no. of bags in one filter assembly)			
				4 Sets
6.01.01	Storage Silo filter pulsation solenoid valves - complete assembly			
				18 Nos.
6.01.02	Storage Silo aeration pads			
				25% of total population
6.01.03	Storage hopper aeration sectionalizing valves			
				25% of total population
6.01.04	Storage Silo isolation valves			
				2 Nos.
6.01.05	Dry fly ash retractable chute assembly			
				2 Nos.
6.01.06	Interconnection Valves at Silo top / FA transport pressure lines.			
				2 Nos.
7.00.00	BOTTOM ASH SLURRY DISPOSAL SYSTEM			
7.01.00	Ash slurry disposal pumps & Drives			
7.01.01	Impeller			
				6 Nos.
7.01.02	Casing Liners (One set consists of all the liners section used in one pump)			
				6 Sets
7.01.03	Liners (Suction side and gland side)			
				6 Sets
7.01.04	Pump bearings			
				3 Sets
7.01.05	Shaft sleeves			
				6 Sets
7.01.06	Motors bearings			
				3 Sets
7.01.07	Pump shaft			
				3 Sets
7.01.08	Complete fluid coupling for Ash Slurry Pump			
				4 Nos.
7.01.09	Fusible plug			
				10 Nos.
7.01.10	Résilience plate			
				6 Nos.
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CLAUSE NO.	MANDATORY SPARES 		
7.01.11	Flexible coupling	4 Nos.	
7.01.12	Ash slurry pump speed reduction gear box	2 No	
7.02.00	Slurry Line Valves (Pipes and Valves)		
7.02.01	complete assembly of valves at bottom ash slurry disposal pumps discharge	6 Nos.	
7.02.02	Knife edge gate valve in bottom ash slurry Disposal pumps suction (complete assembly)	6 Nos.	
7.03.00	Ash Slurry Lines / AWRS Lines and fittings		
7.03.01	Ash Slurry Pipes & Fittings (bends)	10% of Population of each size	
7.03.02	AWRS Pipes and fittings	10% of Population of each size	
8.00.00	SUMP DRAINAGE PUMPS (Quantities as specified shall be applicable for each type of sump drainage pumps)		
8.01.00	Impeller	1 No. of each type	
8.02.00	Pump and motor bearings	2 Sets of each type	
8.03.00	Casing Liners	2 Sets of each type	
9.00.00	WATER AND AIR LINE VALVES AND JETTING NOZZLES		
9.01.00	Valves for each size used in system	1 No. (min.) for each size and type of valve for quantity upto 10; 2 Nos. for each size and type of valve for quantity 11-25; Beyond 25 Nos. 10% of the valves used in system.	
9.02.00	Nozzle tips for nozzles in ash slurry jetting, agitation, quenching, flushing service.	20 Nos. of each type & size	
10.00.00	HCSD SYSTEM		
10.01.00	Ash Mixer		
10.01.01	Impeller Blades (one set consist of all blades for mixer)	6 Sets	
10.02.00	Ash Mixer Gear Box		
10.02.01	Oil Seals of each type and size	6 Nos	
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CLAUSE NO.	MANDATORY SPARES 						
10.02.02	Gaskets of each type and size	8 Nos					
10.02.03	Bearing of each type and size	4 Nos					
10.02.04	Retaining Rings of each type and size	4 Nos					
10.03.00	HCSD Pumps						
10.03.01	Valve Unit (D)	2 Set					
10.03.02	Conical valve	72 Nos					
10.03.03	Valve Disc	144 Nos					
10.03.04	Valve Seat	72 Nos					
10.03.05	Lock Nut	8 Nos					
10.03.06	Compression spring	4 Nos					
10.03.07	Clamping piece	2 Nos					
10.03.08	Guide Bush	40 Nos					
10.03.09	Stud bolts of each type and size	3 Nos					
10.03.10	Piston	3 Nos					
10.03.11	Nuts of each type and size	3 Nos					
10.03.12	Sealing Rings of each type and size	4 Nos					
10.03.13	Connecting nipple	3 Nos					
10.03.14	Treating reducing piece	3 Nos					
10.03.15	Sealing Ring	3 Nos					
10.03.16	Plug	3 Nos					
10.03.17	Retaining Rings of each type and size	60 Nos					
10.03.18	O' Ring of each type and size	60 Nos					
10.03.19	Seal	3 Nos					
10.03.20	Hex. Socket Head Screw	15 Nos					
10.03.21	Valve Unit (S)	1 Set					
10.03.22	Valve Support	3 Nos					
10.03.23	Clamping piece	3 Nos					
10.03.24	Pin	3 Nos					
10.04.00	Diaphragm Housing unit						
10.04.01	Clamping bush	2 Nos					
10.04.02	Diaphragm	12 Nos					
10.04.03	Sealing Ring	4 Nos					
10.04.04	Discharge dampener diaphragm	10 Nos					
10.05.00	Ash Conditioners						
	(Quantities as specified shall be applicable for each type of ash conditioners separately)						
10.05.01	Nozzle	2 Sets					
10.05.02	Blades	2 Sets					
10.05.03	Blade liner	2 Sets					
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; text-align: center; vertical-align: top;"> SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE </td> <td style="width: 33%; text-align: center; vertical-align: top;"> TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.: CW-CM-11159-C-O-M-001 </td> <td style="width: 33%; text-align: center; vertical-align: top;"> SUB-SECTION-VI CHAPTER - 3 ASH HANDLING PLANT </td> <td style="width: 3%; text-align: center; vertical-align: top;"> PAGE 10 OF 13 </td> </tr> </table>				SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.: CW-CM-11159-C-O-M-001	SUB-SECTION-VI CHAPTER - 3 ASH HANDLING PLANT	PAGE 10 OF 13
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CLAUSE NO.	MANDATORY SPARES 	
10.05.04	Shaft	2 Sets
10.05.05	Plumer block	2 Sets
10.05.06	Flexible coupling	2 Sets
10.05.07	Gear box with drive motor	1 No
10.05.08	Oil seals & bearing sets for Gear Box	2 Sets
10.06.00	Rotary Feeders	
	(Quantities as specified shall be applicable for each type of Rotary feeder seperately)	
10.06.01	Body	4 Nos
10.06.02	Rotor	4 Nos.
10.06.03	Shaft	4 Nos.
11.00.00	ELECTRICAL	
11.01.00	Control Panels	
11.01.01	Control supply transformers	2 Nos. of each type and rating
	LEDs	5 Nos. of each type & color
	Control switches	2 Nos. of each type
	Selector switches	1 No. of each type
	Push buttons (complete with contact elements)	5 Nos. of each type & colour
	Relays and Timer	10 Nos. of each type and rating
	Contactors	1 No of each type and Rating
	Ammeters and volt meters	1 No of each type and rating
	Auxiliary contactors and bimetallic overload relay set for panel	1 No of each type and rating
	Control fuse base with carrier complete set for panel	1 No of each type and rating
	Any special meter	1 No. of each type
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11.01.02

II	VFD SYSTEM FOR ROTARY FEEDER	
1	Electronic cards	
	a. Control modules	1 no of each type & rating
	b. I/O modules	1 no of each type & rating
	c. Power supply modules	1 no of each type & rating
	d. Thyristor gate module including gate transformer	100% of one channel
	e. Exciter module	1 no.
2	Complete Thyristor bridge leg	1set
3	Over voltage limiter and surge suppressor network	1set
4	Semiconductor fuses for thyristor	25% of installed quantity
5	Power and control fuses	1 no. of each type & rating
6	Control transformer	1 no. of each type & rating
7	Contactor/breakers	1 no. of each type & rating
8	CT/VT	1 no. of each type & rating
9	Indicating lamps	100% of each type and rating
10	Auxiliary contactors and relays	1 no. of each type & rating
11	Indicating lamp holder full set	10% of each type and color

III	VFD TRANSFORMER (If applicable)	
	a. Secondary Bushings with metal parts and gaskets	1 no. each rating
	b. Winding temperature indicator with alarm & trip contacts	1 no.
	c. Oil temperature indicator with alarm & trip contacts	1 no.
	d. Magnetic oil level gauge	1 no.
	e. Pressure relief device	1 no.
	f. Diaphragm for explosion vent	1 no.
	g. Buchholz relay/sudden pressure relay	1 no.
	h. Silica gel charge	1 no.
	i. Pressure gauge (applicable for sealed tank)	1 no. each type

CLAUSE NO.	MANDATORY SPARES 		
12.00.00	CONTROL & INSTRUMENTATION		
12.01.00	MEASURING INSTRUMENTS		
12.01.01	Transmitters of all types and model no. (For the measurement of Pressure, differential pressure flow, level, temp etc.). This shall include magnetic/ electromagnetic flow meter, mass flow meter also.	10% or 1 no of each type and model whichever is more.	
12.01.02	Density meter/ transmitters.	1 no. of each type and model.	
12.01.03	Temperature elements along with thermo well (Except winding temperature elements of motor).	10% or 1 no. of each type and model	
12.01.04	Process actuated switch (Includes all types of Pressure, differential pressure, flow, temperature, level switch Devices).	10% or 1 no. of each type and model	
12.01.05	Process actuated switch (Limit switches (for Pneumatic and manual valves))	10% or 2 no. of each type, rating whichever is more	
12.02.00	PROCESS CONNECTION PIPING		
12.02.01	2 way, 3 way, 5 way valve manifolds	2 nos. of each type	
12.03.00	SOLONOID VALVES	2 nos. of each type	
12.04.00	CONTROL VALVE ACTUATORS & ACCESSORIES		
12.04.01	Actuator/Power Cylinder assembly	1 no. of each type and model.	
12.04.02	Valve trim (including cage, plug, stem, seat rings, guide bushings etc.)	1 set for each type and model.	
12.04.03	Diaphragms, 'O' rings, seals etc. of all types, make etc.	2 nos. of each type and model.	
12.04.04	Positioner units (complete unit)	1 no. of each type and model.	
12.04.05	Actuators	10% or 1 no of each type , class , size and model whichever is more.	
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CHAPTER-4

COAL HANDLING PLANT

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.		MANDATORY SPARES				
S.No.		If Applicable (Y/N)	ITEM	QUANTITY	Unit	
1			Mechanical			
B)			IDLERS			
1	i)		35° Troughing idlers complete with base frame and mounting brackets etc.	2.5%	of population of each type	
	ii)		Rolls for (i) above	1%	of population of each type	
2	i)		Troughing idlers complete with base frame & mounting brackets etc.(for belt feeder).	10%	of population of each type	
	ii)		Rolls for (i) above	10%	of population of each type	
3	i)		35° impact idlers complete with mounting brackets and base frame etc.	10%	of population of each type	
	ii)		Rolls for (i) above	10%	of population of each type	
4			35° troughing training idler complete with base frame and brackets etc. (if used)	10%	of population of each type	
5			Transition idler complete as in (1) above	10%	of population of each type	
6			Flat return idlers complete with mounting brackets etc.	2%	of population of each type	
7			Flat return idlers complete with mounting brackets etc.(for belt feeders)	10%	of population of each type	
8			Flat return trainer complete with mounting brackets etc.	10%	of population of each type	
9			Belt cleaning spiral rubber disc return idler complete with mounting brackets etc.	10%	of population of each type	
10	i)		Two roll 10° troughing return idler assy	2%	of population of each type	
	ii)		Rolls for (I) above	2%	of population of each type	
11			SS idlers	10%	of population of each type	
12			Any other type of idlers	10%	of population of each type	
13			Idlers for pipe conveyors, if applicable			
	a)		Adjustable Impact Idlers assembly	10%	of population of each type	
	b)		Adjustable Troughing idlers assembly	10%	of population of each type (or) 5 nos of each type whichever is more.	
	c)		Pipe forming idler with finger roller (carrying side)	10%	of population of each type (or) 3 nos of each type whichever is more.	
	d)		Pipe forming idler with finger roller (return side)	10%	of population of each type (or) 3 nos of each type whichever is more.	
	e)		Return Adjustable Idler (v-type)	10%	of population of each type (or) 2 nos of each type whichever is more.	
	f)		Belt supporting idler (Return)	10%	of population of each type (or) 2 nos of each type whichever is more.	
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CLAUSE NO.		MANDATORY SPARES				
	g)		Self-cleaning return roller	10%	of population of each type (or) 2 nos of each type whichever is more.	
	h)		Finger-rolls at skirt board	10%	of population of each type (or) 2 nos of each type whichever is more.	
	i)		Safety Panels (6 Rolls Carry, 6 Rolls Return)	10%	of population of each type (or) 2 nos of each type whichever is more.	
	j)		1. Standard module (6 Rolls Carrying side idler)	5%	of population of each type	
			2. Rolls for (1) above	3%	of population of each type	
	k)		1. Standard module (6 Rolls return side idler)	5%	of population of each type	
			2. Rolls for (1) above	3%	of population of each type	
	l)		Standard Half Module, (6 Rolls return idler) if applicable	10%	of population of each type (or) 1 no of each type whichever is more.	
	m)		Deflector Roller	10%	of population of each type (or) 1 no of each type whichever is more.	
	n)		Any other type of idlers	10%	of population of each type	
C)			CONVEYOR GEAR BOXES			
			(Including boom conveyor, belt feeders & intermediate conveyor of S/R)			
	i)		Input shafts with pinion	1	set of each type and rating	
	ii)		Oil seals	2	sets of each type and rating	
	iii)		Bearings	1	set of each type and rating	
	iv)		Hold back device	2	nos. of each type and rating	
	v)		Cooling fan with cover	2	nos. of each type and rating	
	vi)		Complete gear box assy with hold back device	1	set of each type and rating for population upto 10 nos.	
				1	set of each type and rating for population more than 10 nos.	
D)			CONVEYOR DRIVE AND CONVEYOR BELT			
a)			Gear Coupling			
	i)		All type of drive couplings including gear Coupling	1	nos. of each type	
	ii)		Bolts for gear coupling	2	sets of each size	
	iii)		Seal kit for gear coupling (o-ring)	2	sets of each type	
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CLAUSE NO.		MANDATORY SPARES			
	IV)		Conveyor Drive Motor(Including boom conveyor, belt feeders & intermediate conveyor of S/R)	1	No. of each type and rating for population upto 10 nos.
				1	No. of each type and rating for population more than 10 nos.
b)			Fluid Coupling		
	i)		Fluid Coupling complete	1	no. of each type and size
	ii)		Multi Disc assembly (for fluid coupling)	4 2	nos. each type and size
	iii)		Resilient Drive plate assy.	1	no. of each type and size
	iv)		Bearings	1	no. of each type and size
	v)		Seal kit for fluid coupling	2	sets of each size
	vi)		Fusible plug	10	nos. of each size
	vii)		Complete actuator and engaging assembly (including motor, gear box etc.)	1	set of each type
	viii)		Oil Cooler assembly (if applicable)	1	set of each type
	ix)		Oil pump-motor set (if applicable)	1	set of each type
	x)		Oil filters	2	sets of each type
	xi)		Oil/Cooler valves (if applicable)	2	nos. of each type
c)			Belting		
			Conveyor Belt		
	i)		Main Conveyors	2	drum length of 250 m of each type, size and rating if total population of particular type, size and rating of conveyor is equal to or more than 2500 m
				1	drum length of 250 m of each type, size and rating if total population of particular type, size and rating of conveyor is less than 2500 m
	ii)		Boom conveyor, belt feeder, intermediate conveyor & bunker seal belt, lime conveyor,gypsum conveyor as applicable	one	complete length of each type
d)			Brakes		
	i)		Brakes	1	no of each size & type
	ii)		Brake shoes	2	sets of each size
E)			PULLEYS		
	i)		Pulleys complete with shaft excluding bearing & plummer blocks (complete with lagging)	1	no. of each type and size in pulley drum and shaft dia.(for population upto 10 Nos)

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CLAUSE NO.		MANDATORY SPARES				
				2	no. of each type and size in pulley drum and shaft dia.(for population more than 10 Nos)	
	ii)		Plummer Block complete with bearings & sleeves	2	no. each type and size	
	iii)		SS Pulleys complete with shaft excluding bearing & plummer blocks (complete with lagging)	1	no. of each type and size in pulley drum and shaft dia.	
F)			BELT CLEANERS AND SKIRT BOARD			
	i)		Modular segments for belt cleaner	5	%of total population of each type & size	
	ii)		Modular segments skirt rubber for skirt board	5	%of total population of each type & size	
	iii)		Skirt Rubber	5	%of total population of each type & size	
	iv)		Complete belt cleaner (internal / external)	2	%of total population of each type & size	
G)			IN-LINE MAGNETIC SEPARATORS			
	i)		Cleated conveyor belt	1	Set	
	ii)		Motor, gear box drive assy. complete	1	Set	
	iii)		Pulleys with plummer block & bearings	1	set of each size & type	
	iv)		Sheaves	1	no. of each size & type	
	v)		V-belts	2	no. of each size & type	
H)			SAMPLER (Coal)			
	i)		Plummer block	1	no. of each type and size	
	ii)		Hammers	1	set of each type and size	
	iii)		Liner plate	1	Set	
	iv)		Cutter lip	1	no.	
	v)		Cutter seal	1	no.	
	vi)		V-belts (for crusher)	1	Sets	
	vii)		Hammer pins	1	sets of each type and size	
	viii)		Pulley	1	no. of each type and size	
	ix)		Conveyor belt	1.2	times length of each type and rating	
	x)		Gear box assembly for conveyor	1	no. of each type and rating	
	xi)		Gear box drive assy, for primary and secondary samplers	1	set of each type and rating	
	xii)		Hydraulic pump with motor and coupling	1	set of each type	
	xiii)		Hydraulic motor	1	set of each type	
	xiv)		Hydraulic cylinder	1	set of each type	
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CLAUSE NO.		MANDATORY SPARES				
	xv)		Cylinder sealing kit	2	set of each type	
	xvi)		Set of hoses	2	set of each type	
	xvii)		Coupling with grid for primary sampler	2	Sets	
	xviii)		Screw conveyor gear box assembly	1	Set	
	xix)		Sampler Motor if applicable	1	Each type and rating	
I)			CRUSHER (Coal			
	i)		Plummer Block assembly complete including bearing, lock nut, lock washer etc.(DE+NDE)	2	Set	
	ii)		Shaft seal	4	Sets	
	iii)		Hammer sets	5	sets or 750 Nos whichever is more (1 set means hammers required for one crusher)	
	iv)		Rotor assembly complete consisting of rotor shaft & keys, End discs, Centre discs, distance rings, suspension bars, disc clamping nuts and shaft extension etc. but without hammers, bearings and pillow blocks	1	Set	
	v)		Cage bars/Perforated screen plates as applicable	4	Sets	
	vi)		Breaker plate	4	Sets	
	vii)		Liners	2	Sets	
	viii)		Suspension bars	4	Set	
	ix)		Kick-off plate	4	Set	
	x)		Screen plate upper & lower	4	no. each	
	xi)		Tramp iron pick up plate	2	no. each	
	xii)		Fluid coupling			
	a)		Fluid coupling complete	1	Set	
	b)		Bearings	2	Set	
	c)		Seal kit (sealing rings)	2	Sets	
	d)		Fusible plugs	8	nos.	
	e)		Oil pump motor set (if applicable)	1	set of each type	
	f)		Oil filter	3	Sets	
	g)		Complete actuator and engaging assembly (including motor, gear box etc.)	1	Set	
	h)		Cooler assembly (if applicable)	1	no.	
	i)		Oil / Water valves	2	nos. of each type	
	j)		Gear Coupling/ other flexible coupling of crusher drive along with bolts and sealing kit, as applicable	2	Sets	
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CLAUSE NO.		MANDATORY SPARES				
	l)		Multi Disc assembly (for fluid coupling)	2	sets. of each type and rating	
	m)		Resilient Drive plate assy	2	sets. of each type and rating	
	n)		Crusher Motor	1	No. of each type and rating	
J)			VIBRATING (GRIZZLY/SCREENING) FEEDER			
	i)		Bearings	2	no. of each type & size	
	ii)		Seals	2	no. of each size	
	iii)		Liners	1	sets.	
	iv)		Screen plates	10	Sets	
	v)		Complete vibrating assembly consisting of all rotating parts including drive & driven unbalanced shafts including bearings,casing,spring,vibrating blocks,main shaft,sheave & unbalanced weights as applicable.	1	set of each type and rating and direction	
	vi)		Hoses (if applicable)	2	Set	
	vii)		Drive unit assembly (including electric motor, hydraulic pump, hydraulic motor, , flexible shaft, gear box, as applicable)	1	Set	
	viii)		Base springs, rubber pads	2	sets. of each type & size	
	ix)		V belts	4	sets. of each type & size	
	x)		Uncoaler	1	Set	
K)			ELECTRIC HOISTS			
	i)		Brake linings	2	sets of each type	
	ii)		Rope guide & rope tightner	1	no. of each type	
	iii)		Limit switch	2	nos. of each type & size	
	iv)		Gear box/gear set	2	sets of each type	
	v)		Motor/geared motor	1	no of each type & rating	
	vi)		Drum bearing	1	set of each type & rating	
L)			FLAP GATES (INCLUDING THAT OF TRIPPERS)			
	i)		Limit switch	8	nos. of each type & rating	
	ii)		Actuator (complete with motor, gear box,limit switches etc.)	1	nos. of each type & rating	
	iii)		Oil seals of Actuator	2	nos. of each type & rating	
	iv)		Flap gate shaft	1	nos. of each type & rating	
	v)		Pressure nut	12	nos. of each type & size	
M)			RACK & PINION GATE			
	i)		Limit switch	2	no. of each type & size	
	ii)		Rollers with bearings	2	no. of each size	
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CLAUSE NO.		MANDATORY SPARES				
	iii)		Motor gear box assembly	1	set of each type	
	iv)		Actuator (complete with motor, gear box, limit switches etc.)	1	nos of each type & rating	
N)			SUMP PUMP			
	i)		Complete pump assembly with pump, motor, coupling base etc	1	Set	
	ii)		Impeller with key & nut	2	set of each size & type	
	iii)		Oil seal	2	nos. of each size	
	iv)		Coupling bolt with bushes	2	set of each type	
	v)		Pump shaft	2	no. of each size	
	vi)		Shaft sleeve	2	sets of each size	
	vii)		Bearing bush	2	sets of each size	
	viii)		Set of bearings	2	Sets	
O)			DUST SUPPRESSION, SERVICE WATER, POTABLE WATER, COOLING WATER (for hydraulic coupling or any other purpose), Dust Extraction System			
	a)		Pump impeller with key & nut	1	set of each type & size	
	b)		Pump Shaft	1	no of each type & size	
	c)		Bearings	1	sets each type & size	
	d)		Wearing rings	2	sets of each type & size	
	e)		Shaft sleeve	2	sets of each type & size	
	f)		Bushings	2	sets of each type & size	
	g)		Coupling bolts & nuts (with bushes) 2 sets	1	sets each type & size	
	h)		Spray nozzles	50	nos.of each type & size	
	i)		Spray nozzles (for plain water dust suppression)	25	nos.of each type & size	
	j)		Solenoid valves	5	% of each type and size	
	k)		Globe valve / plug valves	10	% of each type and size	
	l)		Gate valve	2	nos. of each size	
	m)		Strainers	1	no. of each type	
	n)		Motor	1	No. of each type and rating	
	o)		Compressor			
	(i)		Air filter element	8	Nos.	
	(ii)		Oil filter	6	Nos.	
	(iii)		Discharge Check Valve	3	Nos.	
	(iv)		Oil Pump Parts (including distance ring, eccentric rings, Pump element, Pin, Key O, Ring) as applicable	2	Sets	
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CLAUSE NO.		MANDATORY SPARES				
	(v)		Inlet Valve Assembly	2	Nos.	
	(vi)		Electronic regulator	3	Nos.	
P)			VENTILATION SYSTEM			
	i)		V-Belt	1	set of each type	
	ii)		Pre-filter element of pressurizing fans	2	sets of each type	
	iii)		Foundation Rubber pads	1	sets of each type & size	
	iv)		Bearings	1	sets of each type & size	
	v)		Plummer Blocks	1	set of each type & size	
	vi)		Motor	1	Each type and Rating	
Q)			TRAVELLING TRIPPERS/MT			
	i)		Complete drive assembly including gear box, coupling, brake etc.	1	Set	
	ii)		Complete internals of speed reducer (including input shaft, output shaft, gearset)	1	set of each size & type	
	iii)		Bearings for reducer	2	Sets	
	iv)		Drive axle with wheels, plummer blocks, bearings etc.	1	Set	
	v)		Oil seals	2	nos. of each size	
	vi)		Non-drive axle with wheels plummer blocks, bearings etc.	1	set of each type	
	vii)		Flap gate actuator with motor, gear box, position / thrust switches	1	set of each type	
	viii)		Chain assembly with sprockets	1	set of each type & size	
	ix)		Festoon Roller assembly for flexible cable	4	Nos	
	x)		Pulleys and plummer block bearings	1	no of each type	
	xi)		Plummer block with bearing for cable reel drums	1	set of each type	
	xii)		Energy Chain	1	Set	
	xiii)		Drive Motor	2	No.	
	xiv)		Cable reel drive motor complete (if applicable)	1	No.	
R)			STACKER/RECLAIMER			
			(Including boom conveyor, intermediate conveyors)			
1			Fluid coupling (complete)	1	no. of each type	
1a			Motors (other than those covered under D- a (iv)	1	No of each type and rating	
2			Fluid coupling spares			
	i)		Fusible plug	4	sets for each type of coupling	
	ii)		Oil seals	4	sets for each type of coupling	
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CLAUSE NO.		MANDATORY SPARES				
	iii)		Bearings	2	set of each type	
3			couplings consisting input and output halves (for travel drive)	1	no. of each type	
4			Bearings excluding slewing bearings	1	no. of each type	
5.1			Hydraulic pump & hydraulic motor drive for luffing system	1	set of each type	
5.2			Hydraulic pump & hydraulic motor drive for slew mechanism	1	set of each type	
5.3			Hydraulic pump & hydraulic motor drive for bucket wheel mechanism	1	set of each type	
6			Hydraulic cylinder	1	no. of each type	
7			Repair kit for hydraulic cylinder including oil seals etc.	2	set for each type of cylinder	
8			Grease pump	1	no. of each type	
9			Hoses	2	sets of each type and size	
10			Slew gear Box	1	nos of each type and size	
11			Gear Box of bucket wheel	1	nos of each type and size	
12	i)		Carbon brushes for current collector of cable reeling drum	2	sets for each drum	
	ii)		Plummer blocks and bearings of (CRD)	1	set of each type	
13			Traverse drive assembly consisting of reducer, couplings, brake assy. etc.	1	no. of each type and direction	
14			Brake shoes	4	sets for each type of brake	
15			Complete carriage wheel assembly (Each set comprising of 1 wheel + 1 axle + 2 bearing + 2 locking assy), as applicable	1	Sets	
16			Complete bucket with liners, pins, wedges	1	Bucket	
17			Drive assembly of cable reel drive consisting of motor, gear box, coupling, brake etc. as applicable	1	set of each type	
18			Chain & chain sprockets	1	set of each type	
19			Cable guide assembly	1	set of each type	
20			Plummer block for bucket wheel drive	1	no. of each type & size	
21			Various plummer block used in Stacker reclaimer (without bearings)	1	no. of each type & size	
22			Plummer block with bearing for cable reel drums	1	set of each type	
23			Rail clamp assembly	1	set of each type	
24			Seal kit for thrustor assembly	1	set of each type	
25			Thrustor cylinder assembly	1	set of each type	
26			Cooler for Hydraulic drive	1	no. of each type	
27			Energy Chain	1	Set	
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CLAUSE NO.		MANDATORY SPARES				
S)			ELEVATOR			
	a.		Brake			
			1. Tool to brake	1	No.	
			2. Fan	1	No.	
			3. Magnet coil with housing pads	2	Nos.	
			4. Brake pads	6	Nos.	
			5. Adjusting sleeve	2	Nos.	
			6. Fixed brake disc	2	Nos.	
	b.		Worm Gear			
			1. Worm gear	1	no.	
			2. 'O' ring	2	nos. of each type	
			3. Sealing ring	2	nos. of each type	
	c.		Door Front			
			1. Bearing	2	Nos.	
			2. Roller	3	Nos.	
			3. Bushing	2	Nos.	
	d.		Limit Cams			
			1. Sensor	1	No	
			2. Switch	2	Nos.	
			3. Switch arm	2	Nos.	
	e.		CAD			
			1. Guide roller	50	% of the total ones installed each type or minimum 1 no. whichever is higher	
			2. Switch	1	no.	
	f.		Sliding Door			
			1. Rollers	4	nos. of each type	
	g.		Machinery			
			1. Guide roller	2	nos.	
			2. Pinion	1	no.	
			3. Rubber inserts	6	nos.	
			4. Grove ring	6	nos.	
			5. Brake motor	1	no.	
	h.		Cable trolley			
			1. Ball bearing	2	nos. of each type	
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CLAUSE NO.		MANDATORY SPARES			
					
T)		DUST EXTRACTION SYSTEM			
	1	Fan Motor	1	nos. of each type & rating	
	2	Plummer Blocks	2	sets of each type	
	3	Bearing of fans & motor	1	set of each type	
	4	Pulley	2	nos of each type	
	5	Belts	2	sets of each size	
	6	Impeller and shaft of coal slurry disposal pump	1	set of each type	
	7	Bearing of pumps	1	set of each type	
	8	Pump Motor	1	nos of each type	
	9	Motor terminal blocks with studs for all motors	1	set of each rating and type of motor	
	10	Spray nozzle	10	nos of each type	
	11	Solenoid valve with coil	2	nos of each type	
U)		SIDE ARM CHARGER			
1		Carriage Wheels			
	(a)	Bearings	1	set of each size and type	
	(b)	Oil Seals	2	set of each size and type	
	(c)	Plummer Block	1	set of each type and size	
	(d)	Carriage wheel fitted with shaft (without Plummer Block)	1	Set	
2		Coupling	1	set each type	
3		Travel Wheel Assembly	1	No	
4		Bearing	1	no. of each type	
5		Speed Reduers			
	(a)	Internals complete including input and output shafts and gears etc.	1	set of each type and rating.	
	(b)	Oil seals	4	sets of each type and rating	
	(c)	Bearings	2	sets of each type and rating	
6		Motor			
	(a)	Motor including slip ring motor	1	set of each type and size	
	(b)	Bearings	1	set of each type and size	
	(c)	Oil Seal	1	set of each type and size	
7		Brakes			
	(a)	Complete assembly	1	no. of each type and size	
	(b)	Linings & springs	1	set of each type and size	
8		Couplings			
	(a)	Complete assembly	1	no. of each type and size	
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CLAUSE NO.		MANDATORY SPARES				
9	(b)		Pins, bushes and nuts	1	set of each type and size	
			Hydraulic Power Pack			
	i)		Hydraulic Pump with electric motor, coupling, valves (mounted on pump) etc.	1	set of each type and rating	
	ii)		Solenoid Valves complete with coils	1	set of each type and size	
	iii)		Filter element (1 No. Pressure Filter + 1 No. Return Filter)	4	sets of each type	
	iv)		Hydraulic Hoses	2	Sets	
	v)		Hydraulic Motor	1	nos of each type	
	vi)		Hydraulic cylinder	1	no. of each type	
	vii)		Oil cooling fan with motor	2	sets of each type	
	viii)		Oil filling motor	1	nos of each type	
	ix)		Servo motor	1	nos of each type	
W)	Wagon Tippler and Accessories					
	1		Speed Reducers			
	(a)		Internals complete including input and output shafts and gears etc.	1	set of each type and rating	
	(b)		Oil Seals	4	sets of each type and rating	
	(c)		Bearings	2	sets of each type and rating	
	(d)		Speed Reducer assy/ Gear box	1	set of each type	
	2		Motor			
	(a)		Motor including slip ring motor	1	no. of each type	
	(b)		Bearings	1	set of each type and size	
	(c)		Oil Seal	1	set of each type and size	
	3		Brakes			
	(a)		Complete assembly	1	no. of each type and size	
	(b)		Linings & springs	1	set of each type and size	
	4		Couplings			
	(a)		Complete assembly	1	no. of each type and size	
	(b)		Pins, bushes and nuts	1	set of each type and size	
	5		Thyristor Panel			
	(a)		Thyristor cards/modules	1	no. of each type	
	(b)		Relays	2	nos. of each type and rating	
	6		Hydraulic Power Pack			
	(a)		Hydraulic Pump with electric motor, coupling, valves (mounted on pump) etc	1	set of each type and size	
	(b)		Hydraulic Motor	1	no. of each type and size	
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CLAUSE NO.		MANDATORY SPARES				
	(c)		Valves	1	no. of each type and size	
	(d)		O.P. Coolers	1	no.	
	(e)		Filter Elements	10	nos. of each type	
	(f)		Pressure Switch	1	no. of each type	
	(g)		Temperature Switch	1	no. of each type	
	7		Bearings (not covered separately)	1	set of each type and size	
	8		Limit Switches	2	nos. of each type.	
	9		Cylinder Manifold block with all valves mounted on it	1	Set	
	10		Hydraulic cylinder with piston	1	set of each type and size	
	11		Seals of hydraulic cylinder and pumps etc.	2	sets of each type.	
	12		Hydraulic hoses	2	Sets	
	13		Gear / flexible coupling, as applicable	1	Set	
	14		Rod end bearings with housing	1	set for all four clamps	
	15		Pressure Switches	1	No	
	16		Common manifold block complete with all valves mounted on it.	1	no.	
	17		Main Pivot bearing	1	no.	
	18		Pinion support & bearing	1	no. each type.	
	19		Pinion	2	no.	
	20		Latch (Pinion & rack segment locking device)	1	no.	
	21		One set of bush bearing liners for all drive group bearings	1	Set of each type	
	22		Paul Lever Assy.	2	pieces (in case of non machined) and one complete set in case of machined rack segment	
	23		Rack Segment	1	Set of each type	
	24		Spur wheel along with key	1	Set of each type	
	25		Drive shaft fitted with pinion	2	Sets	
	26		Bolts for rack segment (fitted bolts) one complete set	2	Sets	
	27		Coupling bolts of drive shaft (fitted/machined bolts) one complete set	1	Set of each type	
X)		APRON FEEDERS				
	1		Head Pulley complete with shaft	1	no.	
	2		Tail pulley complete with shaft	1	no.	
	3		Drive Motor	1	no. of each type and size	
	4		Gear Box	1	no. of each type and size & direction.	
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CLAUSE NO.		MANDATORY SPARES				
	5		Complete internals of gear box including input and output shafts	1	set of each type & size	
	6		Fluid coupling, flexible coupling etc.	1	No. of each type and size	
	7		Traction rollers	20	%of population	
	8		Carrying idlers	20	%of population	
	9		Return Rollers	20	%of population	
	10		Sprocket segments	2	sets of each type and size	
	11		Link Chain	50	% of each type and size	
	12		Pans (flights)	1	Set for one full Apron Feeder	
	13		Hydraulic Cylinder	1	sets of each type and size	
	14		Seal kit of hydraulic cylinders	2	sets.	
	15		Plummer Blocks	1	no. of each type and size	
	16		Bearings	1	set of each type and size	
Y		BUCKET ELEVATOR				
	1		Buckets	10	% of total population	
	2		Belt for bucket elevator	10	% of total population	
	3		Linkages	20	% of total population	
	4		Drive Unit Assembly (including Shaft & Drum/Pulley as applicable)	01	Set	
	5		Bearings(One no of each type and size)	01	No	
	6		Tensioning Arrangement/Take up Unit assembly	01	Set	
Z		Surface Feeder/BRU –Bulk Reception Unit				
	1		Drive Unit Assembly (including Shaft & Drum/Pulley as applicable)	01	Set	
	2		Bearings(One no of each type and size)	01	No	
	3		Side Seals	01	Set	
	4		Leveler Blade	01	No	
Z.A		Truck Tippler				
	1		Hydraulic Cylinders	01	No	
	2		Seal Kits	01	Set	
	3		Hydraulic Power pack	01	Set	
	4		Hydraulic Pumps(One of Each Type)	01	No	
			Drive Unit Assembly	01	Set	
			Bearings(One no of each Type & Size)	01	No	
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CLAUSE NO.		MANDATORY SPARES				
II		"ELECTRICAL and C&I"				
A)		PADDLE FEEDERS				
	1		Set of cards mounted on paddle feeder	1	Sets	
	2		Various limit switches, pressure, temperature, level, flow and other switches	2	nos. of each type	
	3		Flexible Trailing cable (power & control) -if applicable	1	length each type	
	4		Cable tension switches with leads) - if applicable	1	nos. of each type	
	5		Cooling fan with motor for oil cooler	1	no.	
	6		Oil filling motor	1.	No	
	7		Slip ring and carbon bushes (If applicable)	1	Set	
	8		Motor terminal block with studs for all motors	1	set of each rating & type of motor	
	9		Carbon brushes for current collector of cable reeling drum (CRD) - if applicable	2	Sets	
	10		Anti-collision Switch Assembly	1	Set of each type	
B)		<u>CONVEYORS</u>				
	1		Belt Sway Switch assy	5	% of each type	
	2		Pull cord switch assy.	15	% of each type	
	3		Zero speed switch assy.	15	% of each type	
	4		Chute Block switch assy.	15	% of each type	
	5		Position switches for trippers, paddle feeders	10	% of each type	
	6		Sensor/probe for zero speed switch	20	%(min. 1 no)of each type and speed range	
	7		Micro/limit switch of pull cord switch, belt sway switches, chute block switches	20	%(min. 1 no)of each type	
	8		Motor terminal block with studs for all motors	1	set. of each type and rating of motor	
C)		CRUSHING EQUIPMENT				
	1		Set of pressure, temperature flow switches, zero speed/under speed switches, limit and other switches etc.)	2	nos. of each type and rating	
	2		Motor terminal block with studs for all motors	1	set. of each rating and type of motor	
	3		Motor Cooling Fan	1	no. of each type	
	4		Motor bearing	1	set of each type	
	5		Water pump motor (if applicable) along with motor bearing	1	Set of each type and rating	
D)		MAGNETIC SEPARATORS				
	1		Rectifier with surge absorber	1	Set	
	2		Rectifier transformer	1	no.	
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CLAUSE NO.		MANDATORY SPARES				
	3		Auxiliary and power relays	2	nos. of each type	
	4		Control transformers	2	no. of each type	
	5		Ammeter	2	nos. of each type	
	6		Under current relay	1	no. of each type	
	7		Isolating switch	1	no. of each type	
	8		Motor terminal block with studs for all motors	1	set. of each rating and type of motor	
	9		Complete control unit including rectifier transformer	1	No.	
	b)		SUSPENDED MAGNET			
	1		Rectifier with surge absorber	1	Set	
	2		Rectifier transformer	1	No	
	3		Auxiliary and power relays	2	No. of each type	
	4		Control transformers	1	No. of each type	
	5		Ammeter	2	No. of each type	
	6		Under current relay	1	No. of each type	
	7		Isolating switch	1	No. of each type	
	8		Complete control unit including rectifier transformer	1	No.	
	E)		COAL SAMPLER			
	1		Set of various limit switches	2	nos. of each type	
	2		PLC cards & power supply unit	1	Complete set	
	3		Zero speed switch	1	no. of each type	
	4		Solenoid valves with coils	2	nos. of each type and size	
	5		Motor terminal block with studs for all motors	1	set. of each rating and type of motor	
	F)		TRAVELLING TRIPPER			
	1		Brake assembly for traverse drive complete	2	Sets	
	2		Set of limit switches	2	nos. of each type	
	3		Cable tension switches with lead	2	sets of each type	
	4		Anti-collision device	1	set of each type	
	5		Motor terminal block with studs for all motors	1	set. of each rating and type of motor	
	6		Festoon roller assembly	2	Sets	
	7		Flexible Trailing cable (power & control)	1	length each type (largest)	
	8		Carbon brushes for slip ring current collector of cable reeling drum (CRD)	2	Sets	
	G)		METAL DETECTOR			
	1		Cards	1	set complete	
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CLAUSE NO.		MANDATORY SPARES				
	2		Relays	2	nos. of each type	
	3		Coils of metal detector	2	Sets	
	4		Cables for search coils	1	Set	
	5		Complete MD assy with panels	1	Set	
H)			BELT WEIGHER			
	1		Set of cards	2	nos. of each type	
	2		Load Cells	2	nos. of each type	
	3		Display Unit	2	nos. of each type	
	4		Speed sensor	1	nos. of each type	
	5		Cables for load cells & speed sensor	2	Sets	
	6		Transducer, if applicable	2	nos. of each type	
	7		Complete belt weigher assy. with control and display units	1	Set	
I)			STACKER RECLAIMER			
	1		Proximity detectors	5	% of total population min 1 no	
	2		Level switches	5	% of total population min 1 no	
	3		Rotation digit emitters (Flashing Beacon)	5	% of total population min 1 no	
	4		Limit Switch assy	5	% of total population min 1 no	
	5		Pressure switch assy	5	% of total population min 1 no	
	6		Temperature switch assy	5	% of total population min 1 no	
	7		Cable tension switches with loads	2	sets. of each type	
	8		Flow switches	2	nos. of each type	
	9		Flexible Trailing cable (power & control)	1	Largest length of each size & rating	
			LT drivesMain of Stacker Reclaimer			
	11		Transducers of thyristor/VVF/VFD panel	2	nos. of each type	
	12		Complete converter and inverter unit consisting of Thyristors of thyristor/Main control Transistor (main current carrying components)	1	Set of each type	
	13		Potentiometers of thyristor / equivalent panel	10	Nos. of each type	
	14		Set of cards of thyristor/Power Board Gate Drive Board	1	Set complete	
	15		All type of electronics modules	10	% or 1 no(whichever is more)of each type and Model	
	16		Input and out put chokes	1	Set	
	17		Motor terminal block with studs for all motors	1	set. of each rating and type of motor	
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CLAUSE NO.		MANDATORY SPARES			
	18		Coupling relays	10	Nos. of each type
	19		For bucket wheel assy, if hydraulic Solenoid Valves assy, pressure, temp, other switches	2	nos. of each type and rating
J)			AUXILIARY TRANSFORMERS (DRY)-for SR only		
	i)		HT Bushing	3	nos. of each type & rating
	ii)		LT Bushing	3	nos. of each type & rating
	iii)		Neutral bushing	1	no. of each type & rating
	iv)		Neutral CT	1	no. of each type & rating
	v)		Winding temp. indicator with alarm & trip contacts	1	no. of each type
K)			HT LOAD BREAK SWITCH AND JUNCTION BOX		
	i)		Trip coil	10	no.
	ii)		Support Insulators	1	set.
L)			CONTROL PANEL		
			(Wagon tippler control desk, hoists, dust suppression system, sump pumps, fluid couplings etc.)		
	i)		Control supply transformers	1	no. of each type & rating
	ii)		Relays and timer	1	no. of each type & rating
	iii)		Contactors	1	no. of each type & rating
	iv)		Ammeters	1	no. of each type & rating
	v)		Voltmeters	1	no. of each type & rating
	vi)		LEDs	5	nos. of each type & rating
	vii)		Control switches	1	no. of each type
	viii)		Selector switches	1	no. of each type
	ix)		Push button (complete with contact elements)	1	no. of each type & colour
	x)		Auxiliary contactors	1	complete set
	xi)		Control fuse base with carrier complete set for panel	1	complete set
	xii)		Any special meter	1	no. of each type
	xiii)		Bi-metallic overload relay	2	complete sets
	Not e		Spares already covered under respective equipment spares shall not be duplicated under control panel spares.		
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CLAUSE NO.		MANDATORY SPARES				
M)			PLC (STACKER / RECLAIMER)			
	i)		PLC cards (Processor, memory and all cards other than I/O cards)	2	no. of each type	
	ii)		Stabiliser	1	no. of each type	
	iii)		Power pack	1	no. of each type	
	iv)		I/O cards	2	nos. of each type & rating	
	v)		Fuses & Fused terminals	10	nos. of each type & rating	
	vi)		Set of cards for UPS	1	Set	
	vii)		Modems	1	no. of each type	
	viii)		Optical fibre cable	10	%	
N)			VIBRATION MONITORING SYSTEM			
	i)		Vibration pick up	2	Nos	
	ii)		Pick up cable	2	Length	
	iii)		Vibration monitor module and other cards	1	no. of each type	
	iv)		Power supply	1	no.	
	v)		Relays	2	nos. of each type	
	vi)		Indicating lamps / LEDs	5	nos. of each colour	
O)			DUST SUPPRESSION, SERVICE WATER, POTABLE WATER, COOLING WATER (for hydraulic coupling or any other purpose), DUST EXTRACTION SYSTEM			
	i)		Flow switches	2	nos. of each type	
	ii)		Pressure switches	2	nos. of each type	
	iii)		Level switch	2	nos. of each type	
P)			SUMP PUMP			
	i)		Level switch	1	set. of each type	
Q)			ELEVATORS			
	i)		Contactors	4	nos. of each type	
	ii)		Auxiliary Transformer, control transformer	1	nos. of each type & rating	
	iii)		Relays	4	nos. of each type & rating	
	iv)		Resistor	6	nos. of each type & rating	
	v)		Switch	1	no. of each type	
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CLAUSE NO.		MANDATORY SPARES				
	vi)		Rectifier	10	nos.	
	vii)		Limit switch	4	nos. of each type	
	viii)		Battery Charger	1	no. of each type	
	ix)		Tone frequency transmitter	1	set. of each type	
	x)		Tone frequency receiver	1	set. of each type	
	xi)		Control Cards	1	set of each type	
R)			VIBRATING SCREENING FEEDER			
	i)		Motor terminal block with studs for all motors	1	set. of each rating and type of motor	
	ii)		Cards of variable frequency drive of vibrating screening feeders	1	set	
S)			Mobile Headers			
	i)		Drive unit assy complete with motor, gear box etc.	1	set. of each rating and type of motor	
T)			Measuring instruments (applicable to all CHP sub-packages)			
	1		Electronic Transmitters			
			Transmitters of all types and model no. (for the measurement of Pressure, differential pressure flow, level, temperature etc.)	5	Nos. of each type and model	
	2		Temperature elements			
			RTD's*	5	Nos.	
			Thermo well (if applicable) * (With head assembly, terminal block and nipple)	2	Nos.	
	3		Process Actuated Switch Devices Includes all types of Pressure, differential pressure, flow, temperature, and differential temperature, level switch Devices.	2	Nos. of each type and model	
Note: 1. Unless stated otherwise a 'set' means items or sub-items required for each type/size range of the assembly/ sub-assembly, required for replacement in one main equipment. It is further intended that the assembly/ sub-assembly which have different orientation (like left hand or right hand, top or bottom), different direction of rotation or mirror image positioning or any other reasons which result in maintaining two different sets of the spares to be used for the subject assembly/ sub-assembly, these shall be considered as different types of assembly/ sub-assembly. 2. Wherever quantity has been specified as percentage (%), the quantity of mandatory spares to be provided by contractor shall be the specified percentage (%) of the total						
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CLAUSE NO.	MANDATORY SPARES		
	population of the plant. In case the quantity so calculated happens to be a fraction, the same shall be rounded off to next higher whole number. 3. Whenever the quantities have been indicated for each type, size, thickness, material, radius, range etc., these shall cover all the items supplied and installed and the breakup for these shall be furnished in the bid. 4. In case spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder should offer spares applicable to offered design with quantities generally in line with the approach followed in the above list. 5. Price of each and every item is to be given separately.		
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CHAPTER-5

MILL REJECT

CLAUSE NO.	Mandatory Spares of MRS. 		
Sl. No.	Item Description	Qty	Unit
	DRAG CHAIN CONVEYORS / METALLIC CONVEYOR		
(A)	Drag Chain Conveyors / Metallic Conveyor		
1.	Chain link with Flight assy (if applicable)-	20	Nos each type
2.	Metallic Pan assy (Meshed with Belt) (if applicable)	01	Set each type
3.	Chain Pin & Circlip (if applicable)-	20	Nos each type
4.	Sprocket (if applicable)-	01	No each type
5.	Drive & Non-drive Pulleys (if applicable)	01	No each type
6.	Carrying and return Idler assy (if applicable)	5	Nos each type
7.	Bearings	02	Nos each type
8.	Conveyor Geared Motor/Gear Box	1	No each type
9.	Shear Pin of Conveyor (if applicable)	10	Nos each type
10.	Coupling (if applicable)	1	No each type
(B)	Vibrating Feeder assy (if applicable)	02	Nos
(C)	Bucket Elevator		
1	Chain link	10	Nos
2	Shackle	10	Nos
3	Bearings	02	Nos of each type
4	Elevator Geared Motor/Gear box	1	No
5	Coupling (If applicable)	1	No of each type
6	Buckets	5	Nos
(D)	Other Items		
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CLAUSE NO.	Mandatory Spares of MRS. 		
	Sl. No.	Item Description	Qty Unit
		Complete assembly of Valves at Pyrite Hopper inlet, outlet, emergency outlet	02 No of each type, size and rating
		Rupture Disc	05 Nos
		Metallic Expansion Bellow	5 Nos.
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-VI CHAPTER-5 MILL REJECT SYSTEM PAGE 2 OF 2



CHAPTER-6

PIPING

CLAUSE NO.	LIST OF MANDATORY SPARES FOR PIPING		
1.0	Low Pressure Piping		
1)	Valves all sizes (Population= All Units)	5% of the total population of each type, size and class OR minimum 2 nos. of each type size & class whichever is more	
	NOTE: 1. If there is one no valve only of particular type, class and size then only one no is required 2. Wherever valves are specified as mandatory spare, complete valve along with actuator and all other accessories which are the part of original supply shall also be supplied.		
2.0	Power Cycle Piping		
1)	Spare gaskets / pressure seal gaskets for gate valves of all sizes	02 sets/Nos of gaskets / pressure gaskets for each size of valve	
2)	Spare sets of gland packings for gate valves of all sizes	02 sets of gland packings for each size of valve	
3)	Spare gaskets for globe valves of all sizes	02 sets/Nos of gaskets / pressure gaskets for each size of valve	
4)	Spare sets of gland packings for globe valves of all sizes	02 sets of gland packings for each size of valve	
5)	Spare gaskets/pressure seal gaskets for NRV of all sizes (if applicable)	02 sets/Nos of gaskets / pressure gaskets for each size of valve	
6)	Spare set of gaskets for safety valves, relief valves and safety relief valves of all sizes	02 sets of gaskets for each size of valve	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR PIPING 		
7)	Complete gate valves assembly up to the size of 50 NB	Not Applicable	
8)	Complete globe valves assembly up to the size of 50 NB	Not Applicable	
9)	Complete angle valves assembly up to the inlet size of 50 NB (if applicable)	10 Nos of angle valve assembly	
10)	Complete NRV's assembly up to the size of 50 NB	Not Applicable	
11)	Spring unit of hangers (Variable & Constant spring hangers)	02 Nos of each type hangers of same make/model & stiffness	
12)	Snubbers / Shock absorbers	02 Nos of each type snubbers/shock absorbers of same make/model, rated load & stiffness	
13)	Gasket for each flanged connection on high pressure steam and feed line. (if applicable)	02 Nos of each type flanged connection	
14a)	safety valves, relief valves and safety relief valves up to 50 NB size. (if applicable)	02 nos. of each type, material, size & class per unit	
14b)	safety valves, relief valves and safety relief valves above 50 NB size	01 no of each type, material, size & class per unit	
15)	Steam traps and Y-Strainers		
15a)	Steam trap & Y strainers up to 25 NB	Not Applicable	
15b)	Steam trap & Y strainer above 25 NB & up to 50 NB (if applicable)	Not Applicable	
15c)	Steam trap & Y strainer above 50 NB (if applicable)	Not Applicable	
16)	Complete Valve assembly (all types) for sizes above 50 NB and up to & including 250 NB	02 nos. of each type, material, size & class per unit. (If there is one no. valve only of particular type, class, and size	
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR PIPING		
		then only one no per unit to be considered.)	
17)	Complete Valve assembly (all types) for sizes above 250 NB	01 no. of each type, material, size & class per unit	
3.	L.P. Chemical dosing system		
Sl. No	Description	Quantity	
(1.)	Drive shaft cum worm	1 No. for each type of pump per unit.	
(2.)	Drive worm wheel	3 Nos. for each type of pump per unit.	
(3.)	Connecting rod plate	1 No. for each type of pump per unit.	
(4.)	Cross head guide bush	3 Nos. for each type of pump per unit.	
(5.)	Plunger	1 No. for each type of pump per unit.	
(6.)	Plug	1 No. for each type of pump per unit.	
(7.)	Oil seal	1 No. for each type of pump per unit.	
(8.)	Washer	2 Nos. for each type of pump per unit.	
(9.)	Gland nut	2 Nos. for each type of pump per unit.	
Notes: 1) Mandatory spare requirements of Valves and specialties for power cycle piping systems (Sub Section: A-07 of Part-A of Technical Specifications) specified above does not include items/valves/specialties which are already specified/ covered elsewhere in this Technical specification for mandatory spare requirement. 2) Wherever complete valve assembly as mandatory spare has been specified above for power cycle piping, it shall include complete gear operator/ box assembly which forms part of original valve assembly/supply. 3) Mandatory spares for valve actuators (for Pneumatically, Hydraulically & Electrically operated valves) shall be supplied as per actuator quantity/details specified elsewhere in this technical specification for mandatory spare requirement. 4) Mandatory spare requirement for complete valve assembly above 50NB in power cycle piping systems shall include Gate valve, Globe valve, check valve, safety valve, Angle valve, butterfly valve etc.			
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CLAUSE NO.	LIST OF MANDATORY SPARES FOR PIPING			
	5) In case the quantity of mandatory spares so calculated happens to be a fraction, the same shall be rounded of to next higher whole number. For example 10% of 11 is equal to 1.1, then it should be rounded as 2 instead of 1. 6) Mandatory spares for valves above 50NB made of A105 / A216 WCC installed on 15NiCuMoNb5 (EN 1.6368) / ASTM A335 Grade P36 piping shall be supplied with suitable matching pieces (in welded condition with valve ends at valve manufacturing works). 7) Wherever Mandatory spares are specified as “per unit”, Total Mandatory spares quantity shall be arrived by multiplying the specified quantity with number of units under the package.			
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CHAPTER-7

WS-PLANT UTILITY

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	MANDATORY SPARES FOR PLANT UTILITIES 		
1.00.00	AIR COMPRESSORS / ADP /COMPRESSOR HOUSE CRANE		
1.01.00	Oil free Screw Air Compressor (as applicable)		
(i)	Complete HP Stage with HP element.	1 No.	
(ii)	Complete LP stage with LP element	1 No.	
(iii)	Motor Bearings	2 Sets	
(iv)	LP stage Pinion	1 No.	
(v)	HP stage Pinion	1 No.	
(vi)	Air Oil Filter Kit	4 Nos.	
(vii)	After cooler Safety Valve (if applicable)	1 No.	
(viii)	Inter Cooler Safety Valve (if applicable)	1 No.	
(ix)	Oil Pump kit	2 Nos.	
(x)	After cooler drain valve kit (if applicable)	1 No.	
(xi)	Inter cooler drain valve kit (if applicable)	1 No.	
(xii)	Air receiver drain/moisture trap	1 No.	
(xiii)	'O' Rings for oil cooler	8 Nos.	
(xiv)	Moisture separators for Aftercooler (if applicable)	2 Nos.	
(xv)	Moisture separators for Intercooler (if applicable)	2 Nos.	
	Centrifugal Compressor (as applicable)		
1.02.00			
1.02.01	Pinion Shaft Journal Bearing Assembly	2 Sets	
1.02.02	Thrust Bearing Assembly	2 Sets	
1.02.03	Shaft Seals for Air-Oil (All stages)	2 Sets	
1.02.04	Gasket / O rings	3 Sets each type/size	
1.02.05	Air Filter Elements	4 Sets each type/size	
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CLAUSE NO.	MANDATORY SPARES FOR PLANT UTILITIES 	
1.02.06	Lub Oil System	
1.02.06.1	Main oil pump complete	1 No
1.02.06.2	Aux. oil pump complete	1 No
1.02.06.3	Complete coupling for Main & Aux. oil pump, spacer	1 No
1.02.06.4	Cartridge filter elements with gaskets and seals	4 Sets
1.02.06.5	Motor Bearings	2 sets
1.02.07	Drain / Moisture Trap	2 Set of each type/size.
1.02.08	Oil Cooler Gaskets & Seals	2 sets
1.03.00	AIR DRYING PLANT FOR IA SYSTEM (Twin tower Type) (As applicable)	
	1. Pre filter element (Ceramic candle or as applicable)	2 sets
	2. After filter element (Ceramic candle or as applicable)	2 sets
	3. Heater element (if applicable)	1 sets
	4. Blower bearing (if applicable)	1 sets
	5. Blower motor bearing (if applicable)	2 sets
	6. Valves & Valve Actuators (pneumatic/hydraulic)	2 sets
	7. Heater coil for temperature stabilization (for HOC type) (as applicable)	2 sets
	8. Desiccant for Air Dryer:	one complete fill for both towers of one dryer
1.04.00	Valves (within the compressor house having actuators) along with actuator	2 Nos. of each type / rating / size
1.05.00	COMPRESSOR HOUSE CRANE	
	1. All bearings	1 set of each type/rating
	2. Brake assembly and its liners	1 set of each
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CLAUSE NO.	MANDATORY SPARES FOR PLANT UTILITIES		
		type/rating	
	3. Wire rope	1 complete length.	
1.06.00	MEASURING INSTRUMENTS		
	1 Electronic Transmitters		
	(i) Transmitters of all types, ranges and model no. (for the measurement of Pressure, differential pressure flow, level, etc.)	2 Nos. of each type and model	
	2 Temperature elements		
	(i) RTD's* of each type and length	2 Nos. of each type and length	
	(ii) Thermocouples of each type like K-type, R-type, metal etc. and length *	2 Nos. of each type and length	
	(iii) Thermowell	2 Nos. of each type and length	
	(iv) Temperature transmitters (if applicable)	2 Nos of each type	
	3 Process Actuated Switch Devices Includes all types of Pressure, differential pressure, flow, temperature, differential temperature, level switch Devices	2 Nos. of each type and model	
	4 Dew Point meters	1 No.	
1.07.00	MICROPROCESSOR BASED/PLC BASED CONTROL/ELECTRONIC BASED CONTRAL PANEL (IF APPLICABLE)		
	1 Fully programmed controller of electronic modules of each type (as applicable)	1 No.	
	2 Power supply module (if applicable)	1 No.	
1.08.00	Rotary drum type Air drying plant for Instrument Air system (As applicable)		
	Drive assembly consisting of motor, gear boxes, drive shaft & coupling	1 set	
	Desiccant for Air Dryer:	one complete fill of one dryer	
1.09.00	a) Service air compressor motor	1 no.	
	b) Instrument air compressor motor	1 no.	
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CLAUSE NO.	MANDATORY SPARES FOR PLANT UTILITIES 		
2.00.00	<u>AIR CONDITINING AND VENTIALTION SYSTEM</u>		
1.00.00	AIR CONDITINING SYSTEM		
1.0	Screw Compressor Chilling Machine for each type/rating/model		
1.1	Oil filter – O ring	1 Set	
1.2	Refrigerant filter	1 Set	
1.3	Master solenoid valve	1 No.	
1.4	Master solenoid valve coil	1 Set	
2.0	Pumps (for each model)		
2.1	Pump Bearing	1 Set	
2.2	Pump Motor Bearing	1 Set	
2.3	Shaft Sleeve	2 set	
3.0	Air handling unit (for each model)		
3.1	V-belts for AHU Blower	2 Sets	
3.2	AHU Blower bearing	1 Set	
3.3	Blower motor bearing	1 Set	
3.4	Filters at suction and discharge of all AHUs	25% of installed population for each type/rating	
4.0	Cooling Tower (for each model)		
4.1	Nozzles for cooling towers	20 Nos.	
4.2	Float valve assembly	1 No.	
4.3	Fan Bearings	1 Set	
4.4	Motor bearings	1 Set	
4.5	Fills	20% of total population	
5.0	Air Washer Units (for each type)		
5.1	<i>Supply Air fans</i>		
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CLAUSE NO.	MANDATORY SPARES FOR PLANT UTILITIES 	
5.1.1	V-belts for Supply air fans	2 Sets
5.1.2	Supply air fan bearings	1 Set
5.2	Air Washer pump	
5.2.1	Impeller for Pump	1 no of each type.
5.2.2	Pump Shaft	1 no of each type
5.2.3	Pump Bearing	1 Set
5.2.4	Shaft Sleeves	1 Set
5.2.5	Gland Packings for pumps	2 Sets
5.2.6	Spray nozzles	5% of total population or 100 numbers whichever is higher.
5.2.7	Air Washer Pump inlet water strainer	1 No.
5.2.8	Brass suction screen/strainer for air washer tank	1 Set
5.3	Fabric filters	1 Set (Quantity to suit one no. of air washer)
5.4	Metallic filters	1 Set (Quantity to suit one no. of air washer)
6.0	Electrical Actuators	
6.1	Actuators	1 No. of each type, model and rating.
6.2	Motor for Centrifugal fan for air washer unit	1 No of each rating
7.0	Unitary air filtration unit (for each type)	
7.1	<i>Supply Air fans</i>	
7.1.1	V-belts for supply air fans	2 Sets
7.1.2	Supply air fan bearings	1 Set
7.2	<i>UAF Pump</i>	
7.2.1	Pump bearings	1 Set
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CLAUSE NO.	MANDATORY SPARES FOR PLANT UTILITIES 		
7.2.2	Impeller for pump	1 no.	
7.2.3	Pump Shaft	1 no.	
7.2.4	Shaft sleeves	1 Set	
7.2.5	Gland Packings for pumps	1 Set	
7.3	Nylon Filter	1 Set (Quantity to suit one no. of UAF unit)	
7.4	Spray nozzles	5% of total population or 50 Numbers whichever is higher.	
7.5	UAF Pump inlet water strainer	1 No.	
7.6	Brass suction screen/strainer for unitary air filtration tank.	1 Set	
7.7	Motor for Centrifugal fan for UAF	1 No	
8.0	Control & Instrumentation		
(I)	Air-Conditioning System		
8.1	Electronic Transmitters		
8.1.1	Transmitters of all types and model no. (for the measurement of Pressure, differential pressure flow, level, temperature etc.)	5 Nos. of each type and model	
8.2	Temperature elements		
8.2.1	RTD's*	5 Nos.	
8.2.2	Thermo well (if applicable) * (With head assembly, terminal block and nipple)	2 Nos.	
8.3	Process Actuated Switch Devices Includes all types of Pressure, differential pressure, flow, temperature, and differential temperature, level switch Devices.	2 Nos. of each type and model	
8.4	Relative Humidity Sensors	1 No.	
8.5	Geyserstat	1 No.	
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CLAUSE NO.	MANDATORY SPARES FOR PLANT UTILITIES		
8.6	Local Humidity/Temperature indicators	2 Nos. each	
9.0	Variable Frequency Drive (VFD)		
9.1	Complete VFD drive	1 No of each type & rating	
9.2	Complete Converter & Inverter unit	1 No of each type & rating	
9.3	Set of Cards	1 No of each type & rating	
9.4	Set of fuses	2 Nos of each type & rating	
9.5	Input & Output Chokes (If applicable)	1 Set	
(II)	Ventilation System		
10.0	Measuring Instruments		
10.1	Level transmitter	1 No. of each type and model	
10.2	Pressure transmitter	1 No. of each type and model	

CLAUSE NO.	MANDATORY SPARES FOR PLANT UTILITIES			
3.00.00	MANDATORY SPARES FOR FIRE DETECTION AND PROTECTION SYSTEM			
SI.No	ITEM DESCRIPTION	QUANTITY		
1.0	PUMPS	Booster Hydrant	Booster Spray*	
1.1	Impeller	1 Set	1 Set	
1.2	Pump bearing (Incl. thrust brg, journal brg., line shaft brg.)	1 Set	1 Set	
1.3	Pump shaft	1 Set	1 Set	
1.4	Wearing rings	2 Sets	2 Sets	
1.5	Shaft Sleeve	1 Set	1 Set	
1.6	Bushings	2 Sets	2 Sets	
1.7	Bearing housing (if provided)	1 Set	1 Set	
1.8	Coupling bolts & nuts (with bushes)	1 Set	1 Set	
	Above quantity/items are required for each type and rating of pumps being supplied under the contract * if applicable			
2.0	DIESEL ENGINE (1 set means item required for 1 diesel engine)			
		Booster Hydrant	Booster Spray*	
2.1	Sprayers/Injector	1 Sets	1 Sets	
2.2	Piston rings & sealing rings	2 Sets	2 Sets	
2.3	Exhaust valve assembly	1 Set	1 Set	
2.4	Springs	1 Set	1 Set	
2.5	Packings and gaskets	1 Set	1 Set	
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CLAUSE NO.	MANDATORY SPARES FOR PLANT UTILITIES			
SI.No	ITEM DESCRIPTION	QUANTITY		
2.6	Fuel oil filter elements with seals	2 Sets	2 Sets	
2.7	Fuel oil filter assy	1 Set	1 Set	
2.8	Lub. oil filter elements with seals	2 Sets	2 Sets	
2.9	Scrapper rings	1 Set	1 Set	
2.10	Solenoid coil for fuel valve	1 No.	1 No.	
2.11	Corrosion inhibitor (if provided)	1 Set	1 Set	
2.12	Big end & small end bearing of connecting rod	1 Set	1 Set	
2.13	Speedometer (if applicable)	1 No.	1 No.	
2.14	Speedometer wire (if applicable)	1 No.	1 No.	
2.15	Rubber hoses of water line with mounting clamps	1 Set	1 Set	
2.16	Cranking starter assembly complete	1 Set	1 Set	
2.17	Lub. oil and fuel oil hoses with end connectors	1 Set	1 Set	
2.18	Water pump belts	2 Sets	2 Sets	
	Above quantity/items are required for each type and rating of diesel engine being supplied under the contract * if applicable			
3.0	Motors (for each type & rating)			
3.1	Bearing	1 set		
3.2	Motors (HT / LT)	1 No of each type & rating		
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CLAUSE NO.	MANDATORY SPARES FOR PLANT UTILITIES		
SI.No	ITEM DESCRIPTION	QUANTITY	
4.0	FIRE HOSES WITH COUPLINGS		
4.1	7.5m long fire hoses (internal) with end connectors	8 Nos.	
4.2	15m long fire hoses (internal) with end connectors	30 Nos.	
4.3	15m long fire hoses (external) with end connectors	24 Nos.	
5.0	BRANCH PIPES WITH NOZZLES		
5.1	Nozzles with branch pipes & quick coupling ends (internal)	20 Nos.	
5.2	Nozzles with branch pipes & quick coupling ends (external)	10 Nos.	
6.0	DELUGE VALVE ASSEMBLIES		
6.1	Complete deluge valve assembly along with internals and accessories		
6.1.1	150 NB	5 Sets	
6.1.2	100 NB	15 Sets	
6.1.3	80 NB	1 Set	
6.2	Clapper assembly complete (consisting of clapper seat rubber, screws, etc.)		
6.2.1	150 NB	5 Sets	
6.2.2	100 NB	15 Sets	
6.2.3	80 NB	1 Set	
6.3	Solenoid coils		
6.3.1	150 NB	5 Sets	
6.3.2	100 NB	15 Sets	
6.3.3	80 NB	1 Set	
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CLAUSE NO.	MANDATORY SPARES FOR PLANT UTILITIES		
SI.No	ITEM DESCRIPTION	QUANTITY	
8.0	VALVES (GATE/GLOBE/BUTTERFLY/NRV)		
8.1	Complete valves	02 Nos of each type & size	
8.2	Reduction gear operator (Gate/Butterfly)	02 Nos of each type & size	
8.3	Flap/door with pin (NRV)	02 Nos of each type & size	
8.4	Disc (butterfly)	02 Nos of each type & size	
8.5	Gate (Gate valve)	04 Nos of each type & size	
8.6	Stem (all types)	02 Nos of each type & size	
8.7	Seat rings (all types)	02 Nos of each type & size	
8.8	Flap rings (NRV)	02 Nos of each type & size	
8.9	Gaskets	02 Nos of each type & size	
8.10	Bearing/ Bushing (Butterfly valve)	02 Nos of each type & size	
8.11	Motorized actuator of butterfly valve 300 NB	1 No.	
9.0	BASKET STRAINERS / Y-TYPE STRAINERS for HVW/MVW SYSTEM		
9.1	Strainer elements with o-rings and stiffeners.		
9.1.1	Basket strainer		
9.1.1.1	300 NB	1 No.	
9.1.1.2	200 NB	1 No.	
9.1.2	Y- Type strainer		
9.1.2.1	150 NB	05 Nos	
9.1.2.2	100 NB	05 Nos	
9.1.2.3	80 NB	2 No.	
10.0	MVW SPRAY SYSTEM		
10.1	Spray Nozzles	5% of each type & size	
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CLAUSE NO.	MANDATORY SPARES FOR PLANT UTILITIES		
SI.No	ITEM DESCRIPTION	QUANTITY	
10.2	QB Detectors	5% of each type	
11.0	HVW SPRAY SYSTEM		
11.1	Spray nozzles	5% of each type & size	
11.2	QB Detectors	5% of each type	
13.0	HYDRANT VALVE		
13.1	Hydrant valve complete (internal) single headed with instantaneous female coupling	20 Nos	
13.2	Hydrant valve complete (external) single headed with instantaneous female coupling	20 Nos	
13.3	Water monitor sets with nozzle branch pipe etc.	2 Nos.	
13.4	Spindle with nuts of Hydrant valve	20 Nos	
13.5	Bonnet, gland nut, rubber assembly of hydrant valve	20 Nos	
13.6	Seat, check nut, washer assembly of hydrant valve	20 Nos	
13.7	Rubber washer for female coupling	20 Nos	
13.8	Instantaneous female coupling assembly complete for hydrant valve	20 Nos	
13.9	Lock pin assembly for hydrant valve	20 Nos	
14.0	FIRE DETECTORS		
14.1	Multisensor detectors (Addressable)	50 nos.	
14.2	Indicators assembly for smoke detectors provided in false ceiling (Response indicator)	20 nos.	
14.3	LHS cable for coal conveyors	500 mtrs	
14.4	LHS cable for cable galleries	500 mtrs	
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CLAUSE NO.	MANDATORY SPARES FOR PLANT UTILITIES		
SI.No	ITEM DESCRIPTION	QUANTITY	
14.5	Manual pull stations	05 Nos of each type	
15.0	INFRA RED DETECTORS		
15.1	IRD unit with local control unit, purging unit, other accessories (for complete replacement)	2 nos.	
16.0	PORTABLE EXTINGUISHERS		
16.1	Pressurized water type (9 lit. cap.)	15 Nos.	
16.2	Foam type (9 lit. cap. IS: 15683)	6 Nos.	
16.3	CO2 type (4.5 kg. Cap. IS: 15683)	15 Nos.	
16.4	Dry Chemical powder (6 kg. Cap. IS: 15683)	15 Nos.	
17.0	MOBILE EXTINGUISHERS		
17.1	Foam type (60 lit. cap. IS: 16018)	1 No.	
17.2	CO2 type (22.5 kg. Cap. IS: 16018)	3 Nos.	
17.3	Dry Chemical powder (50 kg. Cap. IS: 16018)	3 Nos.	
18.0	INERT GAS EXTINGUISHING SYSTEM		
18.1	Nozzles	2 Nos. of each size/type	
18.2	Automatic & Manual release system	1 No. of each size/type	
18.3	Cylinder valve with safety pressure relief device	1 No. of each size/type	
18.4	Flexible hoses(if applicable)	5 Nos. of each size/type	
18.5	Solenoid coils	2 Nos. of each size/type	
19.0	FIRE ALARM PANEL & REPEATER FIRE ALARM PANEL		
19.1	Power supply modules	2 No. of each type & rating	
19.2	Processor modules, Control modules, loop cards modules, isolator cards	2 No. of each type	
19.3	LCD display of each type unit of panel	1 No.	
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CLAUSE NO.	MANDATORY SPARES FOR PLANT UTILITIES		
SI.No	ITEM DESCRIPTION	QUANTITY	
19.4	Interface unit / modules for non-addressable devices, auxiliary / output relay modules, control modules, supervisory control modules and any other electronic modules	50 Nos. of each type	
19.5	Power supervision relay (if applicable)	4 Nos. of each type.	
19.6	Fire screen / alarm buzzer	1 No. of each type	
20.0	ELECTRICAL		
20.1	Electrical Actuator	10% or 1 No. of each type, model and rating whichever is more.	
21.0	CONTROL AND INSTRUMENTATION		
21.1	MEASURING INSTRUMENTS		
21.1.1	Process Actuated Switch Devices : (All types of Pressure, diff. pressure, flow, temperature, level switch devices).	2 Nos. of each type and model	
21.1.2	All type of Electronic Transmitters and Ultrasonic Transmitters including sensors.	2 Nos. of each type and model	
21.1.3	Limit switches for isolation valves	2 Nos. of each type	
21.2	PROCESS CONNECTION PIPING (For Impulse Piping / Tubing and Air Supply Piping as Applicable)		
21.2.1	Valves	1 No. of each type, class, size and model.	
21.2.2	2 way, 3 way, 5 way valve manifolds (as applicable)	5 Nos. of each type, class, size and model.	
21.2.3	Fittings	5 Nos. of each type, class, size and model	
21.3	CABLES		
21.3.1	Pre fabricated cable with connector of each type.	1 No. of each type, size and model.	
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CLAUSE NO.	MANDATORY SPARES FOR PLANT UTILITIES		
SI.No	ITEM DESCRIPTION	QUANTITY	
21.3.2	Other cables (including instrumentation cable, core cable, short term fire proof cable, fibre optic cables, etc.)	500 mtr of each type, pair/ core and size.	
21.4	PLC CONTROL SYSTEM		
21.4.1	Power Supply Unit	2 No. of each type and model,	
21.4.2	Electronic modules(I/O modules, communication modules and any other module used in the system)	2 No. of each type and model,	
21.4.3	Central Processor Unit	2 No. of each type and model	
21.4.4	Interconnecting Cables (as applicable)	10% of each type & size	
21.4.5	Cooling Fan in PLC system / cabinet	2 Nos.	
21.4.6	Graphical Interface Unit	1 No.	
21.5	24V – DC POWER SUPPLY SYSTEM		
21.5.1	Current Transducer, Voltage transducer, chokes, AC/DC isolators, contactors, timers, relays (as applicable)	2 Nos. of each type and rating	
21.5.2	Fuses of each type and rating	2 Nos of each type and rating	
21.5.3	Fuse free Circuit breakers	2 Nos. of each type and rating	
21.5.4	Electronic modules of all types	1 No. of each type	
21.5.5	Cooling Fans (as applicable)	2 No. of each type	
21.5.6	Relays of all types including overload relays (as applicable)	2 Nos. of each type and rating	
21.5.7	Batteries	2 nos. of each type & rating	
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CHAPTER-8

WATER SYSTEM

CLAUSE NO.	MANDATORY SPARES FOR WATER SYSTEM			
1.00.00	MANDATORY SPARES FOR WATER SYSTEM AREA (CW, ACW, ECW, RAW WATER, CT, WTP AREA ETC.)			
	CW Pumps			
	SN	Description	Quantity	
	A)	Mechanical Items (Quantity indicated is for each type, size & rating)		
	1)	CW pump (Vertical Turbine or Volute type) – Contractor to consider the following items whichever is applicable.		
	i)	Shaft sleeves	1 set	
	ii)	Complete set of bearings / bushes of pump (all bearings/ bushes / line bearings) including thrust bearing as applicable.	1 set	
	iii)	Pump shafts line bearings/ bushes only (line bearings / bushes for impeller shaft, intermediate shafts, drive shaft, bowl bearing)-as applicable	1 set	
	iv)	Bearing of motor (all bearings including thrust bearing as applicable)	1 set	
	v)	Thrust bearing collar of pump / motor as applicable	1 set	
	vi)	Wearing rings or equivalent for impeller (if applicable)	1 set	
	vii)	Wearing rings or equivalent for Casing/ Bowl (if applicable)	1 set	
	viii)	Impeller Shaft and Line shafts with fasteners (as applicable)	1 set	
	ix)	All shaft Couplings with fasteners (as applicable)	1 set	
	x)	Complete Coupling assy. between pump and motor incl. coupling Guard	1 set	
	xi)	Bushes with fasteners for all Couplings as applicable	1 set	
	xii)	Motor to Pump Coupling bushes if applicable	1 set	
	xiii)	Mechanical seal or/and gland packing as applicable for the pumps	1 set	
	xiv)	Thrust bearings Pads	1 set	
	xv)	Impeller with impeller nut	1 set	
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CLAUSE NO.	 MANDATORY SPARES FOR WATER SYSTEM		
	xvi)	Oil Seal Ring (if applicable)	1 set
	xvii)	Deflectors (if applicable)	1 set
	xviii)	Cooling coil for bearing housing of pump / motor as applicable	1 set
	2)	Seal Water pumps (for Volute type CW pumps only)	
	i)	Impeller with nuts	1 set
	ii)	Shaft (s) with fasteners	1 set
	iii)	Shaft Sleeves	2 sets
	iv)	Wearing rings – Impeller as applicable	1 set
	v)	Wearing Rings – Casing as applicable	1 set
	vi)	Bearings for the pump and Drives	2 sets
	vii)	Thrust bearings if applicable	1 set
	viii)	Pump & Drive Coupling with all fasteners & coupling Guards	1 set
	ix)	Bushes for all the Couplings as applicable	1 set
	x)	Gland packing / Mechanical seal as applicable	1 set
	xi)	Thrust bearing collar if applicable	1 set
	xii)	Motor for seal water pump	1 No
	3)	Drainage Water pumps (for Volute type CW pumps only)	
	i)	Impeller with nuts	1 set
	ii)	Shaft(s) with fasteners	1 set
	iii)	Shaft Sleeves	2 sets
	iv)	Wearing rings – Impeller as applicable	1 set
	v)	Wearing Rings – Casing as applicable	1 set
	vi)	Bearings for the pump and Drives	2 sets
	vii)	Thrust bearings, thrust bearing collar if applicable	1 set
	viii)	Pump & Drive Coupling with all fasteners & coupling Guards	1 set
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CLAUSE NO.	MANDATORY SPARES FOR WATER SYSTEM		
	ix)	All shaft Couplings with fasteners (as applicable)	1 set
	x)	Pin and Bushes for the all Couplings as applicable	1 set
	xi)	Gland Packing / Mechanical seal as applicable	1 set
	xii)	Motor for drainage water pump	1 No
	4)	Butterfly valves of all Sizes (Quantity indicated is for each type / size /rating)	
	i)	Valve discs.	1 set
	ii)	Shaft	1 no
	iii)	Bearing	1 set
	iv)	Gear box units for valve (if applicable)	1 set
	v)	Gear box internals with shaft (if applicable)	1 set
	vi)	Bearings & 'O-ring for gear box unit (if applicable)	1 set
	5)	Complete valve assembly- All types of valves of Sizes 500 NB and Below	1 no of each type, size & rating for total population < 10 nos ≥ 1 nos of each type, size & rating for total population ≥ 10 nos
	6)	Spares for Electro-hydraulic actuators	
	i)	Complete actuator excluding the oil tank, accumulator cylinders, counterweight, and power pack.	1 no
	ii)	Complete power pack	1 set
	7)	Complete assembly of rubber expansion joints (including bolts & nuts)	1 set of each type /size / rating
	8)	ARV's for CW, Raw water system	10 nos. for each type, size & rating
	9)	Lubrication Water Pumps (CW/Raw Water as applicable)	
	i)	Impeller with nuts and other accessories	1 Set
	ii)	Impeller Shaft with fasteners	1 Set
iii)	Shaft Sleeves	1 Set	
iv)	Wearing rings – Impeller (if applicable)	1 Set	
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CLAUSE NO.	 MANDATORY SPARES FOR WATER SYSTEM		
	v)	Wearing Rings – Casing (if applicable)	1 Set
	vi)	Pump bearings	1 Set
	vii)	Thrust bearings	1 Set
	viii)	Pump & Drive Coupling compl. assy. & coupling Guards	1 Set
	ix)	Pump to drive coupling bushes with fasteners	1 set
	x)	Gland, Packing & Gland Assembly / Mech. seal as applicable	1 Set
	xi)	Motor for lubrication water pumps	1 No. of each type
	10)	Submersible Pumps (Quantity indicated is for each type / size /rating)	
	i)	Impeller	1 set
	ii)	Pump shaft	1 set
	iii)	Mechanical Seal	1 set
	iv)	Oil Seal	1 set
	11)	CRANE (Quantity indicated is for each type / size /rating)	
	a)	Bearings for long travel wheels	1 set
	b)	Bearings for cross travel wheels	1 set
	c)	Brake liners for all the Brakes	1 set
	d)	Hydraulic thrusters for Brakes	1 set
	e)	Wire rope for Crane	1 length
	f)	Electrical Items of Crane	
	i)	Carbon brushes and brush holders for motors	1 set of each rating/Size
	ii)	Solenoid coils for all brakes	1 set of each rating/Size
	iii)	Contactors and over load relays for motors	1 set of each rating/Size
	iv)	Set of MCCB/MCB/Fuse/ Fuse links for the whole crane	1 Set
	v)	Overload relays for motors	1 set of each rating/Size
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CLAUSE NO.	 MANDATORY SPARES FOR WATER SYSTEM			
		vi)	Set of fuses	1 set
		vii)	Limit switches for main hoist, long travel & Cross travel	1 set
		viii)	Motors of the EOT	1no. of each type, size & rating
		ix)	Timers of each type, size & rating	1 set
		x)	Master Controller for Aux. Hoist,	1 set
		xi)	Resistance Box	1 No of each type.
	12)	Mono-rail Hoist Assembly (Quantity indicated is for each type / size /rating)		
		a)	Bearings	1 set
		b)	Brake liners for all the Brakes	1 set
		c)	Wire rope for Hoist	1 length
		d)	Electrical Items of Crane	
		i)	Solenoid coils for all brakes	1 set
		ii)	Overload relays for motors	1 set
		iii)	Limit switches	1 set
		iv)	Motors	1 no. of each type and rating
	13)	ECW System- DMCW & ACW Pumps		Quantity
		(i)	Shaft Sleeve (DE & NDE)	2 Sets
		(ii)	Shaft	1 Set
		(iii)	Impeller	1 Set
		(iv)	Casing & impeller Wearing Ring	2 Sets
		(v)	Bearings for Pumps	2 Sets
		(vi)	Thrust Bearings (if applicable)	2 Sets
		(vii)	Sleeve nuts and O-rings	2 Sets
		(ix)	Fasteners	1 Set
		(x)	Complete Coupling (Pump & Motor)	1 Set
		(xi)	Mechanical seal (both DE and NDE) if applicable	2 Sets
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CLAUSE NO.	 MANDATORY SPARES FOR WATER SYSTEM		
	Note: One (1) set consists of quantity required for complete replacement for one (1) Pump of each type & size		
	b)	Plate Type Heat Exchangers	Quantity
	(i)	Plate Gaskets	150 nos each for TG ECW & SG ECW
	(ii)	Fasteners	01 Set for each TG ECW & SG ECW
	(iii)	Plates	[150 nos (main plates) + 2 nos of end plates for each TG ECW & SG ECW
	Note: One (1) set consists of quantity required for complete replacement for one (1) PHE of each type & size		
	c)	Motors	
		DMCW & ACW Pumps motor with motor bearing	1 no motor including its bearing and 1 additional set bearings of each type & size
	d)	Electrically operated hoist	
	i)	Bearings	1 Set
	ii)	Rope guide	1 Set
	iii)	Brake lining	1 Set
	iv)	Wire rope	1 Set
	v)	Motor	1no. of each type, size & rating
	Note: One (1) set consists of quantity required for complete replacement for one (1) hoist of each type & capacity.		
	NO	DESCRIPTION	QUANTITY
	A)	MECHANICAL /ELECTRICAL (Drive) ITEMS (Induced Draught Cooling Tower)	
	1)	Drive Shaft assembly complete with balanced couplings with all the fasteners	~~3 Sets~~ 2 sets
	2)	Complete fan and hub assembly matched and balanced	2 Set
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CLAUSE NO.	 MANDATORY SPARES FOR WATER SYSTEM		
	NO	DESCRIPTION	QUANTITY
	3)	Complete gear box	3 No. 1 No
	4)	Set of gear box internals	3 Sets
	5)	Bearings for gear box	3 Sets
	6)	Oil seals & 'O' rings for gear box	6 Sets
	7)	Set of gaskets for gear box	3 Sets
	8)	Coupling (Gearbox end) along with all fasteners	3 Sets
	9)	Coupling (motor end) along with all fasteners	3 Sets
	10)	Spare bolts, nuts, bushes, shims (as applicable) etc. for couplings	6 Sets
	11)	Butterfly valve complete assembly for cell isolation	3 No.
	12)	Spare for Butterfly valves for each size	
		a) Valve discs.	1 No.
		b) Shaft	1 No.
		c) Bearing bushes	1 Set
		d) Seals	1 Set
		e) Gear box units for valve	1 Set
		f) Gear box internals with shaft	1 Set
		g) Bearing & 'O' rings for gear box unit of Valves	1 Set
	13)	Tower Internals :	
		a) Water spray nozzle	10% of total population of one tower
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CLAUSE NO.	MANDATORY SPARES FOR WATER SYSTEM			
	NO	DESCRIPTION	QUANTITY	
		b)Fills (other than concrete fills)	10% of total population of one tower	
		c) Drift eliminator	10% of total population of one tower	
		d)Internal distribution pipes, end caps and couplings	5% of total population of one tower	
		Motor along with bearings	1 No. of each type	
	14) CW Chemical Treatment			
	1) <u>Horizontal Centrifugal Pumps– Acid Unloading Pump</u>			
	Sl. No.	Name of Items	Unit	QTY
	1)	Impeller	Set	1
	2)	Wearing rings – Impeller (if applicable)	Set	2
	3)	Wearing rings – Casing (if applicable)	Set	2
	4)	Shaft	Set	1
	5)	Shaft Sleeves	Set	2
	6)	Mechanical Seal	Set	1
	7)	Coupling between Pump & Drive, bushes, pins with all fasteners & coupling Guards	Set	1
8)	Pump bearings	Set	1	
9)	Motor with Bearings	Set	1	
Note: One set consists of quantity required for complete replacement for one pump				
2) Horizontal Centrifugal Pumps– Dilution Water pumps				
Sl. No.	Name of Items	Unit	QTY	
1)	Impeller	Set	1	
2)	Wearing rings – Impeller (if applicable)	Set	2	
3)	Wearing rings – Casing (if applicable)	Set	2	
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CLAUSE NO.	 MANDATORY SPARES FOR WATER SYSTEM			
	4)	Shaft	Set	1
	5)	Shaft Sleeves	Set	2
	6)	Stuffing box, Gland, Packing & Gland assembly	Set	1
	7)	Coupling between Pump & Drive, bushes, pins with all fasteners & coupling Guards	Set	1
	8)	Pump bearings	Set	1
	9)	Motor with Bearings	Set	1
	Note: One set consists of quantity required for complete replacement for one pump			
	3) ACID DOSING PUMPS			
	Sl. No.	Name of Items	Unit	QTY
	1)	Diaphragms	Set	1
	2)	Coupling between Pump & Drive, bushes, pins with all fasteners & coupling Guards	Set	1
	3)	Pump & Motor Unit assembly	Set	1
	Note: One set consists of quantity required for complete replacement for one pump of each type /Rating			
	4) SCALE / CORROSION INHIBITOR DOSING PUMPS			
	Sl. No.	Name of Items	Unit	QTY
	1)	Complete Pump & Motor Assembly	Set	1
	5) DISPERSANT DOSING PUMPS			
	Sl. No.	Name of Items	Unit	QTY
	1)	Complete Pump & Motor Assembly	Set	1
	6) Agitators			
	Sl. No.	Name of Items	Unit	QTY
	1)	Agitator Assembly with Motor & Gear Box – Scale /corrosion preparation Tank	Set	1
	2)	Agitator Assembly with Motor & Gear Box – Dispersion Tank	Set	1
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CLAUSE NO.	MANDATORY SPARES FOR WATER SYSTEM						
	7) ANY OTHER PUMPS						
	Sl. No.	Name of Items	Unit	QTY			
	1)	Complete Pump & Motor Assembly	Set	1 set for each type of pump			
	15) Auxiliary Water Pumps & raw water Pump						
	A) Vertical Sump & Wet Pit Pumps – (For each Type & Size)						
	Name of Items		Unit	QTY			
	a)	Impeller with nuts & washers	Set	1 set			
	b)	Bearings for Line, Head and Impeller shafts	Set	-do-			
	c)	Thrust Bearings of pump & drive	Set	-do-			
	d)	Wearing rings – Impeller (if applicable)	Set	-do-			
	e)	Wearing rings – Casing (if applicable)	Set	-do-			
	f)	Gland, packing & gland assembly	Set	-do-			
	g)	Impeller Shaft, line shaft and head shaft	Set	-do-			
	h)	Shaft Sleeves	Set	-do-			
	i)	Stuffing box	Set	-do-			
	j)	Pump & Drive Coupling, bushes, pins with all fasteners & coupling guards (as applicable)	Set	-do-			
	k)	All Gaskets	Set	-do-			
	l)	Motor and Motor Bearings of each type and rating	Set	-do-			
	m)	Line Shaft Couplings (if applicable)	Set	-do-			
	16) Horizontal Centrifugal Pumps (For each Type & Size)						
	Name of Items		Unit	QTY			
	a)	Impeller for each type	Set	1			
	b)	Wearing rings – Impeller for each type (if applicable)	Set	1			
	c)	Wearing rings – Casing for each type (if applicable)	Set	1			
	d)	Shaft for each type	Set	1			
	e)	Shaft Sleeves for each type	Set	1			
	f)	Stuffing box for each type	Set	1			
g)	Coupling between Pump & motor, bushes, pins with all fasteners & coupling Guards	Set	1				
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CLAUSE NO.	 MANDATORY SPARES FOR WATER SYSTEM		
	h) Pump bearings for each type	Set	1
	i) Gland, Packing & Gland Assembly for each type	Set	1
	j) Motor and Motor Bearings of each type	Set	1
	Note: One set consists of quantity required for complete replacement for one pump		
	17) C&I :MEASURING INSTRUMENTS(As Applicable)		
	1)	Electronic Transmitters	
	(i)	Transmitters of all types and model. (for the measurement of Pressure, differential pressure, flow, level, etc.) including local indication (if applicable)	2 Nos. of each type and model.
	2)	Temperature elements	
	(i)	Temperature Transmitter	2 Nos. of each type and model.
	(ii)	RTD's*	1 no. of each type
	(iii)	Thermo well	1 no. of each type
		* (With head assembly, terminal block and nipple)	** (to be divided into various insertion lengths in proportion to
	3)	Local Indicators (Non-Electrical type) -As applicable for the package as per the following items	
	(i)	Temperature gauges	1 no. of each range and type
	(ii)	Pressure gauges	1 no. of each range and type
	(iii)	Differential Pressure Gauges,	1 no. of each range and type
	(iv)	Level gauges	1 no. of each range and type
	(v)	Flow gauges excluding Rota meters	1 no. of each range and type
	(vi)	All types of Rota meters	1 no. of each range
	4)	Process Actuated Switch Devices -As applicable for this package, as per the following items	
	(i)	Temperature switches	1 no. of each range and type
	(ii)	Pressure switches	1 no. of each range and type
	(iii)	Differential Pressure switches	1 no. of each range and type
	(iv)	level switches	1 no. of each range and type
	(v)	Flow switches	1 no. of each range and type
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CLAUSE NO.		MANDATORY SPARES FOR WATER SYSTEM			
2.00.00	5)	Solenoid Valves	2 nos. of each type, model and rating.		
	6)	Limit Switches (for Pneumatic Valves and Manual valves)	2 no. of each type		
	Mandatory Spares for PT, DM, Chlorination Systems				
	1)	CLARIFIERS : PT System			
	Sl. No.	Name of Items	Unit	Qty	
	a)	Rake (Scraper) drive	Set	1	
	b)	Turbine drive shaft assembly	Set	1	
	c)	Rake (Scraper) drive shaft assembly	Set	1	
	d)	Worm wheel	Set	1	
	e)	Worm shaft	Set	1	
	f)	All Bearings with motors for Turbine drive, and Rack drive	Set	1	
	Note: One set consists of quantity required for complete replacement for one clarifier or motor as the case may be				
	2) Lime Slurry Transfer Pumps, Lime Dosing Pumps				
	a)	Lime Dosing Pump Unit along with motor	No	1	
	b)	Lime Slurry Transfer Pump Unit along with motor	No	1	
	Note : One set consists of quantity required for complete replacement for one pump				
	3) Alum Dosing Pumps : PT – CW , LET (for tube settlers)				
	a)	Alum Dosing Pump Unit along with motor (for each system)	No	1	
	Note : One set consists of quantity required for complete replacement for one pump				
	4) Absorbant circulation Pumps – CW Chlorine Leak Absorption system				
	Sl. No.	Name of Items	Unit	QTY	
	a)	Impeller	Set	1	
	b)	Wearing rings – Impeller (if applicable)	Set	1	
	c)	Wearing rings – Casing (if applicable)	Set	1	
	d)	Shaft	Set	1	
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CLAUSE NO.	MANDATORY SPARES FOR WATER SYSTEM					
	e) Shaft Sleeves		Set	1		
	f) Mechanical Seal		Set	1		
	g) Pump bearings		Set	1		
	h) Motor along with bearings		Set	1		
	Note : One set consists of quantity required for complete replacement for one pump					
	5) Vertical Sump Pumps (For Each Type & Size)					
	Sl. No.	Name of Items	Unit	QUANTITY		
	a)	Complete Casing including suction (if applicable) bell	Set	1		
	b)	Impeller	Set	1		
	c)	Wearing rings – Impeller (if applicable)	Set	1		
	d)	Wearing rings – Casing (if applicable)	Set	1		
	e)	Impeller Shaft, line shaft and head shaft	Set	1		
	f)	Shaft Sleeves	Set	1		
	g)	Stuffing box	Set	1		
	h)	Line Shaft Couplings (if applicable)	Set	1		
	i)	Impeller, Line and Head shaft bearings (as applicable)	Set	1		
	j)	Motor along with bearings	Set	1		
	Note : One set consists of quantity required for complete replacement for one pump					
	6) Agitators					
	Sl. No.	Name of Items	Unit	QTY		
	a)	Agitator Assembly with Motor and Gear Box – Lime Slaking Tank	Set	1		
	b)	Agitator Assembly with Motor and Gear Box – Lime Preparation Tank – PT System	Set	1		
	c)	Agitator Assembly with Motor and Gear Box – Alum Preparation Tank	Set	1		
	d)	Agitator Assembly with Motor and Gear Box – Coagulant aid Tank – CSSP System	Set	1		
	e)	Agitator Assembly with Motor and Gear Box – Flash Mixer	Set	1		
f)	Agitator Assembly with Motor and Gear Box – Flocculation Tank	Set	1			
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CLAUSE NO.	MANDATORY SPARES FOR WATER SYSTEM			
	7) Valves			
	Sl. No.	Name of Items	Unit	QTY
	a)	Manual Plug Valve	Set	Min 1 no of each type, rating & size
	b)	Motor operated Plug Valve (without motor actuator)	Set	-do-
	c)	Check Valves /Non-return Valve	Set	-do-
	d)	Manual Ball Valve	Set	-do-
	e)	Motor operated Ball Valve (without motor actuator)	Set	-do-
	f)	Manual Globe Valve	Set	-do-
	g)	Manual Diaphragm Valve	Set	-do-
	h)	Motor operated Diaphragm Valve (without motor actuator)	Set	-do-
	i)	Diaphragm for the above Diaphragm Valves	Set	-do-
	j)	Manual Butterfly Valve	Set	-do-
	k)	Motor operated Butterfly Valve (without motor actuator)	Set	-do-
	l)	Manual Gate Valve	Set	-do-
	m)	Motor operated Gate Valve (without motor actuator)	Set	-do-
	11) Electrically Operated Hoists (For each type & capacity)			
		Name of Items	Unit	Qty
		Bearings	Set	1
		Rope guide	Set	1
		Brake lining	Set	1
Note : One set consists of quantity required for complete replacement for one hoist of each type & capacity				
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CLAUSE NO.	MANDATORY SPARES FOR WATER SYSTEM			
	8) Vertical (wet pit) Pumps- (for Each Type & Size)			
	Sl. No.	Name of Items	Unit	QTY
	a)	Impeller with nuts & washers	Set	1 set of each type
	b)	Bearings for Line, Head and Impeller shafts	Set	-do-
	c)	Thrust Bearings of pump & drive	Set	-do-
	d)	Wearing rings – Impeller (if applicable)	Set	-do-
	e)	Wearing rings – Casing (if applicable)	Set	-do-
	f)	Impeller Shaft, line shaft and head shaft	Set	-do-
	g)	Shaft Sleeves	Set	-do-
	h)	Stuffing box	Set	-do-
	i)	Motor along with Bearings	Set	-do-
	j)	Line Shaft Couplings (if applicable)	Set	-do-
	Note : One set consists of quantity required for complete replacement for one pump			
	9) Horizontal Centrifugal Pumps –For Each Type & Size			
	S No.	Name of Items	Unit	QTY
	a)	Impeller for each type	Set	1
	b)	Wearing rings – Impeller for each type (if applicable)	Set	1
	c)	Wearing rings – Casing for each type (if applicable)	Set	1
	d)	Shaft for each type	Set	1
	e)	Shaft Sleeves for each type	Set	1
	f)	Stuffing box for each type	Set	1
	g)	Pump bearings for each type	Set	1
	h)	Motor with bearings for each type	Set	1
Note : One set consists of quantity required for complete replacement for one pump				
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CLAUSE NO.	MANDATORY SPARES FOR WATER SYSTEM						
	10) LET System						
	S.No	Name of Items	Unit	Qty			
	a)	Pack of Lamella Clarifier	Set	1			
	b)	Oil Skimmer (Waste Water Collection Sump)	Set	1			
	CONTROL & INSTRUMENTATION-PT PLANT						
	Sl. No.	ITEM	QUANTITY				
	1.00.00	MEASURING INSTRUMENTS					
	1)	Electronic Transmitters					
	(i)	Transmitters of all types and model. (for the measurement of Pressure, differential pressure, flow, level, etc.) including local indication (if applicable)	2 Nos. of each type and model				
	2)	Temperature elements					
	(i)	Temperature Transmitter	2 Nos. of each type and model				
	(ii)	RTD's*	1 no. of each type				
	(iii)	Thermo well	1 no. of each type				
		* (With head assembly, terminal block and nipple)	** (to be divided into various insertion lengths in proportion to main population)				
	3)	Local Indicators (Non-Electrical type) -As applicable for the package as per the following items					
	(i)	Temperature gauges	1 no. of each range and type				
	(ii)	Pressure gauges	1 no. of each range and type				
	(iii)	Differential Pressure Gauges,	1 no. of each range and type				
	(iv)	Level gauges	1 no. of each range and type				
	(v)	Flow gauges excluding Rota meters	1 no. of each range and type				
	(vi)	All types of Rota meters	1 no. of each range and type.				
	4)	Process Actuated Switch Devices -As applicable for this package, as per the following items					
	(i)	Temperature switches	1 no. of each range and type				
	(ii)	Pressure switches	1 no. of each range and type				
	(iii)	Differential Pressure switches	1 no. of each range and type				
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CLAUSE NO.	MANDATORY SPARES FOR WATER SYSTEM			
2.01.00	(iv)	level switches	1 no. of each range and type	
	(v)	Flow switches	1 no. of each range and type	
	5)	Solenoid Valves	2 Nos. of each type and model	
	6)	Limit Switches (for Pneumatic Valves and Manual valves)	2 no. of each type	
	7)	ANALYSERS		
	1)	Complete PH Analyzer (including Flow Through type cell and Electrode, Electronic Transmitter unit, Pre-fabricated cable with connector as minimum)	1 Set of each type	
	2)	Complete Conductivity Analyzer (including Flow Through type cell and Electrode, Electronic Transmitter unit, Pre-fabricated cable with connector as minimum)	1 Set of each type	
	3)	Complete Turbidity Analyzer (including sensing unit, Electronic Transmitter unit, Pre-fabricated cable with connector as minimum)	1 Set of each type	
	4)	Complete Residual Chlorine Analyzer (including sensing unit, Electronic Transmitter unit, Pre-fabricated cable with connector as minimum)	1 Set of each type	
	CPU			
	Mandatory spares of CPU/Regeneartion Area - Mechanical			
	SI No:	Material Description	Quantity	
	1	Nozzles/Strainers for Service Vessel	1 set of required qty for one vessel	
	CPU Regeneration Area			
	1	Nozzles/Strainers for Regeneration area Vessels	One fourth of required quantity of one vessel	
	2	Bottom Consep for ARU/CRU	1 no	
	CPU/Regen Area Blowers			
1	Impeller with lock nuts and washers	1 set		
2	Air Filters	2 no.		
3	Bearings for drive & driven	1 set		
4	Gears (if applicable)	1 set		
5	V-belts	1 Set for each drive		
CPU/Regen Area Pumps including N-pit & Backwash				
1	Impeller for each type	1 set		
2	Wearing rings – Impeller for each type (if applicable)	1 set		
3	Wearing rings – Casing for each type (if applicable)	1 set		
4	Shaft for each type	1 set		
5	Shaft Sleeves for each type	1 set		
6	Stuffing box for each type (if applicable)	1 set		
7	Pump bearings for each type	1 set		
8	Gland , Packing & Gland Assembly/Mechanical seal assy. for each type (as applicable)	1 set		
9	Diaphragm Pump for acid/alkali injection &	1 complete pump set		
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CLAUSE NO.	 MANDATORY SPARES FOR WATER SYSTEM		
		dosing	
	10	Diaphragms for acid/alkali injection & dosing	Minimum 2 no. each type, size & rating 2 no. Minimum of each type, size & rating
	11	Strainers in pipelines	Minimum 1 no. each type, size & rating 1no. Minimum of each type, size & rating
	12	Relief Valves in Air Blowers unit	Minimum 1 no. each type, size & rating 1no. Minimum of each type, size & rating
	CPU/Regen Area Valves		
	1	Diaphragm Valves of All types	1 no of each type, size & rating for total population < 10 nos 2 nos of each type, size & rating for total population ≥ 10 nos
	2	Diaphragms	One fourth quantity of total population
	3	NRV (Flap type and Dual Plate Type)	Minimum 1 no. each type, size & rating minimum 1no. of each type, size & rating
	4	Ball Valves of all types	Minimum 1 no. each type, size & rating minimum 1no. of each type, size & rating
	5	Butterfly Valves of all types	Minimum 1 no. each type, size & rating minimum 1no. of each type, size & rating
	6	Any other type valve	Minimum 1 no. each type, size & rating minimum 1no. of each type, size & rating
	Agitators		
	1	Agitator assy. With motor and gear box - Alkali Preparation Tank	1 complete set
	2	Agitator assy. With motor and gear box - Alkali Day Tank	1 complete set
	3	Agitator assy. With motor and gear box - Lime Tank near N-pit	1 complete set
	4	Any other agitator assembly with motor & gear box (if applicable)	1 complete set
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB SECTION –VI CHAPTER-8 WATER SYSTEM PAGE 18 OF 27

CLAUSE NO.	 MANDATORY SPARES FOR WATER SYSTEM		
	CONTROL & INSTRUMENTATION –CPU		
Sl. No.	ITEM	QUANTITY	
1.00.00	MEASURING INSTRUMENTS		
1)	Electronic Transmitters		
(i)	Transmitters of all types and model. (for the measurement of Pressure, differential pressure, flow, level, etc.) including local indication (if applicable)	10 % or 1 no. of each type and model whichever is more	
2)	Temperature elements		
(i)	Temperature Transmitter	10 % or 1 no. of each type and model whichever is more	
(ii)	RTD's*	1 no. of each type	
(iii)	Thermo well**	1 no. of each type	
	* (With head assembly, terminal block and nipple) ** (to be divided into various insertion lengths in proportion to main population)		
3)	Local Indicators (Non-Electrical type) - As applicable for the package as per the following items		
(i)	Temperature gauges	1 no. of each range and type	
(ii)	Pressure gauges	1 no. of each range and type	
(iii)	Differential Pressure Gauges,	1 no. of each range and type	
(iv)	Level gauges	1 no. of each range and type	
(v)	Flow gauges excluding Rota meters	1 no. of each range and type	
(vi)	All types of Rota meters	1 no. of each range and type	
4)	Process Actuated Switch Devices -As applicable for this package, as per the following items		
(i)	Temperature switches	1 no. of each range and type	
(ii)	Pressure switches	1 no. of each range and type	
(iii)	Differential Pressure switches	1 no. of each range and type	
(iv)	level switches	1 no. of each range and type	
(v)	Flow switches	1 no. of each range and type	
5)	Solenoid Valves	10 % or 1 no. of each type and model whichever is more	
6)	Limit Switches (for Pneumatic Valves and Manual valves)	2 no. of each type	
7)	ANALYSERS		
1)	Complete PH Analyzer (including Flow through type cell and electrode, Electronic transmitter unit, Pre-fabricated cable with connector as minimum)	1 Set of each type	
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB SECTION –VI CHAPTER-8 WATER SYSTEM PAGE 19 OF 27

CLAUSE NO.	MANDATORY SPARES FOR WATER SYSTEM			
				
	SI. No.	ITEM	QUANTITY	
	2)	Complete Conductivity Analyzer (including Flow through type cell and Electrode, electronic Transmitter unit, Pre-fabricated cable with connector as minimum)	1 Set of each type	
	3)	Complete Silica Analyzer (including sensing unit, Electronic Transmitter unit, Pre-fabricated cable with connector Rubber Tubes & Capillary Tubes, solenoid valves, as minimum) along with sample sequencing unit	1 Set of each type	
	4	Complete Turbidity Analyzer (including sensing unit, Electronic Transmitter unit, Pre-fabricated cable with connector as minimum)	1 Set of each type	
	5	Dissolved O ₂ Analysers (including sensing unit, Electronic Transmitter unit, Pre-fabricated cable with connector as minimum) (if applicable)	1 Set of each type	
	6	Turbidity analysers (including sensing unit, Electronic Transmitter unit, Pre-fabricated cable with connector as minimum) (if applicable)	1 Set of each type	
	Note	Reagents for analysers of SWAS and DM/CPU systems should be supplied at the time of commissioning of the analysers		
2.02.00	DEMINERALISATION PLANT			
	1) ACTIVATED CARBON FILTER			
	SI. No.	Name of Items	Unit	QUANTITY
	a)	Strainers for activated (of DM Stream) carbon filters or Header lateral	No / Set	Min.100 nos or 1 Set whichever is more
	b)	Activated Carbon filter media (for both DM stream & alkali filter application)	%	1.1 times of One AC filter
	Note: One set consists of quantity required for complete replacement for one AC filter of each type /application as the case may be.			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB SECTION –VI CHAPTER-8 WATER SYSTEM PAGE 20 OF 27

CLAUSE NO.	MANDATORY SPARES FOR WATER SYSTEM				
	2) CATION EXCHANGERS				
	Sl. No.	Name of Items	Unit	QUANTITY	
	a)	Middle collector assembly for each stream of MSRL (In case of counter current regeneration system)	No	1 Nos for each DM Stream	
	b)	Strong Acid Cation resin	---	1.1 times of One (1) full charge of One (1) cation vessel	
	c)	Weak Acid Cation resin	---	1.1 times of One (1) full charge of One (1) cation vessel	
	d)	Strainers for Strong Acid Cation Exchanger or Header lateral	No / Set	Min.100 nos or 1 Set whichever is more	
	e)	Strainers for Weak Acid Cation Exchanger or Header lateral (if applicable)	No / Set	Min.100 nos or 1 Set whichever is more	
	3) ANION EXCHANGERS				
	Sl. No.	Name of Items	Unit	QUANTITY	
	a)	Middle collector assembly. for each stream of MSRL (In case of counter current regeneration system)	No	1 Nos for each DM Stream	
	b)	Weak Base Anion resin	---	1.1 times of One (1) full charge of One (1) Anion vessel	
	c)	Strong Base Anion resin	---	1.1 times of One (1) full charge of One (1) Anion vessel	
	d)	Strainers for Strong Base Anion Exchanger or Header lateral	No / Set	Min.100 nos or 1 Set whichever is more	
	4) MIXED BED EXCHANGERS				
	Sl. No.	Name of Items	Unit	QUANTITY	
	a)	Middle collector assembly for Mixed Bed	No	1 Nos for each DM Stream	
	b)	Strong Acid Cation resin	---	1.1 times of One (1) full charge of One (1) Mixed bed vessel	
	c)	Strong Base Anion resin	---	1.1 times of One (1) full charge of One (1) Mixed bed vessel	
	d)	Strainers for MB exchanger or Header lateral	No / Set	Min. 50 nos or 1 Set whichever is more	
	5) VALVES (DM PLANT)				
	SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB SECTION –VI CHAPTER-8 WATER SYSTEM	PAGE 21 OF 27

CLAUSE NO.	MANDATORY SPARES FOR WATER SYSTEM			
	Sl. No.	Name of Items	Unit	QUANTITY
	a)	Manual Diaphragm valves and Pneumatic operated diaphragm valves with actuators	LOT	1 no of each type, size & rating for total population < 10 nos 2 nos of each type, size & rating for total population ≥ 10 nos
	b)	Diaphragm for above valves	LOT	1 no of each type, size & rating for total population < 10 nos 2 nos of each type, size & rating for total population ≥ 10 nos
	c)	Butterfly Valves (manual and pneumatic operated valves with actuators)	LOT	1 no of each type, size & rating for total population < 10 nos 2 nos of each type, size & rating for total population ≥ 10 nos
	d)	Check Valves /Non-return Valve	LOT	1 no of each type, size & rating for total population < 10 nos 2 nos of each type, size & rating for total population ≥ 10 nos
	e)	Gate Valves	LOT	1 no of each type, size & rating for total population < 10 nos 2 nos of each type, size & rating for total population ≥ 10 nos
	6) Horizontal Centrifugal Pumps – (For Each Type & Size)			
	Sl. No.	Name of Items	Unit	QTY
	a)	Impeller	Set	1
	b)	Wearing rings – Impeller (if applicable)	Set	1
	c)	Wearing rings – Casing (if applicable)	Set	1
	d)	Shaft	Set	1
	e)	Shaft Sleeves	Set	1
	f)	Mechanical Seal	Set	1
	g)	Pump bearings	Set	1
	h)	Motor with Bearings	Set	1
	Note : One set consists of quantity required for complete replacement for one pump			
7) DEGASSER BLOWERS, MIXED BED BLOWERS				
Sl. No.	Name of Items	Unit	QTY	
a)	Impeller with lock nuts & washers	Set	1	
b)	Shaft	Set	1	
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE				
TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001				
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CLAUSE NO.	MANDATORY SPARES FOR WATER SYSTEM			
	c)	Bearings of Blowers	Set	1
	d)	Suction filter Assembly	Set	2
	e)	Motor with Bearings	Set	1
	Note : One set consists of quantity required for complete replacement for one blower of each type /Rating			
	8) Agitators			
	Sl. No.	Name of Items	Unit	QTY
	a)	Agitator Assembly with Motor and Gear Box – Alkali Preparation Tank	Set	1
	b)	Agitator Assembly with Motor and Gear Box – Alkali Day Tank	Set	1
	c)	Agitator Assembly with Motor and Gear Box – Lime Tank near N.Pit	Set	1
	d)	Agitator Assembly with Motor and Gear Box – Brine Preparation tank	Set	1
	09) DOSING EJECTORS			
	Sl. No	Name of Items	Unit	QUANTITY
				For Acid applicationFor Alkali application
	a)	Complete Ejector Assembly	Set	11
	Note : One set consists of quantity required for complete replacement for one ejector of each type & capacity			
	CONTROL & INSTRUMENTATION-DM PLANT			
	Sl. No.	ITEM	QUANTITY	
	1.00.00	MEASURING INSTRUMENTS		
	1)	Electronic Transmitters		
	(i)	Transmitters of all types and model. (for the measurement of Pressure, differential pressure, flow, level, etc.) including local indication (if applicable)	2 Nos. of each type and model	
	2)	Temperature elements		
(i)	Temperature Transmitter	2 Nos. of each type and model		
(ii)	RTD's*	1 no. of each type		
(iii)	Thermo well	1 no. of each type		
	* (With head assembly, terminal block and nipple)	** (to be divided into various insertion lengths in proportion to main population)		
3)	Local Indicators (Non-Electrical type) -As applicable for the package as per the following items			
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE				
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CLAUSE NO.	 MANDATORY SPARES FOR WATER SYSTEM		
-	(i)	Temperature gauges	1 no. of each range and type
	(ii)	Pressure gauges	1 no. of each range and type
	(iii)	Differential Pressure Gauges,	1 no. of each range and type
	(iv)	Level gauges	1 no. of each range and type
	(v)	Flow gauges excluding Rota meters	1 no. of each range and type
	(vi)	All types of Rota meters	1 no. of each range and type.
	4)	Process Actuated Switch Devices -As applicable for this package, as per the following items	
	(i)	Temperature switches	1 no. of each range and type
	(ii)	Pressure switches	1 no. of each range and type
	(iii)	Differential Pressure switches	1 no. of each range and type
	(iv)	level switches	1 no. of each range and type
	(v)	Flow switches	1 no. of each range and type
	5)	Solenoid Valves	2 Nos. of each type and model
	6)	Limit Switches (for Pneumatic Valves and Manual valves)	2 no. of each type
	7)	ANALYSERS	
	1)	Complete PH Analyzer (including Flow Through type cell and Electrode, Electronic Transmitter unit, Pre-fabricated cable with connector as minimum)	1 Set of each type
	2)	Complete Conductivity Analyzer (including Flow Through type cell and Electrode, Electronic Transmitter unit, Pre-fabricated cable with connector as minimum)	1 Set of each type
	3)	Complete Turbidity Analyzer (including sensing unit, Electronic Transmitter unit, Pre-fabricated cable with connector as minimum)	1 Set of each type
	4)	Complete Residual Chlorine Analyzer (including sensing unit, Electronic Transmitter unit, Pre-fabricated cable with connector as minimum)	1 Set of each type
	2.00.00	CONTROL VALVES, ACTUATORS AND ACCESSORIES	
	2.01.00	Control valve Smart Positioner Unit	1 No. of each type
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB SECTION –VI CHAPTER-8 WATER SYSTEM PAGE 24 OF 27

CLAUSE NO.	MANDATORY SPARES FOR WATER SYSTEM			
2.03.00	CHEMICAL STORAGE & DOSING SYSTEM			
	B- 1) Anti-Scalant Dosing Pumps, Anti-Oxidant Dosing Pumps			
	SI. No.	Name of Items	Unit	QTY.
	a)	Dosing Pump with Motor unit of each type / size	No	1
	Note : One set consists of quantity required for complete replacement for one pump			
	B-2) Horizontal Centrifugal Pumps (For Each Type & Size)			
	SI. No.	Name of Items	Unit	QTY.
	a)	Impeller with nuts & other accessories	Set	1
	b)	Wearing rings (Impeller & Casing ; as applicable)	Set	1
	c)	Shaft	Set	1
	d)	Shaft Sleeves	Set	1
	e)	Pump bearings	Set	1
	f)	Mechanical Seal	Set	1
	g)	Motor with bearings	Set	1
	Note : One set consists of quantity required for complete replacement for one pump			
	B- 3) Dosing (Metering) Pumps (For Each Type & Size)			
	SI. No.	Name of Items	Unit	QTY.
	a)	Dosing Pump unit with Motor of each type / size	No	1
	C) Valves For RO & UF The mandatory spares shall be as indicated under DM plant			
	a)	Cartridge Filter Element	Set	1
	10) Flushing Cleaning System (RO Plant)			
	SI. No.	Name of Items	Unit	QTY
	a)	Flushing Pump	No	1
	B- 1) Anti-Scalant Dosing Pumps, Anti-Oxidant Dosing Pumps			
	SI. No.	Name of Items	Unit	QUANTITY
	a)	Dosing Pump unit with Motor of each type / size	No	1
	Note : One set consists of quantity required for complete replacement for one pump			
	B-2) Horizontal Centrifugal Pumps (For Each Type & Size)			
SI. No.	Name of Items	Unit	QTY.	
a)	Impeller with nuts & other accessories	Set	1	
b)	Wearing rings (Impeller & Casing ; as applicable)	Set	1	
c)	Shaft	Set	1	
d)	Shaft Sleeves	Set	1	
e)	Pump bearings	Set	1	
f)	Mechanical Seal	Set	1	
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		SUB SECTION –VI CHAPTER-8 WATER SYSTEM		
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CLAUSE NO.	MANDATORY SPARES FOR WATER SYSTEM			
	g)	Motor with bearings	Set	1
	Note : One set consists of quantity required for complete replacement for one pump			
	B- 3) Dosing (Metering) Pumps (For Each Type & Size)			
	Sl. No.	Name of Items	Unit	QUANTITY
	a)	Dosing Pump unit of each type / size	No	1
	b)	Motor with bearings	Set	1
	C) Valves For RO & UF The mandatory spares shall be as indicated under DM plant			
	11) <u>Horizontal Centrifugal Pumps –CW Makeup Pumps, service water, Air pre-heater wash, Chlorine Water Booster Pumps – CW System, PT System, Final Effluent Disposal Pumps, (If applicable)</u>			
	Name of Items	Unit	QTY	
Impeller for each type	Set	1		
Wearing rings – Impeller for each type (if applicable)	Set	1		
Wearing rings – Casing for each type (if applicable)	Set	1		
Shaft for each type	Set	1		
Shaft Sleeves for each type	Set	1		
Stuffing box for each type	Set	1		
Coupling between Pump & motor, bushes, pins with all fasteners & coupling Guards	Set	1		
Pump bearings for each type	Set	1		
Gland , Packing & Gland Assembly for each type	Set	1		
Motor along with bearings	No	1 no. of each type and rating		
Note: One set consists of quantity required for complete replacement for one pump				
Miscellaneous (Electrical & C&I Items)				
S.no.	Item Description		Quantity	
	a. Motor for Raw water pump (PT plant)- If applicable		1 no.	
	b. Motor for Raw Water Pumps (Ash handling		1 no.	
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001		SUB SECTION –VI CHAPTER-8 WATER SYSTEM	PAGE 26 OF 27

CLAUSE NO.	MANDATORY SPARES FOR WATER SYSTEM 		
		Plant) - If applicable	
		c. Motor for travelling water screen- If applicable	1 no.
	IV	ELECTRICAL ACTUATOR	
	1	Actuators	10% or 1 no. of each type, class, size and model whichever is more.
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB SECTION –VI CHAPTER-8 WATER SYSTEM PAGE 27 OF 27



CHAPTER-9

FUEL OIL UNLOADING SYSTEM

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

CLAUSE NO.	MANDATORY SPARES FOR FO UNLOADING SYSTEM		
	ITEM	QUANTITY	
1.00.00	MECHANICAL ITEMS		
1.01.00	Strainer elements		
	a. F.O. Drain pumps	1 no.	
	b. LDO unloading pumps	1 no. of each type	
1.02.00	Relief valve complete assembly		
	a. LDO unloading pumps	1 no. of each type	
1.03.00	Bearings of:		
	a. LDO unloading pumps	1 set of each type	
	b. F. O. Drain pumps	1 set	
1.04.00	Rotor Assembly (Complete cartridge assembly)		
	a. LDO unloading pumps	1 no. of each type	
	b. F. O. Drain pumps	1 no.	
1.05.00	Coupling Bolts with nuts, washer and bushes for LDO unloading pumps	1 set for each size of coupling	
1.06.00	Wearing Rings	1 set for each type of pump	
1.07.00	Gland Packing (if applicable)	1 set for each type of pump	
1.08.00	Mechanical seal Assembly (if applicable)	2 sets for each type	
1.09.00	Shaft Sleeve	1 set for each type of pump	
1.10.00	Valves (Each type and size)	a) 1 number, where the total quantity of a particular type and size of valve is less than or equal to 10. b) 2 numbers, where the total quantity of a particular type and size of valve is less than 40 but more than 10. c) 10% of total quantity (to nearest whole number) of a particular type and size of valve, where the total	
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-VI CHAPTER - 9 FO Unloading System
			PAGE 1 OF 3

CLAUSE NO.	MANDATORY SPARES FOR FO UNLOADING SYSTEM 		
1.11.00	Neoprene rubber unloading hoses (For LDO) with end connections complete hose)	quantity of a particular type and size of valve is more than 40 Ten (10) Nos.	
1.12.00	Dirty Oil Pump complete assembly with motor	01 set.	
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-VI CHAPTER - 9 FO Unloading System PAGE 2 OF 3



CHAPTER-10

ELECTRICAL

CLAUSE NO.	MANDATORY SPARES FOR ELECTRICAL																																
	<table><tr><th>Sr. No.</th><th>Description</th><th>Quantity</th></tr><tr><td>1.</td><td>Switchyard 400kV AIS</td><td></td></tr><tr><td>1.01.00</td><td>Circuit Breaker</td><td></td></tr><tr><td></td><td>a. Relays, power contactors, switch-fuse units, limit switches, Auxiliary switch assembly, push buttons, timers & MCB for electrical control circuit (consisting of one no. each of all types and ratings)</td><td>1 Set</td></tr><tr><td></td><td>b. Set of gaskets, rings & seals</td><td>1 Set</td></tr><tr><td></td><td>c. Molecular filter for Circuit breaker</td><td>1 Set</td></tr><tr><td></td><td>d. Tripping coils with resistors and closing coil with resistor (each type)</td><td>3 Nos</td></tr><tr><td></td><td>e. Density / pressure monitoring system for circuit breaker</td><td>1 Set</td></tr><tr><td></td><td>f. Set of spares for pneumatic/ Spring/ hydraulic operated mechanism(as applicable) as per the main supply of circuit breaker applicable.</td><td>1 Set</td></tr><tr><td></td><td>g. Spare of pneumatic/spring/hydraulic operated mechanism: 1) Spare of pneumatic operated mechanism - Complete compressor assembly along with motor, accessories and coupling along with regenerating unit (wherever applicable) – 1 set. - Micro Filters – 1No. - Coupling for compressed air – 1set - Pressure switch and valve – 1 no. of each type - Pressure gauges – 1 Set - Gaskets – O-rings & seals – 1Set - Dowty Seal – 1set - Operating drive – 1 set 2) Spare of spring-operated mechanism(complete) - Spring charging Motor – 1 no - Limit switch etc. – 1 no. of each type - Closing dash pot – 1 Set - Opening dash pot – 1 Set - Opening catch gear – 1 Set - Complete spring operating mechanism – 1 Set 3) Spare of hydraulic operated mechanism - Hydraulic operating mechanism with drive Motor – 1 no. - Ferrules and joints – 1 Set - Hydraulic Filter – 3 Sets - High Pressure Hose – 1 Set - N2 accumulator – 2 No. - Pressure Transducers – 1No. </td><td>1 Set for each type of Circuit Breaker</td></tr></table>			Sr. No.	Description	Quantity	1.	Switchyard 400kV AIS		1.01.00	Circuit Breaker			a. Relays, power contactors, switch-fuse units, limit switches, Auxiliary switch assembly, push buttons, timers & MCB for electrical control circuit (consisting of one no. each of all types and ratings)	1 Set		b. Set of gaskets, rings & seals	1 Set		c. Molecular filter for Circuit breaker	1 Set		d. Tripping coils with resistors and closing coil with resistor (each type)	3 Nos		e. Density / pressure monitoring system for circuit breaker	1 Set		f. Set of spares for pneumatic/ Spring/ hydraulic operated mechanism(as applicable) as per the main supply of circuit breaker applicable.	1 Set		g. Spare of pneumatic/spring/hydraulic operated mechanism: 1) Spare of pneumatic operated mechanism - Complete compressor assembly along with motor, accessories and coupling along with regenerating unit (wherever applicable) – 1 set. - Micro Filters – 1No. - Coupling for compressed air – 1set - Pressure switch and valve – 1 no. of each type - Pressure gauges – 1 Set - Gaskets – O-rings & seals – 1Set - Dowty Seal – 1set - Operating drive – 1 set 2) Spare of spring-operated mechanism(complete) - Spring charging Motor – 1 no - Limit switch etc. – 1 no. of each type - Closing dash pot – 1 Set - Opening dash pot – 1 Set - Opening catch gear – 1 Set - Complete spring operating mechanism – 1 Set 3) Spare of hydraulic operated mechanism - Hydraulic operating mechanism with drive Motor – 1 no. - Ferrules and joints – 1 Set - Hydraulic Filter – 3 Sets - High Pressure Hose – 1 Set - N2 accumulator – 2 No. - Pressure Transducers – 1No.	1 Set for each type of Circuit Breaker
Sr. No.	Description	Quantity																															
1.	Switchyard 400kV AIS																																
1.01.00	Circuit Breaker																																
	a. Relays, power contactors, switch-fuse units, limit switches, Auxiliary switch assembly, push buttons, timers & MCB for electrical control circuit (consisting of one no. each of all types and ratings)	1 Set																															
	b. Set of gaskets, rings & seals	1 Set																															
	c. Molecular filter for Circuit breaker	1 Set																															
	d. Tripping coils with resistors and closing coil with resistor (each type)	3 Nos																															
	e. Density / pressure monitoring system for circuit breaker	1 Set																															
	f. Set of spares for pneumatic/ Spring/ hydraulic operated mechanism(as applicable) as per the main supply of circuit breaker applicable.	1 Set																															
	g. Spare of pneumatic/spring/hydraulic operated mechanism: 1) Spare of pneumatic operated mechanism - Complete compressor assembly along with motor, accessories and coupling along with regenerating unit (wherever applicable) – 1 set. - Micro Filters – 1No. - Coupling for compressed air – 1set - Pressure switch and valve – 1 no. of each type - Pressure gauges – 1 Set - Gaskets – O-rings & seals – 1Set - Dowty Seal – 1set - Operating drive – 1 set 2) Spare of spring-operated mechanism(complete) - Spring charging Motor – 1 no - Limit switch etc. – 1 no. of each type - Closing dash pot – 1 Set - Opening dash pot – 1 Set - Opening catch gear – 1 Set - Complete spring operating mechanism – 1 Set 3) Spare of hydraulic operated mechanism - Hydraulic operating mechanism with drive Motor – 1 no. - Ferrules and joints – 1 Set - Hydraulic Filter – 3 Sets - High Pressure Hose – 1 Set - N2 accumulator – 2 No. - Pressure Transducers – 1No.	1 Set for each type of Circuit Breaker																															
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-VI CHAPTER-10 ELECTRICAL	PAGE 1 OF 11																														

CLAUSE NO.	MANDATORY SPARES FOR ELECTRICAL		
		- Valves – 1 Set - Orings, gaskets and seals – 1 Set - Pressure switches and pressure gauges – 1 Set - Hydraulic oil – 15% of total used quantity in substation - Limit switch – 1 no. of each type	
		h. Fixed and moving arcing contact assemblies including insulating Nozzles etc. for 1 interrupter (each type & rating of Breaker)	2 Set
		i. Terminal connector	3 Nos. of each type
		j. Actuator rings if required	6nos
		k. Magnetic ventile if required	3nos
		l. Operation counter	1no
		m. SF6 gas	Not Applicable
		n. Pressure Gauge and coupling	1set
		o. Pressure switches	1set
		p. Terminal Pads and connectors	~~2set~~ 1set
		q. Corona rings	1no
		r. Grading capacitor if applicable	3nos
		s. One complete pole (phase) of circuit breaker including CSD/Closing resistor, grading capacitor(as applicable), pole column, interrupter, Unit operating mechanism, marshalling box excluding supporting structure, terminal connectors and common operating Mechanism	1 No. of each type and Rating
	1.02.00	Disconnecter	
		a. One complete pole of each type of HCB isolator with 1 E/S along with operating mechanisms, insulators etc. without support structure	1 no. of each type & rating
		b. Isolator Arms with finger contacts and current carrying assembly	1set
		c. Relay, power contactors, switch fuses, timers, key interlock pushbutton switch for electrical control circuit	1 Set
		d. Limit switch & aux. switch	6 Nos. of each type
		e. Terminal Pads and connectors	3 Nos. of each type
		f. Rotary Bearing for Isolator	3 Nos. of each type
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO.:CW-CM-11159-C-O-M-001	SUB-SECTION-VI CHAPTER-10 ELECTRICAL PAGE 2 OF 11

CLAUSE NO.	MANDATORY SPARES FOR ELECTRICAL			
		g. Motor with hear assembly and bevel gear assembly	1no	
		h. Coronal shield rings	3nos	
		i. Hinge pins	3nos	
		j. Copper contacts fingers for male & female contacts	2sets	
		k. Support insulators	1set	
	1.03.00	Current Transformer complete in all respects including terminal connectors etc. (120% Rating)	4 nos of each type & rating	
	1.03.01	Primary Terminal Bushings	Not Applicable	
	1.04.00	Surge Arrester complete in all respects with surge counter, terminal connector etc.	2 Nos	
	1.04.01	Surge counter/Monitor	2 Nos	
	1.05.00	Capacitor Voltage Transformer complete in all respects including terminal connectors etc.	2 nos of each type & rating	
	1.05.01	Bus Post Insulator Assembly (Complete)	2 Nos of each type	
	1.06.00	Clamps and connectors (Minimum 3 Nos. of each type)	5% of total population	
	1.07.00	Spacers and corona bells.	(Minimum 1 nos of each type)	
	1.08.00	String Insulators and associated hardware's	2 nos of each type	
	1.09.00	Disc Insulators	Not Applicable	
	1.10.00	Long Rod insulator	Not Applicable	
	1.09.00	SAS Including GRPs		
		A. Bay Control unit (complete with all components)	2 Nos.	
		B. Numerical Relays comprising various bay protection units, Bus Bar(CU & PU) and grp	1 No. of each type	
		C. Cards/modules of Generator Disturbance Recorder, Line DR (if stand-alone)	1 No. of each type	
		D. Energy Meter	1 no. of each type	
		E. Operator work station (OWS) along with software, monitor, mouse, keyboard, printer etc.	1 No.	
		F. Complete Network Controller / Server along with software	1 No.	
		G. Complete Programming station along with software, monitor etc.	1 No.	
		H. LAN switches (if included in main package)	1 No. of each type	
	I. Firewall(if included in main package)	1 No of each Type		
	J. Media cleaning solution	2 bottles		
	K. Fuses	40% of each type and rating		
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	L. Terminal Blocks	5 nos. of each type, make, model and rating
	M. Interface cables containing standard length of each type of cable and its connector for each type of peripheral	2 Sets
	N. MCBs	50% of each type, make and model used in the system
	O. Relays other than numerical relays	10% of each type of total population (min 1 no.)
	P. Gateways	1 no. of each type
	Q. Modem (if applicable)	1 no. of each type
	R. LIU of OFC including necessary connectors	1 no. of each type
	S. Transducers	1 no. of each type
	T. Auxiliary CT/PT	1 no. of each type

CLAUSE NO.	MANDATORY SPARES FOR ELECTRICAL						
2.	LIST OF MANDATORY SPARES for oil filled transformers/reactor						
	S. No	ITEMS DESCRIPTION	GT	ST	UT	Aux. Trans. (for each rating)	REACTOR
	1.	HV Bushing with metal parts and gaskets (See Note 1)	1 No.	1 No.	2 No.	1 No.	1 No.
	2.	HV Neutral bushing with metal parts and gaskets	2 No.	1 No.	-	1 No. (if applicable)	1 No.
	3.	MV Bushing with metal parts and gaskets (See Note 1)	-	-	-	-	-
	4.	LV bushing with metal parts and gaskets (See Note 1)	2 No.	2 No.	2 No.	1 No.	-
	5.	LV Neutral bushing with metal parts and gaskets	-	1 No.	1 No.	1 No. (if applicable)	-
	6.	WTI with contacts	1 No.	1 No.	1 No.	1 No.	1 No.
	7.	OTI with contacts	1 No	1 No.	1 No.	1 No.	1 No.
	8.	Pressure relief device	1 No	1 No.	1 No.	1 No. (if applicable)	1 No.
	9.	MOG	2 No.	1 No.	1 No.	1 No.	1 No.
	10.	Buchholz relay complete	1 No.	1 No.	1 No.	1 No.	1 No.
	11.	Oil surge relay	-	1 No.	1 No.	-	-
	12.	Set of gaskets (See Note 2)	1 Set	1 Set	1 Set	1 Set	1 Set
	13.	Set of valves	1 No. of each type/size	1 No. of each type/size	1 No. of each type/size	1 No. of each type/size	1 No. of each type/size
	14.	Cooler fan with motor	2 No.	2 No.	2 No.	-	-
	15.	Oil Pump with motor	2 No.	-	-	-	-
	16.	Oil flow indicator	2 No.	-	-	-	-
	17.	Set of OLTC/OCTC contacts	-	1 Set (OLTC)	1 Set (OLTC)	-	-
	18.	Air cell for conservator	1 No.	1 No.	1 No.	1 No. (if applicable)	1 No.
19.	Neutral Grounding Resistor w/o supporting structure	1 No. each type (as applicable)					
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2.01.00

Dry Type Transformers(EXCEPT STACKER/RECLAIMER)

Note: 1 set consists of quantities required for 1 complete transformer.

3

Bus ducts:

S.No.	Item description	Quantity
1	GENERATOR BUS DUCT	
1	Bus support insulator	20 Nos.
2	Flexible equipment terminal connector complete with hardware complete for one machine (for three phases and neutral)	
	a. Generator	1 Set
	b. Generator transformers	1Set
	c. Unit transformers	1 Set
	d. PT & SP cubicle tap off	1 Set
3	Seal off bushings suitable for	
	a. Main run	1 Nos
	b. Tap off run	1 Nos
4	Rubber belows	

CLAUSE NO.	MANDATORY SPARES FOR ELECTRICAL																																																																													
4.	<table><tr><td></td><td>a. Main run</td><td>1 Nos.</td></tr><tr><td></td><td>b. Delta run</td><td>1 Nos.</td></tr><tr><td></td><td>c. Tap off run</td><td>1 Nos.</td></tr><tr><td>5</td><td>Current trans formers</td><td></td></tr><tr><td></td><td>a. Main run CTs of each type & rating</td><td>2 Nos</td></tr><tr><td></td><td>b. Tap-off run CTs of each type & rating</td><td>2 Nos</td></tr><tr><td>6</td><td>VT & SP Cubicles</td><td></td></tr><tr><td></td><td>a. Lightning arrestor</td><td>2 Nos.</td></tr><tr><td></td><td>b. VT for metering & protection</td><td>2 Nos.</td></tr><tr><td></td><td>c. VT for AVR/EHG/Syn.</td><td>2 Nos.</td></tr><tr><td></td><td>d. VT for performance test, EHG and AVR system</td><td>2 Nos.</td></tr><tr><td></td><td>e. Surge capacitor</td><td>2 Nos.</td></tr><tr><td>7.</td><td>NGT for Generator</td><td>1 no.</td></tr><tr><td>II</td><td>MV Busduct</td><td></td></tr><tr><td>1</td><td>11 kV Busduct</td><td></td></tr><tr><td></td><td>a.Support insulators</td><td>25 Nos.</td></tr><tr><td></td><td>b.Three phase set of flexible terminal connectors for switchgear end of each type & rating</td><td>1 set</td></tr><tr><td></td><td>c.Three phase set of flexible terminal connector for transformer end of each type & rating</td><td>1 set</td></tr><tr><td></td><td>d.Seal off bushings of each type & rating</td><td>2 nos.</td></tr><tr><td>2</td><td>3.3 kV Busduct</td><td></td></tr><tr><td></td><td>a. Support insulators</td><td>25 Nos.</td></tr><tr><td></td><td>b. Three phase set of flexible terminal connectors for switchgear end of each type & rating</td><td>1 set</td></tr><tr><td></td><td>c. Three phase set of flexible terminal connector for transformer end of each type & rating</td><td>1 set</td></tr><tr><td></td><td>d. Seal off bushings of each type & rating</td><td>2 nos.</td></tr><tr><td colspan="3">NOTE: ONE SET MEANS COMPLETE REQUIREMENT OF ONE PHASE, WHEREVER NOT SPECIFIED</td></tr></table>				a. Main run	1 Nos.		b. Delta run	1 Nos.		c. Tap off run	1 Nos.	5	Current trans formers			a. Main run CTs of each type & rating	2 Nos		b. Tap-off run CTs of each type & rating	2 Nos	6	VT & SP Cubicles			a. Lightning arrestor	2 Nos.		b. VT for metering & protection	2 Nos.		c. VT for AVR/EHG/Syn.	2 Nos.		d. VT for performance test, EHG and AVR system	2 Nos.		e. Surge capacitor	2 Nos.	7.	NGT for Generator	1 no.	II	MV Busduct		1	11 kV Busduct			a.Support insulators	25 Nos.		b.Three phase set of flexible terminal connectors for switchgear end of each type & rating	1 set		c.Three phase set of flexible terminal connector for transformer end of each type & rating	1 set		d.Seal off bushings of each type & rating	2 nos.	2	3.3 kV Busduct			a. Support insulators	25 Nos.		b. Three phase set of flexible terminal connectors for switchgear end of each type & rating	1 set		c. Three phase set of flexible terminal connector for transformer end of each type & rating	1 set		d. Seal off bushings of each type & rating	2 nos.	NOTE: ONE SET MEANS COMPLETE REQUIREMENT OF ONE PHASE, WHEREVER NOT SPECIFIED		
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CLAUSE NO.	MANDATORY SPARES FOR ELECTRICAL		
5.	11	Moving contact assembly of each rating (One set means complete replacement for one breaker)	2 SET
	12	Stationary fixed contact of each rating.(One set means complete replacement for one breaker)	2 SET
	11	Numerical Relay Networking System (Switchgear SCADA)	
		a. Ethernet Switch of each type / model / configuration (mounted in Switchgears / Data concentrator Panels)	10% of total quantity (minimum 1No.)
		b. FO Cable terminal equipment of each type such as LIUs along with associated Patch cords & connectors	10% of total quantity (minimum 1No.)
		c. Power supply modules of each type & rating (mounted in Switchgears / Data concentrator Panels, as applicable)	10% of total quantity (minimum 1No.)
		d. Maintenance tools and accessories for maintenance of HT Switchgear	2 Nos.
	LT Switchgears & LT Busducts		
	S. No.	Item Description	Quantity
	1	Complete breaker of each rating	10 Nos.
	2	Numerical Relays of each type	5 Nos.
	3	Auxiliary Relays of each type	02 Nos
	4	Horizontal busbar support Insulators	06 Nos
	5	Vertical busbar dropper support insulators	06 Nos
	6	Current transformer of each type & ratio	3 Nos.
7	Voltage transformer of each type & ratio	3 Nos.	
8	Control supply transformer of each type & rating	3 Nos.	
9	Power Contactor of each type and rating	5 Nos	
10	Coil for above contactor for each type and rating	5 Nos.	
11	MCCBs (equally divided for all ratings)	30 Nos.	
12	MPCBs (equally divided for all ratings)	30 Nos.	
13	Closing coil of each type of each rating	10 Nos.	
14	Trip coil of each type of each rating	10 Nos.	
15	Aux contact set of each type and Rating	6 Sets.	
16	Fixed contact set of each type & rating	3 Sets.	
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CLAUSE NO.	MANDATORY SPARES FOR ELECTRICAL																																																												
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CLAUSE NO.	MANDATORY SPARES FOR ELECTRICAL			
	59.	Timer	1 No. of each type & rating	
	60.	Auxiliary relays	1 No. of each type & rating	
	61.	Current transformers	1 No. of each type	
	62.	Voltage transformers	1 No. of each type	
	63.	Battery charging rectifier diodes	4 Nos.	
	64.	Fuses	6 No. of each type & rating	
	65.	Start/Stop push buttons	2 No. of each type & rating	
	66.	Indication lamps	20%	
	67.	Indication lamp holders	10%	
	68.	On/Off isolator	1 No.	
	NOTE: 1SET MEANS COMPLETE REQUIREMENT OF ONE DG			
	9.	CHIMNEY LIGHTING – Aviation Obstruction Lighting		
	a. Power Supply Card	6 nos		
	b. Electronic Flasher Card	3 Nos		
	c. Photocell Control Unit	3 Nos		
	d. Spare lamp/tube with holder for Aviation Obstruction Lighting fixture	12 Nos		
SINGARENI THERMAL POWER PROJECT STAGE-II (1X800 MW) EPC PACKAGE				
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CHAPTER-11

CONTROL & INSTRUMENTATION

**SINGARENI THERMAL POWER PROJECT
STAGE-II (1X800 MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC NO: CW-CM-11159-C-O-M-001**

MANDATORY SPARES

1.00.00

DISTRIBUTED DIGITAL CONTROL MONITORING AND INFORMATION SYSTEM (DDCMIS)

SI No	ITEM	QUANTITY
1.	HMI Devices	
A)	Work station/PC station/servers	
	(i) OWS with licensed software	2 nos. of each type and model
	(ii) LVS workstation with licensed software	2 nos. of each type and model
	(iii) PC Stations with licensed software	1 nos. of each type and model
	(iv) Server/Information Workstation with licensed software (as applicable)	1 no. of each type and model
	(v) Server of station LAN	1 no.
	(vi) Programmer cum documentation station along with licensed software	1 no. of each type and model
	(vii) Keyboard	2 nos. of each type and model
	(viii) Mouse	4 nos. of each type and model
B)	LVS	
	(i) LVS complete with projectors, accessories etc.	1 nos
	(ii) Power supply modules	2 nos
	(iii) All other types of electronic modules/cards for LVS cube etc..	02 nos of each type
	(iv) LVS controller unit complete	1 nos
C)	(v) Projectors	3 nos
	(vi) Laser Light Source	100%.
	(vii) Prefab special cables for LVS	2 nos of each type

MANDATORY SPARES

D)	Network Components	
	(i)Switch/repeaters/hubs/firewalls for DDCMIS including Station LAN etc.	1 nos of each type and model
	(ii)Wireless equipment like power supplies, modems, electronic modules, media converter (if applicable), connectors patch card, antenna etc.	1 nos of each type and model
	(iii) Any other device/equipment not covered under above items but required to make system complete.	1 nos of each type and model
E)	Miscellaneous items	
	(i)Hard disk drive unit of each type as offered in main offer complete with disks and other accessories	2 nos (to be divided based on main population)
	(ii)Bulk Storage drive unit	2 nos. of each type and model
	(iii)Graphic processors modules/Card for work station/server	2 nos. of each type and model
F)	Matrix KVM switch	
	(i) Matrix KVM switch	1 nos of each type and model
	(ii) Computer connections (CPU end)	08 nos of each type and model
	(iii) User console	08 nos of each type and model
G)	KVM switch along with associated cables	1 no. of each type and model
H)	GIU	1 no. of each type and model
I)	Other HMIPIS devices required for Unified HMIPIS which are not covered in above items like protocol converters, stations with software, gateway etc.	1 no. of each type and model
(J)	Any other device/items for HMIPIS system which are not	1 no of each type and model

MANDATORY SPARES

	covered in above items but are required to make the system complete.	
2.	Cables and Connectors.	
	(i) Prefab interconnecting cables with connectors	2 no. of each type and length.
	(ii) System bus cable with connectors	2 no. of each type and length.
	(iii) I/O bus cable with connectors for remote I/O units	2 no. of each type and length.
	(iv) Loose Connectors	5 nos. (sets) of each type
3.	Power Supply Modules & Power Packs for control system	20% or 4 nos. of each type model and rating, whichever is more.
4.	Electronic modules of each type and model for control system, Data communication system, Master and Slave Clock etc. (This shall include all type of cards like I/O cards, Remote I/O cards, communication/Interface cards, controller cards, CPU module or Card, logic cards, etc.)	20% or 2 Nos of each type, model and rating whichever is more subject to maximum of 20 Nos of each type.
5.	Bus coupler/Interface hardware / other communication devices.	10% of each type and model or minimum 2 nos. whichever is more
6.	Relays	10% of each type and model or minimum 2 nos. whichever is more
7.	Batteries used for battery backup of RAMs (If applicable)	10% of each type and model or minimum 2 nos. whichever is more
8.	Fuses	200 % of each type and rating
9.	Cooling fans for Power supply and cabinets.	10 % of each type and model
10	Intelligent mini UPS for workstation server, PCs, LVS, L3 switch.	1 no. of each size and rating
11	For all items of Fieldbus system (including field accessories) except fieldbus cables	20% or 2 Nos. of each type, model and rating whichever is more subject to maximum of 40 Nos of each type.

MANDATORY SPARES

12	Fieldbus cable	1% of total length used in the project.

2.00.00

MEASURING INSTRUMENTS

Sl. No.	ITEM	QUANTITY
1	Vibration Monitoring System	
(i)	Sensors along with interfacing cables (*If prefab cable or prefab extension cable is used same should be supplied in proportion)	20% or minimum 2 nos of each make and type whichever is more
(ii)	Power Supply Module Cards	3 nos of each make and type
(iii)	Driver / Interface Cards & all other electronic cards.	3 nos of each make and type
2.	(I) Continuous Emission Monitoring System (CEMS)	
(i)	Analyzer for SO ₂ , NO _x , CO ₂ , CO.	Not Required
(ii)	Flue gas flow measurement instrument	Not Required
(iii)	Analyser for Particulate Matter	Not Required
(iv)	Analyser for Mercury	Not Required
(v)	O ₂ Analyser	Not Required
(vi)	Electronic card assembly/ PCBs, moisture/condensate monitor, power supply modules	2 nos.of each type, model and rating
(vii)	Set of gaskets/O-rings/ seals	4 nos. of each type, model, rating and size
(viii)	Temp. Sensor	2 nos. of each type and model
(ix)	Heater assembly, Coolers/dryers, Pumps, etc.	1 nos of each type and model
(x)	Complete Probe with shield assembly (Not applicable for In situ- path)	1 no. of each type and model
(xi)	Solenoids	2 nos. of each type, model and rating
(xii)	Filters, light source, sensor, detector, etc.	2 nos of each type, model and rating
(xiii)	Calibration gases, Calibration cell and other consumables for calibration: - of all types and ranges.	2 nos of cylinders for each type of calibration gas

MANDATORY SPARES

(xiv)	Blower assembly	1 no. of each type, size and rating.
2 (II)	Oxygen Analyzer (Low & High Temp.)	
(a)	Oxygen measurement instrument	1 no complete instrument (along with probe assembly) of each type and model
(b)	Electronic card assembly/ PCBs, power supply modules	2 nos. of each type, model and rating
(c)	Set of gaskets/O-rings/ seals	4 nos. of each type, model, rating and size
(d)	Temp. Sensor	2 nos. of each type and model
(e)	Heater assembly	2 nos of each type and model
(f)	Solenoids	2 nos. of each type, model and rating
(g)	Filters	4 nos of each type and model
(h)	Calibration gases of all types and ranges.	one two year supply
(I)	Rotameter/Air flow meter	2 nos of each type, model and rating
3	Not Used	
4	Not Used	
5	Electrical instrument	
5.1	Voltage transducer	One number of each type and model
5.2	Frequency Transducer	One number of each type and model
5.3	Check Relay	One number of each type and model
5.4	Guard Relay	One number of each type and model
5.5	Auxiliary relay	One number of each type and model
5.6	Auxiliary Potential Transformer	One number of each type and model

3.00.00 POWER SUPPLY SYSTEM

3.01.00 Uninterrupted Power supply (UPS) System including Static Switches for Sub Distribution

SI No	Item	Quantity per UPS system
(i)	Silicon controlled thyristors,	100 %

MANDATORY SPARES

	diodes and power transistors.	
(ii)	Capacitors	2 nos. of each type
(iii)	Current transducers, Voltage transducers, chokes, AC/DC isolators, contactors, timers, relays.	2 nos. of each type
(iv)	Fuses of each types and rating	10 nos. of each type and rating.
(v)	Fuse free Circuit breakers	2 nos. of each type and rating
(vi)	Electronic modules	2 nos. of each type
(vii)	Cooling Fans	2 nos. of each type
(viii)	Digital/analog panel meters/ indicators	1 no. of each type
(ix)	Relays of all types including overload relays.	3 nos. of each type
(x)	Static Switch	2 nos. of each type
(xi)	Batteries	2 Nos. of each type and rating.

3.02.00

24 V DC power supply system

Sl. No.	ITEM	QUANTITY PER BATTERY CHARGER
(i)	Rectifier Modules	2 Nos.
(ii)	Controller module	1 No. of each type and model.
(iii)	AC/DC isolators, DC/DC isolators, contactors, timers, relays	2 nos. of each type and rating
(iv)	Fuses of each type and rating	20 nos. of each type and rating
(v)	Fuse free Circuit breakers of each type and rating	2 nos. of each type and rating
(vi)	Cooling Fans	2 nos. of each type
(vii)	Relays of all types including overload relays	3 nos. of each type
(viii)	Capacitors	2 Nos. of each type and rating.

MANDATORY SPARES

(ix)	Batteries	2 Nos. of each type and rating.

4.00.00 CONTROL DESK & CONTROL PANEL

SI No	Item	Quantity
(i)	UCD mounted devices as per Appendix-I to Part-A, Section-VI	10% of each type subject to max. 5 nos. of each type.
(ii)	Blank tiles	10 nos.
(iii)	Boiler and Turbine trip pushbuttons	2 nos. of each type and rating.

5.00.00 SPARES FOR SWAS INCLUDED IN CHAPTER FOR TG

6.00.00 PUBLIC ADDRESS SYSTEM

6.01.00 Call Stations & Amplifiers

Sr. No.	Item	Quantity
(i)	Call station for outdoor area with amplifier	40 no. of each type, make, model etc.
(ii)	Call station for indoor area desktop mounting type with amplifier	10 no. of each type, make, model etc
(iii)	Master Control Unit (MCU)	1 no. each type, make, model etc.
(iv)	Portable Call station with minimum 2 mtrs connecting cable.	1 no. each type, make, model etc.
(v)	Standalone amplifier	1 no. each type, make, model etc.

7.00.00 CCTV

SI No	Item	Quantity
(i)	PTZ camera	20 nos.
(ii)	Explosion proof camera	1 nos.
(iii)	Fixed Camera	2 nos.

MANDATORY SPARES

(iv)	Full function keyboard & Joystick	1 no.
(v)	Client Work Stations with monitor	1 no.
(vi)	Camera/Database Server	1 no.
(vii)	Media converter	5 nos.
(viii)	Network Switches	
	Field/edge switches	2Nos

8.00.00 Wireless Instruments & System (if applicable)

Sl. No.	ITEM	QUANTITY
(i)	Transmitters	10% of specified quantity or minimum 2 nos. of each model

9.00.00 In addition to the mandatory spares of electric actuators indicated in all the chapters of sub section VI, Part-A of technical specification the below clause is also applicable.

Sl. No.	ITEM	QAUNTITY
(i)	Electronic PCB of all types	10% of each type & model
(ii)	Absolute Encoder (replaceable part)	5% of each type & model
(iii)	Electronic Torque sensor	5% of each type & model

- Note:
1. Refer Part-A Sub-Section-VI (Mandatory Spares) for general requirements and interpretation of various terms and conditions.
 2. In case the main population of any item is only one no., then the spare quantity shall also be one no., overriding requirements indicated in clause 1.00.00 to 11.00.00 above.
 3. Wherever the quantity is given only in percentage, the spare quantity shall be distributed into various ranges/size/rating/type (as the case may be) in the same proportion of the main population. For the quantities coming less than 1, shall be treated as 1 only.
 4. C&I mandatory spares if covered under other chapters of sub section VI, Part A of technical specification are not required to be repeated.