

EPC PACKAGE FOR WASTE TO ENERGY PROJECT (2X350 TPD) FOR KAWAS GAS POWER STATION

Bidding Document No.: CS-2600-001-9

AMENDMENT NO. 01 TO TECHNICAL SPECIFICATIONS (TS), SECTION-VI

SL. NO.	SPECIFICATION REFERENCE				Existing	Read as
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
1.	Part-B	A-12	34/35	1.00.00	Technical Requirement LEACHATE TREATMENT SYSTEM	To be deleted
2.	Part-A	IIA-01	16/18	2.27.00	Segregation facility	To be deleted
3.	Part-A	IIA-02	3/12	2.02.05	Shredder	To be deleted
4.	Part-A	A-06	1/28	1.01.00 (vi)	Condenser Pressure	Refer Part-B
5.	Part-A	IIA-02	-	-	Firing diagram(ANNEXURE-1)	Revised Firing diagram (ANNEXURE-1)
6.	Part-E				Tender drawings(03 Nos)	Tender drawings (10)
7.	Part-B	A-15	4 of 31	4.03.00 (note)	NOTE: Up to 50TR cap. Chilling/Condensing unit can be of air/water cooled type however, beyond this cap. unit shall be water cooled type only.	Deleted
8.	Part-A	IIA-02	02/29	1.01.00	TMCR: The term "TMCR" (Turbine maximum continuous rating) appearing in the technical specification shall mean 14.9 MW or more electrical power output at generator terminals under rated steam parameters, 0% cycle make-up and 160 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.	TMCR to read as NCR: The term "NCR" (Nominal continuous rating) appearing in the technical specification shall mean "The Nominal capacity of the plant shall be designed to incinerate up to 200000 metric tons annually of RDF/ combustible fraction having GCV of 2500 kcal/kg to convert it into Power, assuming 330 days of plant operation

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9.		A-06	02/29	1.01.00	EMCR: The condition corresponding to economic continuous maximum rating (EMCR) at generator terminal shall be 14.9 MW or more output under rated steam conditions with cycle make up of 3% of throttle steam flow and design condenser pressure.	EMCR to be read as ECR: The term "ECR" (Economic continuous rating) appearing in the technical specification shall mean "The economic continuous rating of the plant shall be to incinerate up to 250000 metric tons annually of RDF/ combustible fraction having GCV of 2500 kcal/kg to convert it efficiently into Power, assuming 330 days of plant operation
10.		A-06	02/29	1.01.00	VWO: The condition corresponding to valves wide open to generate 17.1 MW or more at generator terminal at rated steam parameters and design condenser pressure.	VWO to be read as MCR: The term "MCR" (Maximum continuous rating) appearing in the technical specification shall mean "The Maximum continuous rating of the plant shall be designed to incinerate up to 265000 metric tons annually of RDF/ combustible fraction having GCV of 2500 kcal/kg to convert it into Power, assuming 330 days of plant operation
11.	Part-A	I	1 of 12	1.00.0	Complete chapter	Refer revised chapter I-Intent of Specification
12.	Part-B	B-02	4/164	1.11.00	<u>VCB For Generator switching:</u> The circuit breaker shall be suitable for generator switching and shall have interrupting capacity confirming to IEEE std C37.013 under most onerous fault condition. i.e. system source or generator source for the offered unit configurations.	The Circuit Breaker shall be suitable for generator switching using vacuum as arc extinguishing medium. The VCB Shall have Short Time Rating of 40KA (RMS) for 1 Sec and Momentary Dynamic Rating of 105KA (Peak).
13.	Part-E				Kawas WTE Electrical SLD Rev-0A:	Kawas WTE Electrical SLD Rev-0B:

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14.	Part-A	IIC		4.02.00 (CEMS)	Notes:- 1) SOx, NOx, CO2 and CO,HCL,Hf,O2 analyzer are shown separately for the purpose of input only, otherwise SOX, NOX, CO2 and CO,HCL,HF,etc. All necessary software & support required at instrument end shall be provided by the Contractor. Necessary details like scheme, register addresses of analyzer, etc. shall also be provided by the Contractor for implementation of above. For CEMS - In addition to above requirement, 4-20 mA connectivity to DDCMIS shall be provided by the Contractor.	Notes:- 1) SOx, NOx, CO2 and CO,HCL,Hf,O2 analyzer are shown separately for the purpose of input only, otherwise SOX, NOX, CO2 and CO,HCL,HF,etc. All necessary software & support required at instrument end shall be provided by the Contractor. Necessary details like scheme, register addresses of analyzer, etc. shall also be provided by the Contractor for implementation of above. 2). Offered CEMS system shall be fully proven for intended application. Reference list & USER feedback shall be furnished to NTPC for review during details engineering. 3) Contractor to ensure availability and upkeep of the CEMS for entire O&M period. For CEMS - In addition to above requirement, 4-20 mA connectivity to DDCMIS shall be provided by the Contractor.
15.	VI/A	IIA-13	1 of 6	1.02.00 (a)	TWO (2) NOS. BOTTOM ASH / SLAG EXTRACTOR PER UNIT	BOTTOM ASH / SLAG EXTRACTOR
16.	VI/A	IIA-13	2 of 6	1.02.00 (b)	TWO(2) NOS.SUBMERGED GRATE LEAK CONVEYOR PER UNIT	SUBMERGED GRATE LEAK CONVEYOR
17.	VI/A	IIA-13	2 of 6	1.02.00 (c)	ONE (01) NUMBER BOTTOM ASH PIT / BUNKER (COMMON FOR BOTH SLAG EXTRACTOR) PER UNIT	BOTTOM ASH PIT / BUNKER
18.	VI/A	IIA-13	2 of 6	1.02.00 (iii)	A compensator shall be provided between the grate ash/slag extractor and ash fall shaft.	Suitable expansion joints/compensator shall be provided between the bottom ash chute and slag extractor

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19.	VI/A	I/A-13	2 of 6	1.02.00 (vi)	Suitable air Fans shall be provided so that vapours arising from the bottom ashes/slag leaving the ash extractor shall be ventilated back into the Slag chute by a continuously running air fan. Ducts shall be made of acid resistant plastic material.	Suitable air Fans <u>(if applicable)</u> shall be provided so that vapours arising from the bottom ashes/slag leaving the ash extractor shall be ventilated back into the Slag chute by a continuously running air fan. Ducts shall be made of acid resistant plastic material.
20.	VI/A	I/A-13	4 of 6	1.04.00	Fly ash collected in ESP / Bag Filter / Flue Gas treatment Hoppers shall be transported to Fly Ash silo by Pneumatic conveying or by suitable Mechanical Conveying system. Boiler ash from Intermediate/ Buffer hopper shall also be transported along with Fly Ash up to Fly Ash silo either by Pneumatic conveying or by suitable Mechanical conveying system	Fly ash collected in ESP / Bag Filter / Flue Gas treatment Hoppers shall be transported to Fly Ash silo by Pneumatic conveying or by suitable Mechanical Conveying system <u>or combination of Pneumatic and Mechanical Conveying</u> . Boiler ash from Intermediate/ Buffer hopper shall also be transported along with Fly Ash up to Fly Ash silo either by Pneumatic conveying or by suitable Mechanical conveying system or by <u>combination of Pneumatic and Mechanical Conveying</u>

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21.	VI/A	IIA-02	11 of 12	7:00:00	Ash Handling System The contractor shall provide ash evacuation system to collect and transport ashes (different pass of the boiler & Economiser) from the boiler to ash handling silos. Separate Silos shall be provided for hazardous and no hazardous ashes. There shall be a system for transporting the ash either by mechanical / pneumatic means to the silo. The silo shall be made of welded carbon steel. The silos shall be of adequate capacity to store ash for <u>3 days without evacuation</u> . The silos shall be equipped with a mechanical system for easy discharge and fine particles are separated by an exhaust filter. The level in the silo needs to be measured continuously; the maximum fill level is detected by a level switch. Necessary heating system to be provided for bag filters hoppers to maintain uniform flow of ash from the bag filter hopper. The silo shall be provided with thermal insulation. The silo shall be placed on an elevated position to facilitate loading along with bottom ash belt conveyor.	Ash Handling System The contractor shall provide ash evacuation system to collect and transport ashes (different pass of the boiler & Economiser) from the boiler to ash handling silos. Separate Silos shall be provided for hazardous and no hazardous ashes. There shall be a system for transporting the ash either by mechanical / pneumatic means to the silo. The silo/bunker shall be made of welded carbon steel. The silos shall be of adequate capacity to store ash <u>as specified elsewhere in the Technical Specification</u> . The silos shall be equipped with a mechanical system for easy discharge and fine particles are separated by an exhaust filter. The level in the silo needs to be measured continuously; the maximum fill level is detected by a level switch. Necessary heating system to be provided for bag filters hoppers to maintain uniform flow of ash from the bag filter hopper. The silo shall be provided with thermal insulation. The Fly ash silo/ <u>Bottom ash bunker</u> shall be placed on an elevated position to facilitate loading along with bottom ash belt conveyor <u>(if applicable)</u> .
22.	VI/A	IIA-12	1 of 2	1.00.00 (b)	Bottom ash/Slag crane	Bottom ash/Slag crane <u>(if applicable)</u>
23.	VI/A	IIA-12	1 of 2	1.02.00	BOTTOM ASH CRANE	BOTTOM ASH CRANE <u>(if applicable)</u>

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24.	VI/A	IIA-13	3 of 6	1.02.00 (c)	Bottom ash/ slag from the Pit/Bunker shall be loaded to the Truck for onward disposal/ utilization by Bottom ash crane, specified elsewhere in the Technical Specification.	Bottom ash/slag from the <u>Pit</u> shall be loaded in to the Truck for onward disposal by Bottom ash crane, specified elsewhere in the Technical Specification. In case of Bottom ash bunker suitable Sector Gate at Bunker Discharge along with Vibrating arrangement (to facilitate unloading from Bunker) shall be used for Loading of Bottom Ash into the Truck. If Mechanical conveyor is used for conveying, Vibrating Feeder/Equivalent shall be used for feeding into the Conveyor. In case of Belt Conveyor, Metal Detector & Suspended Magnet shall be used. Independent Mechanical Conveying system shall be used for each Unit.
25.	VI/B	A-21	1 of 1	1.00.00	WASTE FEED CRANE Type of crane: To be decided by the bidder to meet the entire functional requirement Volumetric capacity of grab (m3): Minimum 8 (m3) Lifting capacity of crane (T): 12 (T) Minimum The cranes shall be designed as per applicable international standard. Maintenance platform with proper approach all along the Crane movement shall be provided.	WASTE FEED CRANE Type of crane: To be decided by the bidder to meet the entire functional requirement Volumetric capacity of grab (m3): <u>Minimum 20 % margin</u> of the actual requirement <u>Rated</u> Lifting capacity of crane (T): Minimum <u>10 % margin</u> on the maximum load requirement The cranes shall be designed as per applicable international standard. Maintenance platform with proper approach all along the Crane movement shall be provided.

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26.	VI/B	A-21	1 of 1	1.01.00, New clause		For Cross & Long Travel of Waste Feed Crane, Heavy Duty Energy chain system & suitable flexible cable shall be provided. Energy Chain link with integrated Rollers shall be of Self-lubricating Polymer compound with reinforced fibers and bearing Material to provide less wear and long service life. Chain should have special mounting brackets with strain relief elements for effective cable Mounting and should have Interior separators to achieve partitions to enable effective and ideal cable lay out inside the chain.
27.	VI/B	A-21	1 of 1	1.02.00	BOTTOM ASH CRANE Type of crane: To be decided by the bidder to meet the entire functional requirement Volumetric capacity of grab (m3): Minimum 1.5 (m3) Lifting capacity of crane (T): Minimum 5 (T) The cranes shall be designed as per applicable international standard. Maintenance platform with proper approach all along the Crane movement shall be provided.	BOTTOM ASH CRANE Type of crane: To be decided by the bidder to meet the entire functional requirement Volumetric capacity of grab (m3): <u>Minimum 20 % margin</u> of the actual requirement Rated Lifting capacity of crane (T): Minimum <u>10 % margin</u> on the maximum load requirement The cranes shall be designed as per applicable international standard. Maintenance platform with proper approach all along the Crane movement shall be provided.
28.	VI/B	A-21			Complete chapter-AHP and crane	SLAG & ASH HANDLING SYSTEM

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29.	Part-B	A-06	2/28	1.01.00	The term "TMCR" (Turbine maximum continuous rating) appearing in the technical specification shall mean 4 MW electrical power output at generator terminals under rated steam parameters, 0% cycle make-up and design 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.	TMCR to read as NCR: The term "NCR" (Nominal continuous rating) appearing in the technical specification shall mean "The Nominal capacity of the plant shall be designed to incinerate up to 200000 metric tons annually of RDF/ combustible fraction having GCV of 2500 kcal/kg to convert it efficiently into Power, assuming 330 days of plant operation
30.	Part-B	A-06	2/28	1.01.00	The condition corresponding to economic continuous maximum rating (EMCR) at generator terminal shall be 4 MW output under rated steam conditions with cycle make up of 3% of throttle steam flow and design condenser pressure.	EMCR to be read as ECR: The term "ECR" (Economic continuous rating) appearing in the technical specification shall mean "The economic capacity of the plant shall be designed to incinerate up to 250000 metric tons annually of RDF/ combustible fraction having GCV of 2500 kcal/kg to convert it efficiently into Power, assuming 330 days of plant operation
31.	Part-B	A-06	19/28	4.02.00(e)	All pressure parts like shell, heads and nozzles shall be of carbon steel as per ASTM A-516 Gr. 70. Shell plate min. thickness 15.8mm of welded construction.	All pressure parts like shell, heads and nozzles shall be of carbon steel as per ASTM A-516 Gr. 70.
32.	Part-B	A-06	21/28	5.02.00(a)	Configuration 2 x 100 % Motor driven feed pump per unit.	Configuration 2 x 100 % Motor driven feed pump per boiler .
33.	Part-A	IIA-03	-	-	Complete chapter	Refer revised chapter IIA-03 at Annexure-A

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34.	VI/A	IIA-07	1 of 1	1.00.00	SCOPE OF WORK (WATER SYSTEM) The scope includes the design, engineering, manufacturing, supply, packing and forwarding, transportation, unloading, storage, installation, testing and commissioning of following equipment/ system. 1. Raw water intake location is marked in GLP. Construction of complete booster pumping system along with all its accessories, to pump raw water from plant reservoir (tap-off in existing raw water header shall be provided) to waste to energy plant, is in bidder's scope. Capacity of raw water booster pump shall be 2 X 100 %. 2. Pre-treatment Plant of raw water is in bidder's scope. 3. DM plant for Waste to energy plant DM requirement, is in bidder's scope. 4. Construction of complete leachate treatment system, is in bidder's scope. 5. Construction of effluent treatment plant is in bidder's scope. Bidder shall ensure that no effluent shall be discharged out from the Waste to Energy plant. 6. Construction of auxiliary cooling water system along with cooling towers. 7. Supply of Mandatory spares (for two years).	<u>Scope of Work-Water System</u> The scope includes the design, engineering, manufacturing, supply, packing and forwarding, transportation, unloading, storage, installation, testing and commissioning of following equipment/ system. 1. Raw water shall be provided from plant reservoir (tap-off in existing raw water header shall be provided) to waste to energy plant. Bidder shall use raw water in fire water tank and any other application if required. If required, bidder to provide 2 X 100 % raw water booster pumps to fill the fire water tank. 2. Bidder to draw clarified water from existing clarified water tank and store in its clarified water tank for further distribution in its system. Maximum of 20 cum/hr Clarified water shall be provided at terminal point from existing clarified water tanks. If required, bidder to provide 2x100% clarified water make-up pumps to fill the clarified water tank. 3. Maximum 5cum/hr of DM water shall be provided at terminal point from existing DM plant. Bidder to store DM water in its DM water storage tank for further use in Waste to energy plant. If required, bidder to provide 2x100% DM water make-up pumps to fill the DM water tank.
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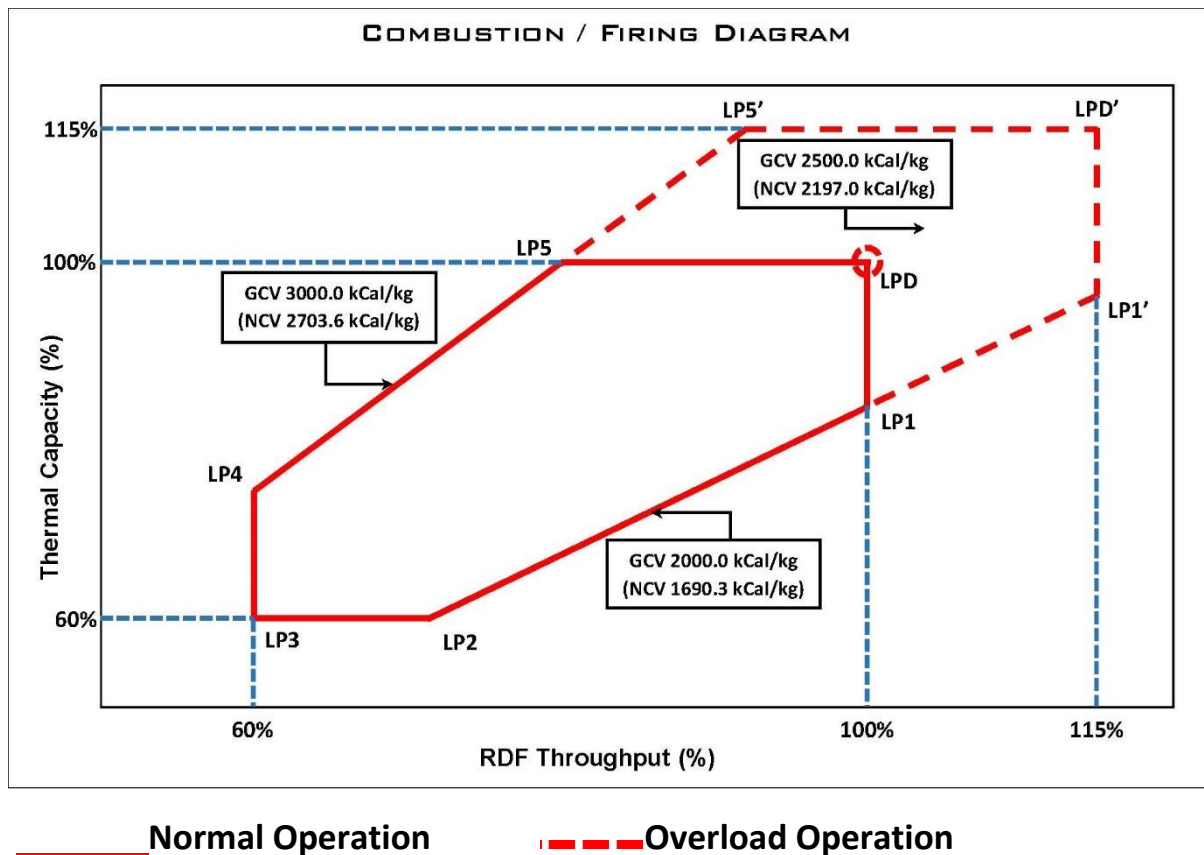
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						4. Construction of effluent treatment plant is in bidder's scope. Bidder shall ensure that no effluent shall be discharged out from the Waste to Energy plant. 5. Construction of auxiliary cooling water system along with cooling towers. 6. Supply of Mandatory spares.
35.	VI/A	III	1 OF 1	1.02.01 b)	Raw water intake location is marked in GLP. Raw water shall be drawn from intake location for waste to energy plant.	Terminal points for Raw water, Clarified water and DM water as marked in Plant water scheme Drg No. 000-000-POM-A-00.
36.	VI/B	A-12	1 OF 35	1.09.00	1) Part-I : DM plant 2) Part-II : Pre-Treatment plant Part - V: Leachate Treatment system	To be deleted
37.	VI/B	A-12	1 OF 35	3.00.00	Total make-up water available for the entire WTE plant is 20cum/hr. Make-up water shall be drawn from existing raw water reservoir through 2x100% raw water booster pumps.	Total make-up water (clarified water) available for the entire WTE plant is 20cum/hr. Make-up water shall be drawn from existing clarified water tank. 5cum/hr DM water is also available from existing DM water tank.

ANNEXURE - 1

Revised Firing Diagram



Details of Various Load points in the Firing Diagram

POINT	ENERGY CONTENT [kCal/kg]	LOAD POINT [%]	THROUGHPUT [%]
LP D	2100	100	100
LP 1	1600	~ 78	100
LP 2	1600	60	~ 81
LP 3	2100	60	60
LP 4	3150	~ 90	60
LP 5	3150	100	~ 68

Note: Energy content - Lower calorific value as NCV (dry basis)

1. In addition, the vendor needs to provide a margin of 15 % for both Waste throughput and thermal load beyond 100 % as overload area, as shown.
2. Bidder should clearly define the operation area requiring supplemental fuel in this diagram.

CLAUSE NO.	INTENT OF SPECIFICATION 			
1.00.0	INTENT OF SPECIFICATION NTPC intends to install a Waste to energy plant (WtE Plant) having waste disposal (incineration) capacity of 700 tonnes per day (TPD). The plant shall be installed at NTPC plant premises at Kawas, Surat and shall be disposing the waste i.e. segregated combustible fraction (SCF)/ Refuse Derived Fuel (RDF) obtained from Surat Municipal Corporation. SCF/RDF consists largely of combustible components of waste such as non- recyclable plastics (not including PVC), wood, pulp or organic waste in the form of fluff. The WtE Plant shall be of global standard and shall use state of the art technology, proven across globe, employing grate firing system and flue gas cleaning system. The WtE plant shall be completely indoor, odorless and emission norm complaint. The plant shall have a clean, aesthetic environment as well as noise within permissible limit. The plant shall involve enough automation to prevent human exposure to messy areas during operation and maintenance (O&M) of plant. The plant shall have effluent treatment system to prevent discharge of harmful substance. The waste reception hall. Waste bunker and the furnace shall remain under negative pressure so that foul smell shall not escape from waste dumping area to the surroundings. 1.01.0 Waste Disposal quantity, quality and Plant Output Ratings: The peak capacity of the plant shall be designed to incinerate up to 265000 metric tons annually of RDF/ combustible fraction having GCV of 2500 kcal/kg to convert it efficiently into Power, assuming 330 days of plant operation. The average incineration capacity of the plant shall be 750 tonnes per day with average GCV of 2500 kcal/kg. However, generator name plate rating shall be corresponding to the incineration capacity of 600 tonnes per day with GCV of 2500 kcal/kg as this corresponds to the minimum guaranteed waste disposal capacity of 200000 tonnes annually assuming 330 days of plant operation in a year. Typical analysis of RDF has been provided elsewhere in the specification, however the plant shall be capable of handling usual variations if RDF due to change in waste input during a course of time. The peak capacity of the plant should take care of seasonal surge in waste supply and calorific value, for example in spring and autumn when lots of dry leaves may be the part of the waste. The plant name plate rating shall not be less than 14.9 MW and plant overload capacity shall be at least 15% higher than the name plate rating to take care of grid frequency response and sudden surge in waste quantity and calorific value. The plant should be able to operate at its peak capacity continuously when the need arises. Plant shall also be capable to supply steam for generating hot water or chilled water or for industrial use. The extraction quantity shall be up to 60% of the steam flowing upstream of the extraction point through internally controlled extraction to ensure high efficiency with variation in demand of steam. The steam extraction pressure at the terminal point has been defined elsewhere in the specification. 1.02.0 Scope of the proposal For disposal of waste i.e. segregated combustible fraction (SCF)/ Refuse Derived Fuel (RDF) obtained from Surat Municipal Corporation, NTPC intends to install a 700 TPD Waste to energy plant at its plant premises at Kawas, Surat. The complete scope of the proposal for the Design, Engineering, Manufacture, Supply, Construction, Erection, Testing, Commissioning works including Operation & maintenance of the plant for an initial period of 2 years for the EPC Package for Waste to Energy Project (2 x 350 TPD), 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;			
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CLAUSE NO.	INTENT OF SPECIFICATION		
	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 material and equipment, construction water supply, 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 after successful completion of 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, E, F and G) 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 equipment 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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CLAUSE NO.	INTENT OF SPECIFICATION 			
	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 with two (2) Solid Waste Fired Steam Generator units, employing Grate System and Flue Gas Treatment System, each having rated waste incineration capacity as specified in para 1.01.0 divided equally into two streams along with one turbine generator set capable of generating power output of a minimum of 14.9 MW including but not limited to: 1.02.01 <u>Waste receipt, waste pit including,</u> - Weigh bridges - Waste Reception Hall - Tipping bays and its management system, - Waste Grab Crane - Feed hopper, - Feed hopper cooling system. - Waste feeding Isolation system & associated hydraulics. - Structures, - Platforms, - Fire fighting system - Methane gas sensors - Separate Maintenance space for each crane on either side of waste pit. - Truck waiting area. - Power operated waste pit doors for each tipping bay 1.02.02 <u>Grate firing system including,</u> - Complete grate firing system, - Grates and its operating mechanism, - Structures, - Platforms, - Waste feeding system (pusher / ram) - Grate cooling system - Supports etc - Hydraulic system - Flame camera			
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CLAUSE NO.	INTENT OF SPECIFICATION 			
1.02.03	- Air feeding arrangement <u>Steam generator and auxiliaries including</u> - Complete pressure parts, structures, platforms, stairs, piping, valves, supports etc. - Soot blowing system with piping, valves, controls etc. - Waste combustion system including start up / secondary oil burners & scanners. - Air and flue gas system & ductwork. - Refractory, Cladding, Cleaning and Spray attemperation System, - Boiler Automation, - Structural Steelwork, - Primary, Secondary, Induced air fans. - Aux PRDS and piping - Start up & circulation system, - Air heaters & SCAPH. - Chemical dosing systems as applicable. - Bag filters. - Oil burner system - Slag and Ash extraction system - Auxilliary condensate pump and tank - Goods Elevators for Steam generators - Activated carbon dosing system - DeNox system, chemical preparation, metering, injection, temperature measurement etc., - Installation Equipment, i.e. special tools and commissioning spare parts - Other systems like tools & tackles etc. as specified.			
1.02.04	<u>Flue gas cleaning system and auxiliaries including</u> - Complete layout of flue gas cleaning system with parts, structures, platforms, stairs, piping, valves, supports, ducts etc. - Bag filters, cleaning system, ash collection system and its controls etc. - Lime storage, metering and dozing system - Activated carbon storage, metering and dozing system. - Air and flue gas ductwork. - Start up heating & circulation system for bag filter, - Ash collection, level measurement & handling system. - Chemical dosing systems as applicable.			
1.02.05	<u>Main Steam System including</u> - Live Steam Piping - Condensing system - Feedwater Heating System - Cooling System			
1.02.06	<u>Turbo Generator cycle including.</u> - Steam turbines with internally controlled extraction to extract up to 60% of steam for District heating and cooling use - Air cooled Condenser - Steam Bypass system. - Low Pressure Chemical Dosing system (as applicable) - Condensate Extraction Pumps. - LP and HP feed water heaters - Deaerator			
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1.02.07	- Boiler Feed Pumps - Turbine hall E.O.T. crane. - Power cycle piping - Low pressure piping. - Equipment cooling water system, Cooling Tower - Boiler fill system <u>Water Treatment Plant Including,</u> - Effluent treatment plant- - Water treatment including storage tanks, unloading and ancillary equipment- - Oil separation pit and oil separation system from waste water. - Chemicals storage room, Urea / Ammonia storage system - Raw water storage - Process water basin Further, 1. Construction of complete pumping system to pump raw water from intake location to waste to energy plant along with all its accessories, is in bidder's scope. Raw water intake location is marked in GLP. Capacity of Intake water pump shall be 2 X 100 %. 2. Construction of effluent treatment plant is in bidder's scope. Bidder shall ensure that no effluent shall be discharged out from the Waste to Energy plant. 3. Construction of auxiliary cooling water system along with cooling towers is in bidder's scope.			
1.02.08	<u>Plant Utilities including,</u> - Compressed air system (service and instrument air as applicable) - Vacuum cleaning System - Air conditioning and ventilation system (HVAC) - Fire detection and protection system, fire water pumping station and distribution - Fire alarm and fire extinguishing system - Paging system for communication			
1.02.09	<u>Material Handling System including,</u> - Ash Handling system for bottom ash, boiler ash and fly ash - Crane for bottom ash storage, loading system - Fly ash handling, storage, loading system into vehicle, feeding to conveyor etc.,			
1.02.11	<u>Acoustic enclosure along with aesthetic architecture including,</u> - Acoustic enclosure for entire plant / machine along with appropriate aesthetic architecture to ensure pleasant appearance on par with international standards to promote people acceptance level towards waste to energy plant. - Appropriate ventilation for the acoustic enclosure of the entire plant, in order to maintain comfortable ambient temperature inside the acoustic enclosure.			
1.02.12	<u>Continuous Emission Monitoring system including,</u> - Online measurement using reliable instruments capable of measuring all the pollutants in the flue gas (as applicable), recording of the same (electronic), retrieving, transfer data into another storage medium, upload data in to website online, displaying data at the plant gate by online digital display board.			
1.02.13	<u>Elevators, Cranes and Hoisting equipments</u> - Elevators for boiler house and control room - Cranes for waste pit			
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1.02.14	- EOT crane for turbine floor - Crane for bottom ash handling - Crane / hoisting equipment for heavy equipments like motor, fan, bag filter, flue gas conditioning tower/reactor (as applicable) etc., <u>Electrical Equipments including,</u> - Electric power system complete with supply system and power supply for auxiliary services, generator, generator circuit breaker and transformers - Main generator and associated equipment. - All Transformers. - Auxiliary power supply - Overall DCS - Power electricity evacuation (switchyard) - 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. - Electrical systems as required. - Control and Instrumentation system along with accessories and Instrument Cables. - Switchyard for power evacuation 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. (which includes chimney) - Complete Mechanical, Civil, Electrical & C&I works related to Make-up water System.			
1.02.15	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. <u>Main Plant Building, Waste Reception hall and other facilities</u> Plant should have main plant building/ other buildings to accommodate various equipment suitable for indoor duty and also the facilities that need to be enclosed considering noise and odour pollution. In addition to the above plant shall have main plant building/ other buildings to facilitate guest reception, guest sitting space near the guest reception area, a space/ hall to accommodate model of the plant, a hall/ area to accommodate safety gears before the guests enter into the control room area/ area requiring wearing of safety gadgets. The guest sitting area should be suitable for sitting of at least 15 guests and shall have a serving table (approximate length of 18 meter) for serving refreshment/ tea and coffee. The area may also require to house tea/ coffee vending machine. Further, the plant shall also house a canteen having capacity to cook meals and refreshment for about 50 employees in safe and hygienic way. The main plant building/ Other buildings shall also have provision for office cabins/ halls for sitting of 20 to 25 office staff including 3 to 4 senior officers and a conference hall to accommodate up to 30 persons.. The design of buildings shall be such that more of the natural light is utilised in the building instead of artificial light during the day. The plant architectural design shall be attractive to give an impression of modern clean facility and it should be tried to minimize the number of buildings and shall try to integrate them with the main building, However			
2.00.00	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			
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	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) 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. 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 terminal points of the equipment to be furnished under this Main Plant Turnkey package shall be as identified in these drawings read in conjunction with text of the specification. 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 colour 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 portion of technical specifications including supply of all consumables (except waste and oil for firing), temporary equipment and pipings, instruments, labour / skilled manpower's etc. The scope includes complete requirement of flushing oils including fresh oil refilling during the pre-commissioning and commissioning activities and subsequent initial operation. 4.03.00 Guarantee Tests The guarantee tests for various equipment and systems shall be carried out as specified under chapter of Function Guarantees and Liquidated damages, 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.		
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4.04.00	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.			
4.05.00	The scope of the Contractor includes complete design and engineering, technical coordination (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.			
5.00.00	GENERAL ENVIRONMENTAL REQUIREMENTS The contractor shall execute all work at site as per the general environmental requirement and following the applicable local 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.			
5.04.00	All materials obtained from excavation shall remain Owner's property. 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.			
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6.00.00	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 and the tyres/wheels of vehicles plying on such roads shall be cleaned before these vehicles leave the project area.			
	OPERATION & MAINTENANCE OF PLANT The contractor shall execute all work at site as per the environmental requirement and following the applicable local provisions and local regulations in this respect. The contractor shall ensure operation of the plant on 24 by 7 basis with all necessary input (man, machinery, material, consumable, spare etc.) on time, without delay and maintain the plant premises and install suitable safeguards and facilities as approved by the Engineer for meeting general environment requirements. Operation & Maintenance of the plant as per the Indian Solid Waste Management Rule 2016, in all respects including waste receipt, power generation, all consumables, all spares etc., 1. Receive the waste as delivered by the municipality and store it in a proper manner in the waste bunker without any air pollution (fugitive dust emission) and water pollution (suspended solids in run-off). 2. 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. 3. Provide necessary sanitation facilities to the labour camps. 4. Control the movement of all vehicles so as to minimize disruption to regular users of the routes. 5. Maintain record of all waste received, ash disposed, continuous emission data for all critical emission parameters as per Indian SWM rule 2016. 6. Procure, maintain & record of the consumables / chemicals/ spares required and consumed for the plant. 7. Make arrangements for loading of municipality vehicle for disposal off the waste viz. Bottom & Fly ash to the landfill facility. The vendor to propose suitable means of transport of ash from waste to energy plant to landfill facility who's O&M shall be in the scope of municipality. 8. All repairs and maintenance activities are to be conducted by qualified companies only. 9. NTPC Ltd reserves the right to refuse unsatisfactorily qualified companies to conduct repairs and maintenance activities. 10. Wear and spare parts are to be kept in stock according to the specifications of the Contractor. 11. NTPC Ltd reserves the right to insist on usage of original spare parts. 12. The vendor must maintain adequate inventories of all necessary operating chemicals & spares in the specified quality and operate the plant for initial period of 2 years. 13. Operation & Maintenance of the plant as per standard norms 14. Customer's staff training. 15. Coordinate with all concerned Govt. agencies as and when required to comply norms related to waste to energy plant and maintain all necessary certificate for ready reference.			
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	16. As and when required, to entertain public / school children for creating awareness on waste to energy plant by allowing them to visit the plant with all safety precautions. 17. Maintain all the plant premises so as to show cause better operation procedure. 18. Top priority shall be given for safety of personnel and material. 19. Any equipment and services that are not clearly specified in the offer 20. All spare parts for operation and maintenance in addition to commissioning spare parts. 21. During defect liability period, the vendor shall need to replace the equipment / parts which is required to achieve the satisfactory performance of the plant on free of cost. 22. The vendor shall, at all times, ensure that all aspects of the plant and the processes employed in the operation and maintenance of the plant facilities shall conform to the laws pertaining to environment, health and safety aspects including rules such as MSW rules, policies and guidelines. 23. Reporting / Record keeping - The vendor shall submit / keep record to NTPC, the following reports i) Quantity of Waste i.e. segregated combustible fraction (SCF)/ Refuse Derived Fuel (RDF) received & ash sent out and Characterization. ii) Power generation iii) Quantity of recyclable material segregated / dispatched (if any) iv) Waste water v) Test reports vi) Unit control room logbook vii) Secondary fuel/ Electric power consumption. viii) Consumption of Chemicals / additives, enzyme as the case may be. ix) Brief report of any accident/incident related to the plant, injury/ fatality, property damage, cause of accident and actions taken to avoid recurrence. x) Copies of any reports submitted for purposes of regulatory compliance and of notices received or reports or notices submitted to any competent authority or otherwise xi) Any other report that may be reasonably required to fulfill any regulatory compliance. xii) Attendance register of the manpower deployed xiii) Log Book of vehicles xiv) Register of issue of the disinfectant liquid xv) Register of Stock of implements, and other materials and their issue xvi) Record of acceptance of personnel carriers with registration Numbers & timings xvii) Register for issue of uniforms and protective gears - xviii) Maintenance & operations records of all vehicles xix) Any other record for regulatory compliance. xx) Any other items/activity not mentioned above. 24. Maintenance i) In order to ensure smooth and uninterrupted operations, routine maintenance of the plant facilities shall include but not be limited to ii) Prompt repairs of the weigh-bridge, entire plant and its auxiliaries, drainage and treatment system, electrical items, drains, internal roads, Trammel machinery, lighting. iii) The vendor, for the purpose of routine maintenance shall, in consultation with OEM of the equipment (bought out items if any), set forth such criteria as to conform to good industry practice for sound maintenance of the plant facilities. iv) Replacement of equipment/consumables, and repairs to equipment, structures and other civil works which are part of the plant facilities. v) Maintaining the storm water drainage system and drainage system.			
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	vi) Keeping the plant facilities in a clean, tidy and orderly condition and taking all practical measures to prevent damage to the plant facilities or any other property on or near the Site. vii) Undertaking maintenance works in accordance with the O&M plan and OEM manual. viii) Taking all reasonable measures for the safety of all the workmen, material, supplies and equipment brought to the site. Diesel / Fuel, if any, shall be stored, transported and disposed of by the vendor in accordance with prevalent Laws/applicable permits. ix) Carry out emergency maintenance and repairs as may be required to repair the damages, if any, in consultation with the OEM and where required under the supervision of the OEM, if required in order to ensure that the plant facilities are returned to normal operating standards as quickly as possible 25. Plant facility The vendor shall not to use the plant facilities for any purpose other than activities envisaged in the scope. The vendor shall not part with or create any encumbrance on the part of the plant facilities including the plant site, save and except as set forth and permitted under this contract. 26. Man power Vendor shall provide uniforms / personal protective equipments (PPE) for all its employees' personnel which shall be worn by such employees/personnel while on duty. Also be responsible for all the security, environment and safety aspects of the plant at all times during the entire award period. Further, the vendor needs to provide PF as per industry standards, basic facilities such as canteen, toilet, resting facilities to their employees. 31. Availability The vendor shall maintain the plant and equipment so as to provide disposal of minimum of 700 TPD of waste daily. 32. In addition to be above, the scope of work of the plant shall mean and include the provision of the following services and facilities within the waste management facility, during the initial period of 2 years. 1. Receipt and unloading of Waste i.e. segregated combustible fraction (SCF)/ Refuse Derived Fuel (RDF) at plant facility 2. Operation of weighbridge & record keeping of waste being delivered and ash sent out. 3. Operation & maintenance of the entire waste to energy plant and its auxiliaries. 4. Disposal of ash and operation and maintenance of the land fill if applicable. 5. Supply of vehicles (various types) required for movement of waste within the plant and outside (if required) 6. Disposal of recyclable materials if any (loading to vendors vehicle – as the case may be) in accordance with prevailing practice. 7. Deployment of adequate and skilled manpower for operation and maintenance management of the plant. 8. Procure and/or provide any other required support services and facilities required for the plant. 9. Maintain the entire plant area in an acceptable environment by regularly spraying permitted sprays to avoid any foul smell / odour / control flies. 10. Deployment of supervisors to ensure all the operations are carried out according to agreed practices. 11. Carry out all kinds of maintenance required to keep the machineries / facilities in good condition, supply of all consumables, spares etc. 12. Procure all the necessary consumable like grease, lub oil, oil seals, rollers, conveyor belt, hydraulic oil, gas cylinders, chemicals, enzymes, lights & fittings etc., and record all such purchases for verifications.			
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	13. Provide and deploy all necessary tools & tackles necessary for maintenance of the equipments / facilities. 14. The entire workforce engaged in the plant shall have protective gears such as helmets, gumboots, hand gloves, masks, etc., to protect their health & ensure positive adherence to the safe operating practices. 15. Paramount importance to be given to ensure all these activities are carried out in a healthy environment in the plant so as to provide a clean and foul (smell) free / dust free / free of flying bird in and around the plant facility. 16. Noise generated from running equipment in the plant should be contained below the acceptable level as per standards by effective maintenance / tuning of the equipment/ providing noise insulation. 17. Operate, maintain & ensure availability of the Diesel generator to supply power to the plant facility, in case of power failure. 18. Carry out scheduled/ planned maintenance in accordance with the O&M requirements, so as to ensure availability of equipment all the time. The maintenance of the plant facilities or any part thereof shall be in such a way that it has not deteriorated to a level which is below the acceptance level prescribed by the OEM. 19. Establish a laboratory / make suitable arrangement with NABL accredited laboratory, capable of measuring the various parameters required for proper operation of the plant such as pH, BOD, COD, C/ N ratio, temperature, trace elements, heavy metals, air pollutant if any etc., During the award period, the vendor shall ensure that all waste delivered at the plant facility is processed and disposed in accordance with Applicable Laws and in accordance with this scope. In addition to the above, it is the responsibility of the vendor to deploy all the adequate systems / services to ensure scientific way of disposal of waste. The services which are not mentioned here but are required for satisfactory operation of the Waste Management Facility shall also to be supplied by the vendor.		
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CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 		
1.00.00 2.00.00 2.01.00 2.01.01 2.01.02 2.02.00 2.02.01 2.02.02	STEAM TURBINE AND AUXILIARIES 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 included unless otherwise specifically mentioned under exclusions. STEAM TURBINE & AUXILIARY SYSTEMS The scope includes all equipment required for One(1) Steam Turbine Generator unit of at least 14.9 MW or as quoted by the bidder along with auxiliaries of the type specified. Each unit will include but not be limited to the following: Steam Turbine The steam turbine shall be of condensing type ,directly coupled or coupled through a gear box to generator . The steam turbine shall be complete with casing, rotor, 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 with their servomotors, removable type steam strainers for start-up and normal operation upstream of emergency stop valves, and electric motors for all its integral subsystems. Steam strainers integral with main stream emergency stop and control valves are also acceptable as per standard practice of the bidder. Steam Turbine Auxiliary Systems Turbine gland sealing steam system shall be provided with gland steam condenser, gland steam exhausters, 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. Lubricating Oil System (common for Turbine Generator Set) shall be complete with oil tank, oil purifying system, oil pumps and jacking oil pump(if envisaged) with drive motors, oil coolers, strainers, vapour extractors with drive motors, all interconnecting		
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	piping, valves and fittings, hangers and supports, necessary instrumentation and control hardware to make the system complete in all respects.			
2.02.03	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, strainers, accumulator, control fluid coolers, waste fluid tank, 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.Common lube oil and control oil system can also be provided.			
2.02.04	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.			
2.02.05	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.			
2.02.06	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 under the scope of Bidder 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.			
2.02.07	Portable 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.			
2.02.08	Turbine 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.			
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2.02.09	Air cooled condenser designed for site ambient condition comprising fin tube bundles, steam distribution manifold, condensate collection headers, condensate and non-condensable removal piping within condenser envelope, condenser hot well and supporting structure shall be provided complete with all accessories such as steam duct from turbine exhaust flange to condenser including expansion joints, associated anchors and hangers with provision for turbine bypass steam dumping device, fans, gearboxes, couplings, motors including associated controls, maintenance platforms, access stairways and suitable cleaning/washing system for outside heat transfer surface.			
2.02.10	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, turbine 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. Startup 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.			
2.02.11	Condenser air evacuation system shall be complete with 2 x 100% vacuum pumps, associated motors, all accessories, associated piping, valves & fittings, specialties, duplex filter, instrumentation and control etc. In addition one (1) number start up air evacuation system shall be provided complete with vacuum pumps, associated motor, 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.) Cycle make-up system (c.) Gland steam sealing system (d.) Lube Oil system / Control fluid system			
KAWAS WTE PROJECT (2X350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-A	SUB-SECTION-IIA-03 TURBINE GENERATOR AND AUXILIARIES	PAGE 3 OF 7

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	(e.) Exhaust hood spray system (f.) Gland sealing (of valves and pumps) system (g.) Equipment cooling water system (h.) Compressed air system (Service Air and Instrument Air) 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	CONDENSATE EXTRACTION PUMPS 2 x 100% capacity motor driven condensate extraction pumps along with all accessories, drives, suction strainers, associated piping, and valves, instrumentation and control etc. shall be provided. One number canister drainage pump per station shall also be provided id vertical CEPs are offered.			
4.00.00	DEAERATOR			
5.00.00	DEAERATOR LEVEL CONTROL STATION			
5.01.00	Deaerator level control station for condensate water flow control, consisting of the following: (1) 2 x 100 % capacity pneumatically operated condensate control valves . (2) One motor operated gate valve on upstream and one manual operated gate valve on downstream of each condensate control valve. (3) One motor operated inching valve in bypass line of above condensate control station.			
5.02.00	Flow measuring system in condensate line to deaerator for measuring condensate flow to deaerator.			
5.00.00	BOILER FEED PUMPS			
5.01.00	Two full capacity (2x100%) motor driven boiler feed pumps per boiler complete with , mechanical seals, foundation base plate, low load recirculation flow control valve, ,			
KAWAS WTE PROJECT (2X350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-A	SUB-SECTION-IIA-03 TURBINE GENERATOR AND AUXILIARIES	PAGE 4 OF 7

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 		
5.02.00	integral piping and valves, local gauge boards, instrumentation and control etc. shall be provided. Feed regulating station (FRS) for feed water flow control during unit start-up, consisting of the following: (1) Two pneumatically operated (2 X 100 %) feed control valves. (2) Two motor operated gate valves with motor operated integral bypass valve, one each on upstream and downstream of feed control valve. (3) One motor operated gate valve of 100% BMCR capacity in parallel to the feed control valve to bypass the feed control valve . The above requirement is for each boiler.		
6.00.00	MAKE UP SYSTEM Normal and emergency cycle make-up to condenser hot well consisting of piping, valves, flow measuring system, hot well make-up control station (normal and emergency) including control valves, drain, vents, etc. are in the scope of this contract. Like wise, condensate spill pipe line consisting of piping, valves, control station etc. are in the scope of this contract .		
7.00.00	GLAND STEAM CONDENSER RECIRCULATION SYSTEM Minimum recirculation flow line from downstream of Gland Steam Condenser to main condenser consisting of piping, control valves, drain, vents etc. are in the scope of this contract.		
8.00.00	TURBINE HALL EOT CRANES One (1) 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.		
9.00.00	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).		
KAWAS WTE PROJECT (2X350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-A	SUB-SECTION-IIA-03 TURBINE GENERATOR AND AUXILIARIES PAGE 5 OF 7

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 		
10.00.00 OTHER MISCELLANEOUS ITEMS: The scope of work for the equipment covered under this specification shall include but not be limited to the following systems: 10.01.00 All weld neck counter flanges shall be supplied by bidder wherever nozzle ends on any equipment such as strainer, flow nozzles etc. are flanged. 10.02.00 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. 10.03.00 All structures which would be required by the Bidder for supporting the piping shall be included in scope of work of this package. 10.04.00 Initial charge of all the lubricants and fluids including . 10.05.00 Paints and painting of all equipments as per approval of the Employer. 10.06.00 Chemical cleaning of all equipment and systems after their erection shall be in Bidder's scope. 10.07.00 Thermal insulation and removable metal cladding shall be provided for all the equipments, piping and piping support frames as required. 10.08.00 Necessary blanking arrangements required to protect the valves and turbine internals and other auxiliaries during steam blowing shall be provided. 10.09.00 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. 10.10.00 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. 11.00.00 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 also 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			
KAWAS WTE PROJECT (2X350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI PART-A	SUB-SECTION-IIA-03 TURBINE GENERATOR AND AUXILIARIES	PAGE 6 OF 7

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 		
12.00.00 13.00.00	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. ERECTION MATERIALS 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.		
KAWAS WTE PROJECT (2X350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION-VI PART-A	SUB-SECTION-IIA-03 TURBINE GENERATOR AND AUXILIARIES	PAGE 7 OF 7

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	SLAG & ASH HANDLING SYSTEM			
1.01.01	BOTTOM ASH / SLAG EXTRACTOR (i) Material of construction of Bottom ash Extractor components shall suit the temperature of falling Bottom ash and shall suit the corrosive nature in water submerged condition. (ii) Capacity of each Extractor: Shall be designed to convey minimum 110 % (by Weight) Bottom Ash (Bottom ash + Coarse Boiler ash, if applicable) generated, operating with 350 TPD waste feed rate (with maximum ash in worst condition) condition. (iii) Bottom ash shall not entrap inside the critical Mechanical/Hydraulic/Instrument components of Slag Extractor.			
1.01.02	SUBMERGED GRATE LEAK CONVEYOR (i) Material of construction of submerged conveyor components shall suit the temperature of falling fine Bottom ash and shall suit the corrosive nature in water submerged condition. (ii) Conveying system shall not allow further spillage of fine bottom ash, outside of desired conveying zone.			
1.01.03	Bottom Ash pit/Bunker Minimum effective storage capacity: Effective storage capacity for 48 Hrs of Bottom Ash generation when operating with full rated waste feed (with maximum % of Bottom ash by weight). Sector Gate(applicable for Bunker) :Electrically/Pneumatically/Hydraulically operated Gate at the discharge of Bottom ash Bunker to facilitate loading into the truck			
1.02.00	Boiler Ash (2nd, 3rd& 4th pass ash, as applicable) Conveying system All components of Boiler ash Conveying system shall be designed to withstand the exposure of high temperature of Boiler ash of various passes. Accordingly material of construction of various components of Boiler ash conveying system shall be selected based on maximum anticipated temperature.			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION-VI, Part-B BID DOC.NO. CS-2600-001-9	SUB-SECTION A-21 SLAG & ASH HANDLING SYSTEM	PAGE 1 of 5

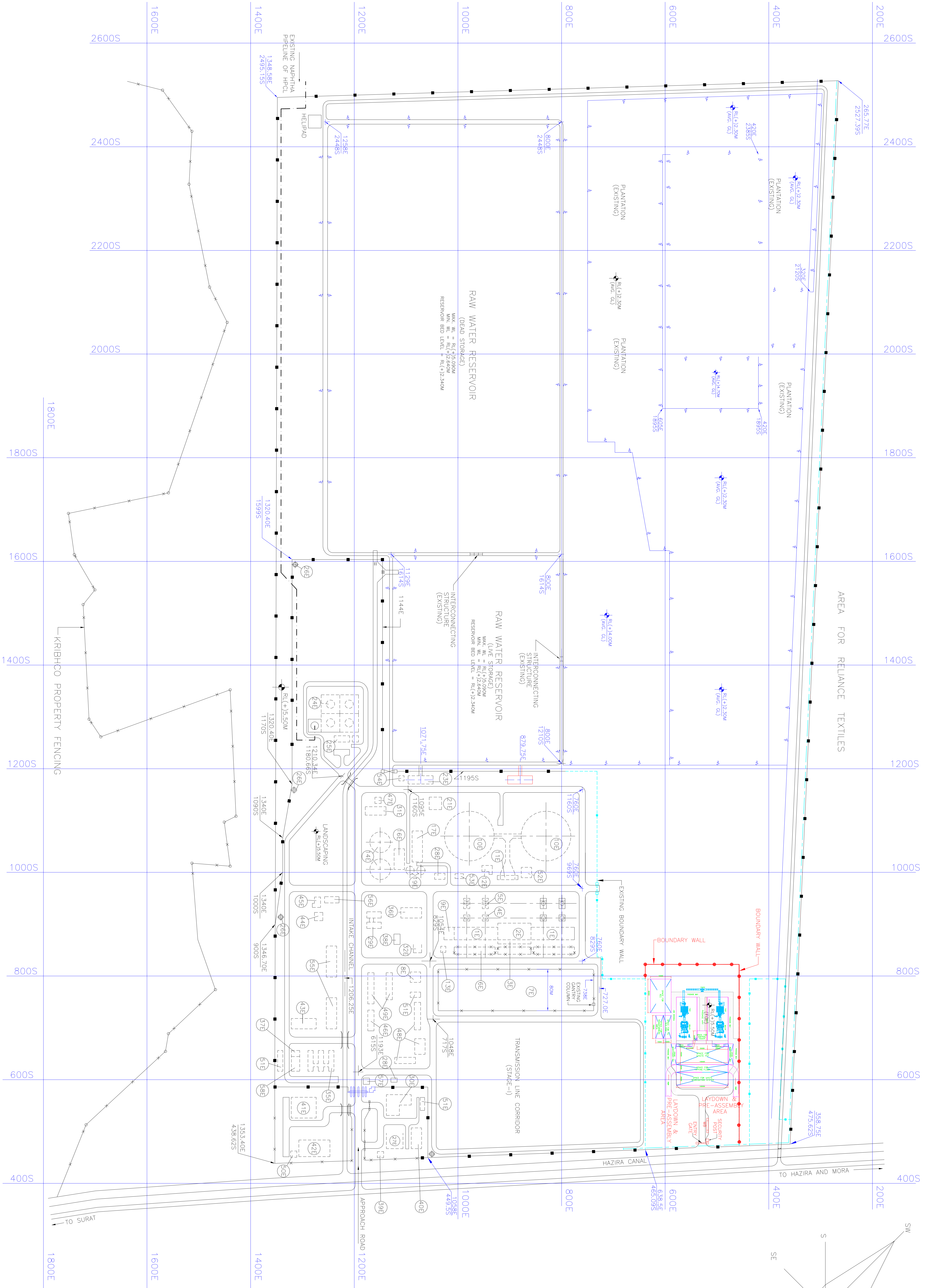
CLAUSE NO.	SCOPE OF SUPPLY & SERVICES									
1.03.01	Temperature detection & monitoring system at various critical points of conveying system shall also be provided. Suitable cooling arrangement of the equipment/components shall be provided based on safe operating requirement of the system.									
	Drive equipment rating for Slag and Ash Handling system Continuous Motor Rating (Name Plate Rating) at 50 Degree Centigrade Ambient temp. for Electric Motors All Mechanical Conveyors (applicable for slag & ash conveying system) shall be designed for (minimum) 110% of rated capacity. *The actual power at drive motor output shaft shall be calculated after considering all the losses of down the line equipment's of the drive train. Gear Box Rating : For mechanical systems @ Service factor X {1.2 times the actual power requirement at drive pulley shaft at design capacity} In any case, gear box rating shall not be less than motor nameplate rating. Gear box shall be designed for heavy shock loads and while selecting a gear box a service factor of minimum 2.0 shall be considered. @ Service factor shall include all the components considered by the supplier and should be clearly indicated in manufacturer's gear box selection catalogues Thermal rating of each speed reduction gear box at 60°C ambient temperature shall not be less than the name plate KW rating of the selected drive motor. Coupling Not less than motor nameplate rating. Pneumatic Conveying system In case of Pneumatic conveying system, at least 10% (percent) margin shall be provided on prime mover (Root blower/ Compressor/Vacuum pumps/Fans etc) capacity over and above the maximum flow requirement determined based on the ash removal rates. The design of pneumatic pipe sizing shall ensure appropriate velocity so as to avoid quick erosion of piping.									
1.03.02	Standby arrangement for Slag & Ash handling system <table><tr><td>Boiler Ash System</td><td>-</td><td>100% standby for ash grinders/crushers (if applicable)</td></tr><tr><td>Fly Ash or Boiler Ash System</td><td>-</td><td>100% standby for vacuum pumps / compressor /Soot blower etc (as applicable)</td></tr></table>				Boiler Ash System	-	100% standby for ash grinders/crushers (if applicable)	Fly Ash or Boiler Ash System	-	100% standby for vacuum pumps / compressor /Soot blower etc (as applicable)
Boiler Ash System	-	100% standby for ash grinders/crushers (if applicable)								
Fly Ash or Boiler Ash System	-	100% standby for vacuum pumps / compressor /Soot blower etc (as applicable)								
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION-VI, Part-B BID DOC.NO. CS-2600-001-9	SUB-SECTION A-21 SLAG & ASH HANDLING SYSTEM	PAGE 2 of 5						

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
1.03.03	100% standby for Pneumatic (if applicable) main stream pipe (excluding Branch pipes e.g. from each ESP/Bag Filter) up to ESP			
	Mechanical Conveyor design criteria:- Mechanical conveyors (apron plate type/screw type /drag chain type etc as applicable) will be required to handle bottom ash/high temperature boiler ash/fly ash with highly abrasive nature continuously. So all components of mechanical conveyors shall be of proven design and shall have a track record of trouble free-operation in order to avoid frequent failures. The conveyor shall be sized for startup with load. Continuous Normal operating capacity: To suit ash removal rate [based on max. ash generated (by weight) applicable for the conveyor]			
1.03.04	Fly Ash Storage Silo For the storage silo, three (3) outlets at the bottom shall be provided. One outlet shall be fitted with rotary feeder and ash conditioner for loading the conditioned ash into open trucks. Second outlet shall be provided with telescopic chute and rotary feeder for loading the ash into closed tankers, third connection at present shall be blanked connections and shall be provided with isolation valve. Minimum effective storage capacity of the Silo: Five (5) days fly ash generation based on max. ash at 350 TPD feed rate Dry Ash unloader (for Closed Truck loading): Un-loading rate shall be varied between min. 40 T/Hr and max. 100 T/Hr with VFD drive Conditioned Ash unloader (for open Truck loading): Un-loading rate shall be varied between min. 40 T/Hr and max 100 T/Hr with VFD drive Necessary head room shall be provided below Ash Silo for loading purpose of Trucks.			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION-VI, Part-B BID DOC.NO. CS-2600-001-9	SUB-SECTION A-21 SLAG & ASH HANDLING SYSTEM	PAGE 3 of 5

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES
1.04.00 1.04.01	BELT CONVEYOR SYSTEM (if applicable) FOR BOTTOM ASH SYSTEM GENERAL One Belt Conveyor stream per unit shall be provided for transportation of Bottom ash up to the Bottom Ash Bunker. Belt Conveyors shall be furnished and erected along with necessary supporting structures, platforms, on ground or overhead galleries, trestle structure with foundation footings, carrying and return idlers, automatic take-ups, pulleys, drive motors with suitable reduction units and couplings, belting, feeder hoppers, hydraulic couplings and other necessary accessories.
1.04.02	CODES AND STANDARDS The design, manufacture, inspection and testing of the Belt Conveyor System shall comply with all the currently applicable statues, regulations and safety codes in the locality where the equipment is to be installed. The belt conveyor system shall confirm to the latest edition of the following standards & codes. Other internationally acceptable standards/codes, which ensure equal or higher performance than those specified, shall also be accepted. Nothing in this specification shall be construed to relieve the contractor of the required statutory responsibility. In case of any conflict in the standard and this specification, the decision of the Employer shall be final and binding. "Belt Conveyors for Bulk Materials" published by Conveyor Equipment Manufacturers' Association. IS:7155 : Codes of Practice for Conveyor Safety. IS:1891 (Part-I) : General Purpose Belting IS:8598 : Idlers and Idler Sets for Belt Conveyors IS:4009 (Part-II) : Conical Head Grease Nipples IS:8531: Pulleys for Belt Conveyors. IS:226 : Structural Steel (Standard Quality) IS:4682 : Codes of Practice for Lining of Vessels and Equipment for Chemical Processes. IS:11592 :Code of practice for selection and design of Belt Conveyors. CAN / CASA - M422 M87: Canadian standard association.
1.04.03	DESIGN REQUIREMENT i. Design of belt conveyor system shall be suitable for produced ash parameters. ii. Slopes of conveyors, wherever applicable, shall not exceed maximum allowable angle depending on the ash properties, lump size, and other governing factors.
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE	TECHNICAL SPECIFICATIONS SECTION-VI, Part-B BID DOC.NO. CS-2600-001-9
SUB-SECTION A-21 SLAG & ASH HANDLING SYSTEM	PAGE 4 of 5

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES			
	iii. The guaranteed capacity of the conveyors shall be the rated capacity. iv. Conveyors shall be designed for 110% of rated capacity. Design capacity of the conveyor system shall be considered for the selection of belt width, belt speed and the continuous motor rating at 50 deg C Ambient. v. The drive chain equipment's for various belt conveyor systems shall consist of drive motors, fluid couplings, gear reduction units, low speed flexible couplings and pulleys. For the ratings of various equipment's as mentioned above in the drive chain of conveyor systems relevant sections of this specification shall be referred to.			
1.04.04	Belt conveyor system shall be designed as per the latest edition of 'Belt Conveyors for Bulk Materials' published by Conveyor Equipment Manufacturer's Association' or equivalent International Standard. Ai value for idlers shall be considered 2.8 (min.) for the purpose of conveyor calculation.			
1.04.05	Belting The belting shall be of either synthetic fabric such as Nylon-Nylon/Polyster-Polyamide, Steel Cord. etc. with rubber covers of adequate flexibility to give a troughing angle of 20 deg.(minimum).The number of plies, cover thickness, factor of safety etc. shall be as per the recommendation of belt manufacturer, but not inferior to the figures as tabulated in data sheet. Steel cord belt shall be provided with “Rip Protection” as follows: Bidder shall provide proven experience of Rip protection Belt. Rip protection shall be of Nylon fabric breaker (of weft strength minimum 150kN/m) or steel cord breaker for top and bottom cover. Combination of steel cord for top and Nylon fabric breaker for bottom is also acceptable.			
1.04.06	Belt Conveyor shall equipped with proper interlock and protection arrangement like Pull Chord switch, Zero speed switch, Belt sway switches, Chute Blockage switches etc.			
1.05.01	Automatic Lubrication unit shall be connected with all bearing zones/ lubrication points of the Slag and Ash Handling plant.			
1.05.02	For the hoists (for handling Slag & Ash Handling Plant) with more than 2.0 ton lifting capacity or more than 06.0 M lift, motor operated hoist block for both long travel and lift shall be provided. Other hoist blocks shall be of hand operated type for both travel and lift. However, all monorails coming out of the building shall be provided with electric hoist block, irrespective of load and lift. For hand operated hoists, the hoists shall be suitable for operation from floor level. Hand chain shall be provided for long travel of trolley and the Hoisting mechanism. The operator shall be able to control the movement of the monorail hoist with the help of floor operated pendant. The creep speed for vertical movement shall also be provided as per the system requirement.			
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATIONS SECTION-VI, Part-B BID DOC.NO. CS-2600-001-9	SUB-SECTION A-21 SLAG & ASH HANDLING SYSTEM	PAGE 5 of 5

CLAUSE NO.	LIST OF TENDER DRAWINGS			एनटीपीसी NTPC
APPLICABLE DRAWINGS FOR THE PACKAGE The drawings listed below and forming part of the specification shall be supplement to the requirements specified herein. The scope and terminal points of the equipment to be furnished under this package shall be as identified in these drawings and read in conjunction with the text of the specification.				
Sl. No.	Drawing Title	Drawing No.	Rev. No.	
1.	General Layout plan	2600-001-POC-F-001	A	
2.	Distributed digital control, monitoring And information system (DDCMIS) configuration diagram	2600-001-9-POI-A-001	0	
3.	Electrical Single line Diagram for Waste to Energy Plant	2600-001-9-POE-A-001	0B	
4.	Revised firing diagram(ANNEXURE-1)	-	-	
5.	RDF(Waste analysis)	-	-	
6.	Seismic design shall be done as specified in Annexure-I	-	-	
7.	Wind load on structures shall be as specified in Annexure-II	-	-	
8.	The bore logs of vicinity are enclosed at annexure-IV	-	-	
9.	General civil, structural & architectural specifications for all anticipated buildings shall be as per Annexure-VI	-	-	
10.	Plant water scheme	000-000-POM-A-00	-	
Note: All the above drawings indicates Employer’s requirements to enable the bidder to make a suitable offer. All variations / alternations shall be clearly brought out in the technical deviation scheduled with implications, if any. Such variations may be acceptable, after assessment of it’s implication and shall be subjected to the Employer’s approval.				
KAWAS WTE PROJECT (2 X 350 TPD) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-E BID DOC. NO.: CS-2600-001-9	LIST OF TENDER DRAWINGS	PAGE 1 OF 1



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National Thermal Power Corporation Ltd.
(A GOVERNMENT OF INDIA ENTERPRISE)
PROJECT ENGINEERING-CIVIL

PROJECT KAWAS WASTE TO ENERGY PLANT
(23360 TPD)

GENERAL LAYOUT PLAN

REV/NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	CAI	ES	APPD	DATE
1	WTE ADDED FOR TENDER PURPOSE ONLY.	PK	KK	KK	-	-	-	-	-	CS	10.09.19
0	FOR FR PURPOSE ONLY.	MANOU	RV	RV	-	-	-	-	-	RB	15.01.19

TITLE	SCALE	DWG. NO.	REV. NO.
GENERAL LAYOUT PLAN	1:4000	2600-001-POC-F-001	A

- NOTES:-**
- FORMATION LEVEL SHALL BE RL(+5.50M UNLESS OTHERWISE NOTED.
 - EL(+10.00M CORRESPONDS TO RL(+6.00M).
 - LAYOUT OF VARIOUS FACILITIES FOR WTE PLANT AS SHOWN IN THE LAYOUT BLOCK IS INDICATIVE. THE FINAL ARRANGEMENT WILL DEPEND ON THE APPROVAL OF THE OWNER.
 - THE MAIN PLANT LAYOUT INDICATED IN THIS DRG IS FOR 23360 TPD MODULE. FOR ALTERNATIVE PROPOSAL, BIDDER SHALL HAVE TO DEVELOP LAYOUT WITHIN THE SPACE AVAILABLE AS SHOWN ABOVE.
 - THE AREA FOR CONSTRUCTION/ERECTION ACTIVITIES LIKE LANDOWN, PREASSEMBLY, OFFICES & STORES IS TO BE MARKED BY THE BIDDER WITHIN THE AREAS IDENTIFIED BY THE ENGINEER.
 - BIDDER SHALL BE RESPONSIBLE FOR ANY DAMAGE TO EXISTING FACILITIES DURING EXECUTION OF WTE PLANT AND SHALL MAKE ALL NECESSARY ARRANGEMENTS FOR PROTECTING THE SAME. DETAILS OF EXISTING FACILITIES ARE AVAILABLE WITH THE OWNER AND SAME CAN BE REFERRED BY BIDDER IF FELT NECESSARY.
 - MINIMUM OFFSET FROM BOUNDARY WALL SHALL BE 15 METER

- LEGEND:-**
- ROADS (i) SINGLE LANE (ii) DOUBLE LANE
 - EMBANKMENT
 - BOUNDARY WALL
 - FENCING
 - FACILITIES FOR STAGE-I (EXISTING)
 - FACILITIES FOR PROPOSED WTE PLANT
 - WATCH TOWERS
 - EXISTING BOUNDARY WALL (5.0M HIGH) (TO BE DISMANTLED BY THE BIDDER)
 - FORMATION LEVEL
 - BOUNDARY WALL FOR WTE PLANT

FOR TENDER PURPOSE ONLY

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National Thermal Power Corporation Ltd.
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PROJECT ENGINEERING-CIVIL

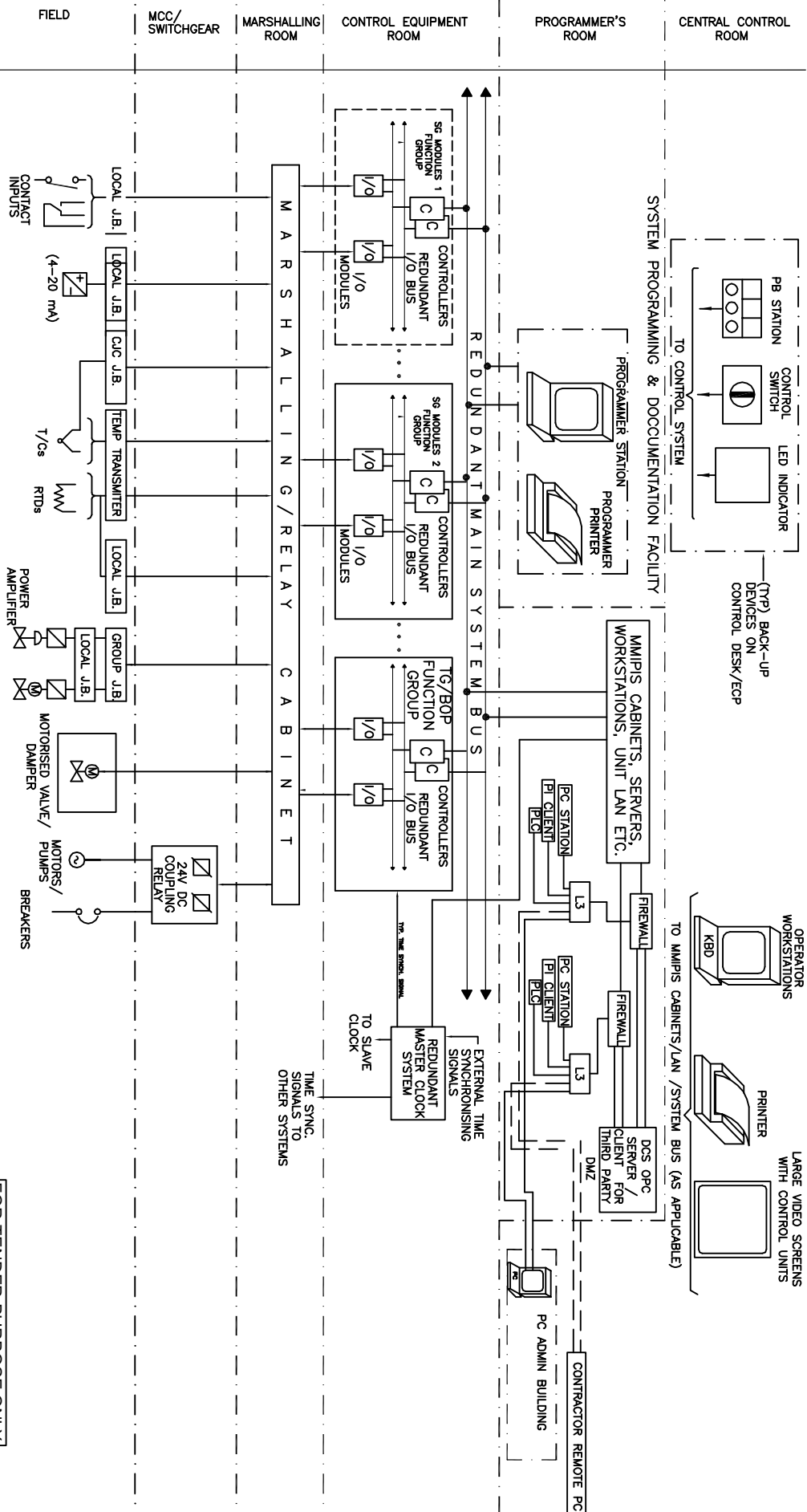
PROJECT KAWAS WASTE TO ENERGY PLANT
(23360 TPD)

GENERAL LAYOUT PLAN

REV/NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	CAI	ES	APPD	DATE
1	WTE ADDED FOR TENDER PURPOSE ONLY.	PK	KK	KK	-	-	-	-	-	CS	10.09.19
0	FOR FR PURPOSE ONLY.	MANOU	RV	RV	-	-	-	-	-	RB	15.01.19

TITLE	SCALE	DWG. NO.	REV. NO.
GENERAL LAYOUT PLAN	1:4000	2600-001-POC-F-001	A

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NOTES:-

1. THIS SKETCH IS INDICATIVE . TO EXPLAIN OF TECHNICAL SPECIFICATION FOR DETAILS.

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NTPC

नैशनल थर्मल पावर कॉर्पोरेशन लिमिटेड
National Thermal Power Corporation Ltd.
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

FOR TENDER PURPOSE ONLY

PROJECT										TYPICAL WASTE TO ENERGY PLANT									
TITLE										DISTRIBUTED DIGITAL CONTROL, MONITORING AND INFORMATION SYSTEM (DDCMS) CONFIGURATION DIAGRAM									
A										FIRST ISSUE									
REV. NO.										DRAWN DESIGN CHKD.									
M										E									
C										C&I									
ARCH.										APPD									
DATE										22.06.17									
SIZE										SCALE									
N.T.S.										DRG. NO.									
2600-999-POI-A-001										REV. NO.									
Sh-1 of 1										A									

GENERAL NOTES:

1. THE SELECTION OF LT OUTGOING FEEDERS(DRAW OUT TYPE) SHALL BE AS INDICATED HEREUNDER:
- (i) upto 400 A – MCCB
(ii) ABOVE 400 A – BREAKER

2. CONTROL AND PROTECTION SUPPLIES FOR ALL SWITCHGEARS/ DBS/CONTROL PANELS SHALL BE FED FROM TWO DIFFERENT SOURCES/DIFFERENT SECTIONS.

3. STANDARD LT TRANSFORMER RATINGS WITH THEIR IMPEDANCES ARE AS FOLLOWS

SL NO.	TRF RATING	% IMPEDANCE (Tolerance as per IS)
1.	2.5 MVA	12.5 %
2.	2.0 MVA	10 %
3.	1.6 MVA	8 %
4.	1.0 MVA	5 %
5.	0.63 MVA	5 %

4. WHEREVER MINIMUM RATING OR NO RATING HAS BEEN INDICATED, SIZING SHALL BE CARRIED OUT AS PER SYSTEM REQUIREMENT AND FINAL DRIVE LIST. FINAL FEEDING ARRANGEMENT TO BE DECIDED DURING DETAILED ENGINEERING AS PER SIZING CRITERIA SPECIFIED IN THE TECHNICAL SPECIFICATION HOWEVER EQUIPMENT SUPPLIED SHALL BE OF ATLEAST MINIMUM SPECIFIED RATING

5. 3x50% FEEDING ARRANGEMENT MAY BE USED FOR 415 VOLTS LOAD CENTERS WHERE THE TOTAL LT LOAD IS MORE THAN 2.15 MVA.

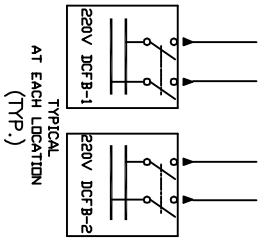
6. NUMBER OF MOTORS/FEEDERS SHOWN IN THE SLD IS TYPICAL AND FEEDING ARRANGEMENT SHOWN AT VARIOUS LOAD CENTERS IS INDICATIVE IN NATURE SHOWING THE FUNCTIONAL REQUIREMENTS.

7. BIDDER SHALL PROVIDE DC SYSTEM OF ADEQUATE CAPACITY FOR MEETING DC LOADS FOR THE PLANT.

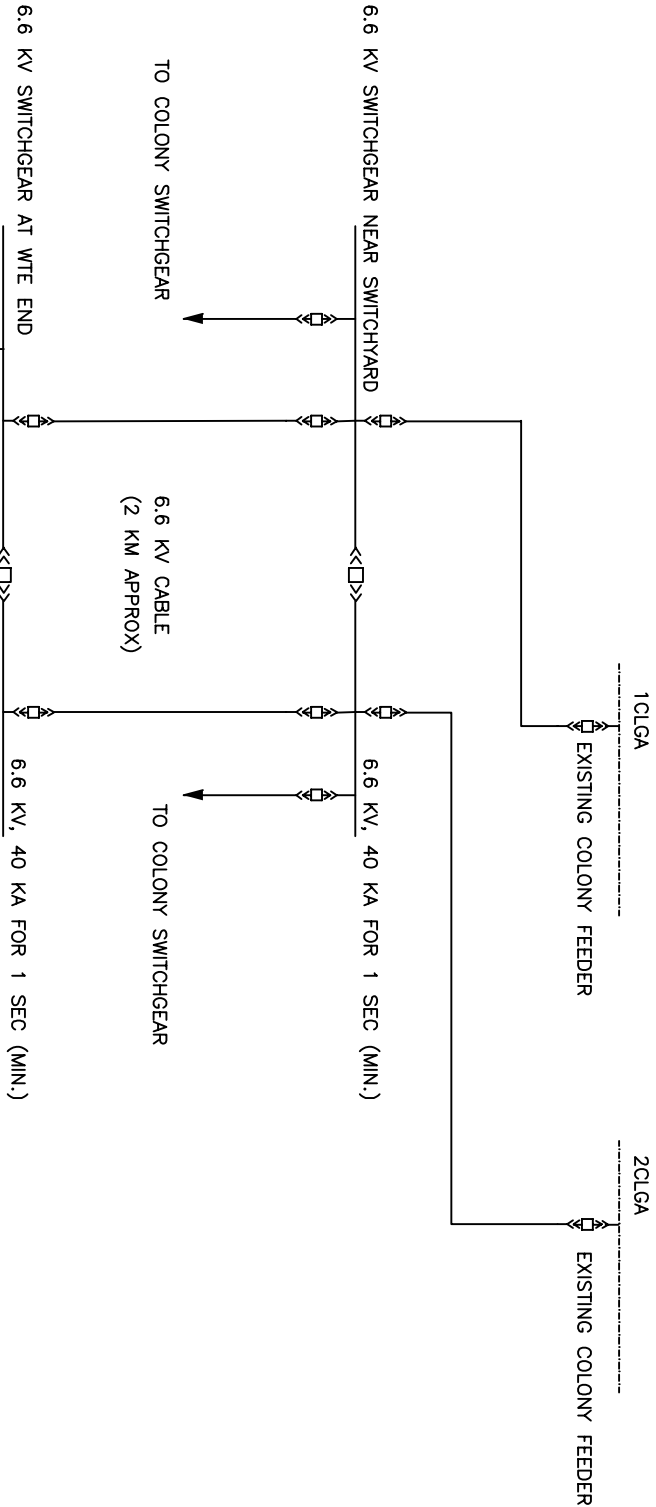
8. MINIMUM ONE NUMBER DG SET COMMON FOR ENTIRE WTE PLANT SHALL BE PROVIDED BY THE BIDDER FOR MEETING THE EMERGENCY PROCESS LOADS ENVISAGED FOR WTE PLANT.

9. ALL BATTERY CHARGERS SHALL HAVE 2 INPUT SUPPLIES ALONG WITH SUITABLE AUTOMATIC CHANGEOVER BETWEEN THE SOURCES.

10. LOCATION OF TARIFF ENERGY METERS SHOWN IS TENTATIVE AND MAY CHANGE AS PER THE DISCOM REGULATION.

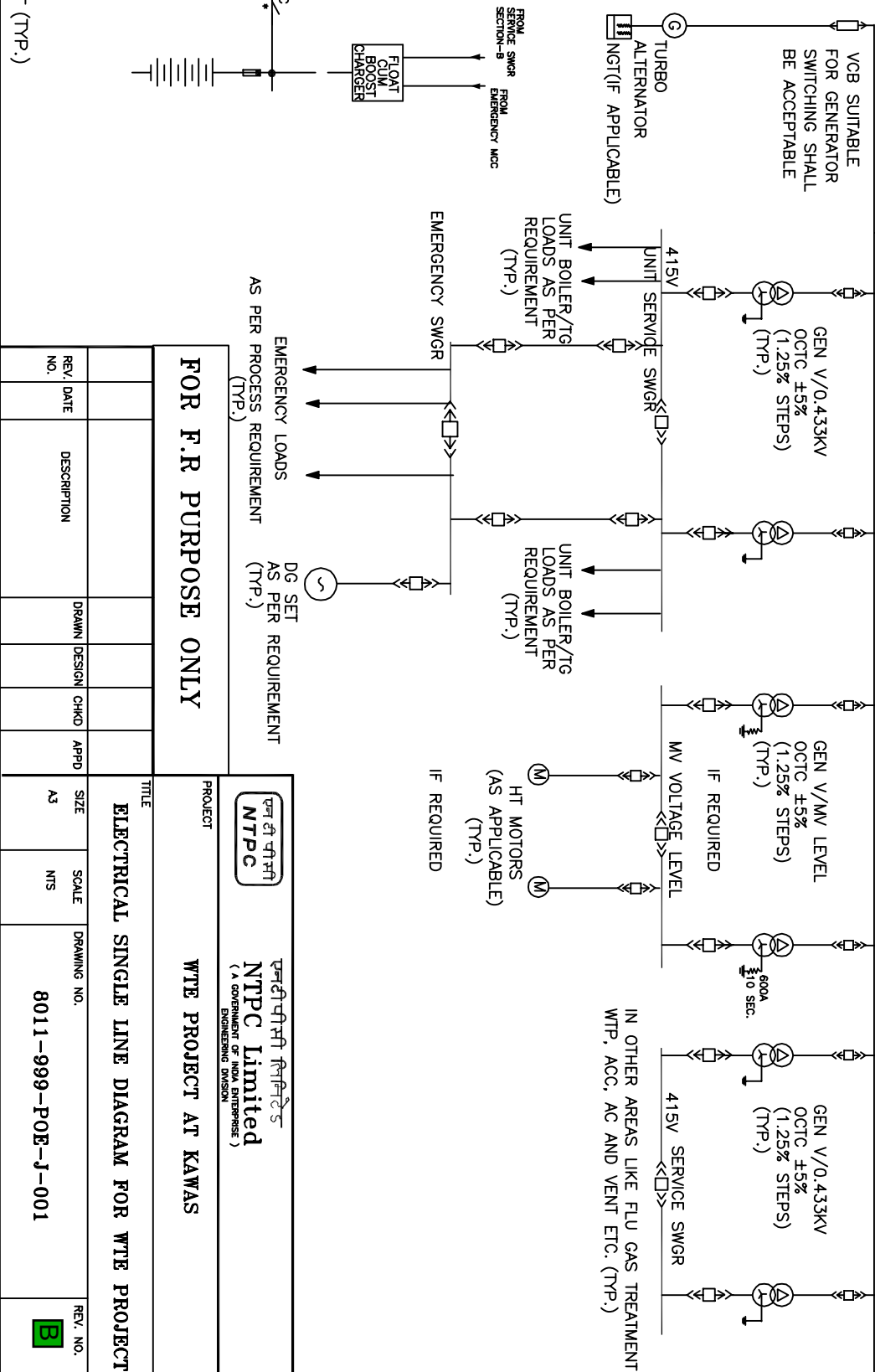


OUTGOING DC FEEDERS AS PER REQUIREMENT (TYP.)



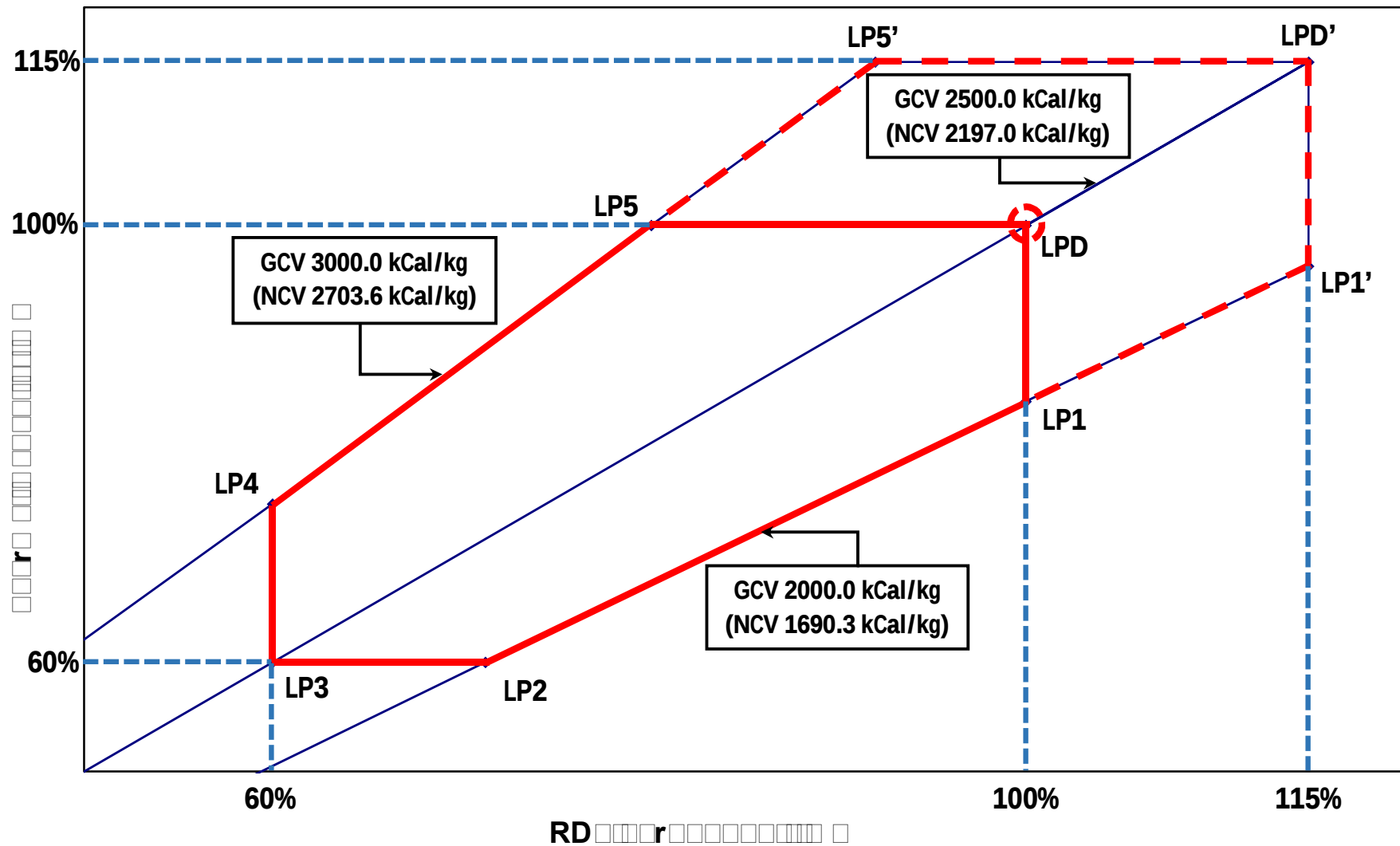
Note:

- Power evacuation shall be From Generator to 1CLGA and 2 CLGA switchgears (6.6KV Rated).
- Bus duct shall be envisaged from Generator up to GT LV Winding.
- CB used for generator switching shall be VCB and should have short circuit rating of 40KA (Rms) for 1 sec and Momentary Dynamic current rating of 105KA (Peak).
- All the switchgears mentioned in the Key SLD except (1CLGA and 2CLGA) shall be in bidder's scope.
- Bidder has to supply all power and control cables for the system shown in SLD.
- Interconnection between the 6.6KV Switchgear near switchyard to colony switchgear (i.e upto colony transformer) is in bidders scope. Distance is approximately 1km.
- Bidder has to replace the existing breakers for existing colony Feeders in 1CLGA and 2 CLGA shall be replaced with the suitable breaker along with CTs, PTs and Protection and control circuit as per NTPC Technical specifications.



FOR F.R PURPOSE ONLY					TITLE		
REV. NO.	DATE	DESCRIPTION	DRAWN	DESIGN	CHKD	APRD	SIZE
							A3
					ELECTRICAL SINGLE LINE DIAGRAM FOR WTE PROJECT		
					SCALE		
					DRAWING NO.		
					8011-999-POE-J-001		
					REV. NO.		
					B		

Combustion / Firing Diagram



Description	Unit	RDF Perf. / Design (2500 kCal/kg)	RDF Minimum (2000 kCal/kg)	RDF Maximum (3000 kCal/kg)
		2	3	4
Carbon	% wt.	26.893	21.514	32.271
Hydrogen	% wt.	2.492	1.993	2.990
Oxygen	% wt.	18.528	14.822	22.233
Sulphur	% wt.	0.098	0.078	0.117
Nitrogen	% wt.	0.275	0.220	0.330
Ash	% wt.	21.807	25.914	17.700
Moisture	% wt.	29.695	35.288	24.103
Chlorine	% wt.	0.214	0.171	0.256
GCV	kCal/kg	2500.0	2000.0	3000.0
NCV(calculated)	kCal/kg	2197.0	1690.3	2703.6

KAWAS WtE**CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT**

All structures and equipment shall be designed for seismic forces adopting the site specific seismic information provided in this document and using the other provisions in accordance with IS:1893 (Part 1 to Part 4). Pending finalization of Part 5 of IS:1893, provisions of part 1 shall be read along with the relevant clauses of IS:1893:1984, for embankments.

A site specific seismic study has been conducted for the project site. The peak ground horizontal acceleration for the project site, the site specific acceleration spectral coefficients (in units of gravity acceleration 'g') in the horizontal direction for the various damping values and the multiplying factor (to be used over the spectral coefficients) for evaluating the design acceleration spectra are as given at Appendix-I.

Vertical acceleration spectral values shall be taken as 2/3rd of the corresponding horizontal values.

The site specific design acceleration spectra shall be used in place of the response acceleration spectra, given at figure-2 in IS:1893 (Part 1) and Annex B of IS:1893 (Part 4). The site specific acceleration spectra along with multiplying factors specified in Appendix-I includes the effect of the seismic environment of the site, the importance factor related to the structures and the response reduction factor. Hence, the design spectra do not require any further consideration of the zone factor (Z), the importance factor (I) and response reduction factor (R) as used in the IS:1893 (Part 1 to Part 4).

Damping in Structures

The damping factor (as a percentage of critical damping) to be adopted shall not be more than as indicated below for:

- | | | |
|-----------------------------------|---|----|
| a) Steel structures | : | 2% |
| b) Reinforced Concrete structures | : | 5% |
| c) Reinforced Concrete Stacks | : | 3% |
| d) Steel stacks | : | 2% |

Method of Analysis

Since most structures in a power plant are irregular in shape and have irregular distribution of mass and stiffness, dynamic analysis for obtaining the design seismic forces shall be carried out using the response spectrum method. The number of vibration modes used in the analysis should be such that the sum total of modal masses of all modes considered is at least 90 percent of the total seismic mass and shall also meet requirements of IS:1893 (Part 1). Modal combination of the peak response quantities shall be performed as per Complete Quadratic Combination (CQC) method or by an acceptable alternative as per IS:1893 (Part 1).

In general, seismic analysis shall be performed for the three orthogonal (two principal horizontal and one vertical) components of earthquake motion. The seismic response from the three components shall be combined as specified in IS:1893 (Part 1).

The spectral acceleration coefficient shall get restricted to the peak spectral value if the fundamental natural period of the structure falls to the left of the peak in the spectral acceleration curve.

For buildings, if the design base shear (V_B) obtained from modal combination is less than the base shear ($\bar{V}_B$) computed using the approximate fundamental period (T_a) given in IS:1893:Part 1 and using site specific acceleration spectra with appropriate multiplying factor, the response quantities (e.g. member forces, displacements, storey forces, storey shears and base reactions) shall be enhanced in the ratio of $\bar{V}_B / V_B$. However, no reduction is permitted if $\bar{V}_B$ is less than V_B .

Design/Detailing for Ductility for Structures

The site specific design acceleration spectra is a reduced spectra and has an in-built allowance for ductility. Structures shall be engineered and detailed in accordance with relevant Indian/International standards to achieve ductility.

APPENDIX –I

KAWAS WtE

SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT

The various site specific seismic parameters for the project site shall be as follows:

- | | | |
|----|---|---------|
| 1) | Peak ground horizontal acceleration | : 0.28g |
| 2) | Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra | |
| a) | for special moment resisting steel frames designed and detailed as per IS:800 | : 0.07 |
| b) | For special concentrically braced steel frames designed and detailed as per IS:800 | : 0.053 |
| c) | for special moment resisting RC frames designed and detailed as per IS:456 and IS:13920 | : 0.042 |
| d) | for RCC chimney, RCC Natural Draft Cooling Tower | : 0.14 |
| e) | For Liquid retaining tanks | : 0.084 |
| f) | for Steel chimney, Absorber tower, Vessels | : 0.105 |
| g) | for design of structures not covered under 2 (a) to 2 (f) above and under 3 below, in general (excluding special structure/ configuration/materials) | : 0.07 |
| 3) | Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted | : 0.14 |

Note: g = Acceleration due to gravity

The horizontal seismic acceleration spectral coefficients are furnished in subsequent pages.

ANNEXURE – I (Contd.)**Kawas WtE: HORIZONTAL SEISMIC ACCELERATION SPECTRAL COEFFICIENTS**
(In units of 'g')

Time Period (Sec)	Damping Factor (as a percentage of critical damping)					
	0.8	1.0	1.6	2	3	5
0.000	1.000	1.000	1.000	1.000	1	1.000
0.030	1.000	1.000	1.000	1.000	1	1.000
0.050	1.693	1.660	1.580	1.545	1.472	1.378
0.100	3.460	3.301	2.937	2.789	2.488	2.130
0.136	4.735	4.479	3.868	3.625	3.140	2.584
0.137	4.735	4.512	3.894	3.647	3.157	2.596
0.143	4.735	4.526	4.042	3.783	3.261	2.666
0.145	4.735	4.526	4.042	3.791	3.296	2.686
0.250	4.735	4.526	4.042	3.791	3.308	2.686
0.300	4.735	4.526	4.042	3.791	3.308	2.686
0.350	4.735	4.526	4.042	3.791	3.308	2.686
0.400	4.735	4.526	4.042	3.791	3.308	2.686
0.450	4.735	4.526	4.042	3.791	3.308	2.686
0.500	4.735	4.526	4.042	3.791	3.308	2.686
0.550	4.735	4.526	4.042	3.791	3.308	2.686
0.600	4.735	4.526	4.042	3.791	3.308	2.686
0.650	4.735	4.526	4.042	3.791	3.308	2.686
0.678	4.735	4.526	4.042	3.791	3.308	2.686
0.687	4.735	4.526	4.042	3.791	3.308	2.686
0.700	4.714	4.444	4.042	3.791	3.308	2.686
0.714	4.622	4.357	4.042	3.791	3.308	2.686
0.717	4.603	4.339	4.025	3.791	3.308	2.686
0.723	4.564	4.303	3.992	3.762	3.308	2.685
0.800	4.125	3.889	3.608	3.400	3.014	2.426
0.900	3.667	3.457	3.207	3.022	2.679	2.157
1.000	3.300	3.111	2.886	2.720	2.411	1.941
1.050	3.143	2.963	2.749	2.590	2.296	1.849
1.100	3.000	2.828	2.624	2.473	2.192	1.765
1.150	2.870	2.705	2.510	2.365	2.097	1.688
1.200	2.750	2.593	2.405	2.267	2.009	1.618
1.250	2.640	2.489	2.309	2.176	1.929	1.553
1.300	2.538	2.393	2.220	2.092	1.855	1.493
1.350	2.444	2.304	2.138	2.015	1.786	1.438
1.400	2.357	2.222	2.061	1.943	1.722	1.386
1.450	2.276	2.146	1.990	1.876	1.663	1.339
1.500	2.200	2.074	1.924	1.813	1.607	1.294
1.550	2.129	2.007	1.862	1.755	1.555	1.252
1.600	2.063	1.944	1.804	1.700	1.507	1.213
1.650	2.000	1.885	1.749	1.648	1.461	1.176
1.700	1.941	1.830	1.698	1.600	1.418	1.142
1.750	1.886	1.778	1.649	1.554	1.378	1.109
1.800	1.833	1.728	1.603	1.511	1.339	1.078
1.850	1.784	1.682	1.560	1.470	1.303	1.049
1.900	1.737	1.637	1.519	1.432	1.269	1.022
1.950	1.692	1.595	1.480	1.395	1.236	0.995
2.000	1.650	1.556	1.443	1.360	1.206	0.971

ANNEXURE – I (Contd.)**Kawas WtE: HORIZONTAL SEISMIC ACCELERATION SPECTRAL COEFFICIENTS**
(In units of 'g')

Time Period (Sec)	Damping Factor (as a percentage of critical damping)					
	0.8	1.0	1.6	2	3	5
2.050	1.610	1.518	1.408	1.327	1.176	0.947
2.100	1.571	1.481	1.374	1.295	1.148	0.924
2.150	1.535	1.447	1.342	1.265	1.121	0.903
2.200	1.500	1.414	1.312	1.236	1.096	0.882
2.250	1.467	1.383	1.283	1.209	1.072	0.863
2.300	1.435	1.353	1.255	1.183	1.048	0.844
2.350	1.404	1.324	1.228	1.157	1.026	0.826
2.400	1.375	1.296	1.203	1.133	1.005	0.809
2.450	1.347	1.270	1.178	1.110	0.984	0.792
2.500	1.320	1.244	1.154	1.088	0.964	0.776
2.550	1.294	1.220	1.132	1.067	0.945	0.761
2.600	1.269	1.197	1.110	1.046	0.927	0.747
2.650	1.245	1.174	1.089	1.026	0.910	0.732
2.700	1.222	1.152	1.069	1.007	0.893	0.719
2.750	1.200	1.131	1.049	0.989	0.877	0.706
2.800	1.179	1.111	1.031	0.971	0.861	0.693
2.850	1.158	1.092	1.013	0.954	0.846	0.681
2.900	1.138	1.073	0.995	0.938	0.831	0.669
2.950	1.119	1.055	0.978	0.922	0.817	0.658
3.000	1.100	1.037	0.962	0.907	0.804	0.647
3.050	1.082	1.020	0.946	0.892	0.790	0.636
3.100	1.065	1.004	0.931	0.877	0.778	0.626
3.150	1.048	0.988	0.916	0.863	0.765	0.616
3.200	1.031	0.972	0.902	0.850	0.753	0.607
3.250	1.015	0.957	0.888	0.837	0.742	0.597
3.300	1.000	0.943	0.875	0.824	0.731	0.588
3.350	0.985	0.929	0.861	0.812	0.720	0.579
3.400	0.971	0.915	0.849	0.800	0.709	0.571
3.514	0.939	0.885	0.821	0.774	0.686	0.552
3.573	0.908	0.871	0.808	0.761	0.675	0.543
3.587	0.901	0.867	0.801	0.758	0.672	0.541
3.673	0.860	0.827	0.764	0.740	0.656	0.528
3.700	0.847	0.815	0.753	0.730	0.652	0.525
3.750	0.825	0.794	0.733	0.710	0.643	0.518
3.775	0.814	0.783	0.724	0.701	0.639	0.514
3.800	0.803	0.773	0.714	0.692	0.634	0.511
3.825	0.793	0.763	0.705	0.683	0.630	0.507
3.850	0.782	0.753	0.696	0.674	0.626	0.504
3.900	0.762	0.734	0.678	0.657	0.618	0.498
4.000	0.725	0.698	0.644	0.624	0.589	0.485

ANNEXURE-II

KAWAS WtE

CRITERIA FOR WIND RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT

All structures shall be designed for wind forces in accordance with IS: 875 (Part-3) and as specified in this document. See Annexure – II-A for site specific information.

Along wind forces shall generally be computed by the Peak (i.e. 3 second gust) Wind Speed method as defined in the standard.

Along wind forces on slender and wind sensitive structures and structural elements shall also be computed, for dynamic effects, using the Gust Factor or Gust Effectiveness Factor Method as defined in the standard. The structures shall be designed for the higher of the forces obtained from Gust Factor method and the Peak Wind Speed method.

Analysis for dynamic effects of wind must be undertaken for any structure which has a height to minimum lateral dimension ratio greater than “5” and/or if the fundamental frequency of the structure is less than 1 Hz.

Susceptibility of structures to across-wind forces, galloping, flutter, ovalling etc. should be examined and designed/detailed accordingly following the recommendations of IS:875(Part-3) and other relevant Indian standards.

It should be estimated if size and relative position of other structures are likely to enhance the wind loading on the structure under consideration. Enhancement factor, if necessary, shall suitably be estimated and applied to the wind loading to account for the interference effects.

Damping in Structures

The damping factor (as a percentage of critical damping) to be adopted shall not be more than as indicated below for:

- | | |
|---|--|
| a) Welded steel structures | : 1.0% |
| b) Bolted steel structures/RCC Structures | : 2.0% |
| c) Prestressed concrete structures | : 1.6% |
| d) Steel stacks | : As per IS:6533 & CICIND Model Code whichever is more critical. |

ANNEXURE-II-A

SITE SPECIFIC DESIGN PARAMETERS

The various design parameters, as defined in IS: 875 (Part-3), to be adopted for the project site shall be as follows:

- a) The basic wind speed “ V_b ” at ten
metres above the mean ground level : 50 metres/second
- b) The risk coefficient “ K_1 ” : 1.08
- c) Category of terrain : Category-2

NKPC						Bore Log						Fig No. 4.97	
Project National Thermal Power Corp. Ltd. KGPP Stage II, Kawas						Bore Hole No. 47							
Location Area -5		Co-ordinate 2300-S/500-E		Date of Execution									
Total Depth (m) : 30.00		Bore Dia meter 150 mm		Start		Completion							
RL : 2.615 m Scale : 1 : 100		Water Table (m) 1.40		4/4/98		7/4/98							
Method of Boring :- Auger Drilling Upto 4.00 m						Casing							
Rotary Drilling Upto 30.00 m													
Soil Description	Depth	Thickness of Layer	Soil	Reduce Level	Sample		Penetration Tests N-Values					Remarks	
		(m)		(m)	Type	Lab	20	40	60	80	100		
CL Inorganic clays of low plasticity	1	1.95		0.665	SPT	556	18					Water Struck at 3.00 m } Failed	
SC Clayey sands	2				UDS	557							
	3	2.55		-1.885	SPT		15						
SP Poorly graded sands; little or no fines	4				UDS	558							
	5				SPT		19						
	6				UDS								
	7				SPT								
	8	6.00			UDS								
	9				SPT								
	10				UDS								
CL Inorganic clays of low plasticity	11			-7.885	SPT	559	43						
	12				SPT		51						
	13				SPT								
	14	6.00			SPT						100		
	15												
	16												
SC Clayey sands	17	3.00		-13.885	SPT	560					73		

NKPC**Bore Log****Fig No.** 4.97/2**Project** National Thermal Power Corp. Ltd. KGPP Stage II, Kawas**Bore Hole No.** 47**Location** Area -5**Co-ordinate** 2300-S/500-E**Date of Execution****Total Depth (m) :** 30.00**Bore Dia meter** 150 mm**Start****Completeion****RL :** 2.615 m **Scale :** 1 : 100**Water Table (m)** 1.40

4/4/98

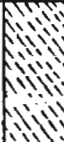
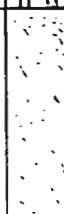
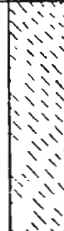
7/4/98

Method of Boring :- Auger Drilling Upto 4.00 m**Casing**

Rotary Drilling Upto 30.00 m

Soil Description	Depth	Thickness of Layer	Soil	Reduce Level	Sample		Penetration Tests N-Values					Remarks
					Type	Lab	20	40	60	80	100	
	18				SPT							
	19				SPT							
SP Poorly graded sands; little or no fines	20			-16.885	SPT	561						
	21											
	22				SPT							
	23											
	24	8.50										
	25											
	26				SPT							
	27											
C1 Inorganic clays of medium plasticity	28			-25.385	SPT							
	29	2.00										
	30			27.385	SPT	562				68		

NKPC

NKPC							Bore Log							Fig No. 41					
Project National Thermal Power Corp. Ltd. KGPP Stage II, Kawas							Bore Hole No. 48												
Location Area -5			Co-ordinate 2300-S/550-E				Date of Execution												
Total Depth (m) : 30.00			Bore Dia meter 150 mm				Start			Completion									
RL : 2.655 m Scale : 1 : 100			Water Table (m) 1.40				4/4/98			6/4/98									
Method of Boring :- Auger Drilling Upto 4.5 m							Casing												
Rotary Drilling Upto 30.00 m																			
Soil Description		Depth	Thickness of Layer	Soil	Reduce Level	Sample		Penetration Tests N-Values					Remarks						
			(m)		(m)	Type	Lab	20	40	60	80	100							
Silty clays (Visually)		1	2.00			SPT		19						Water Struck at 3.00 m					
		2			0.655														
SP — SM Boundry classification between poorly graded Sand and Silty sand		3				UDS	481												
		4				SPT		11											
		5	5.50																
		6				UDS	482												
		7																	
SP Poorly graded sands; little or no fines		8			-4.845	SPT	483		21					Failed					
		9	3.00			UDS													
		10																	
					-7.845	SPT	484		38										
SC Clayey sands		11																	
		12	3.00			UDS	485												
		13																	
					-10.845	SPT													
CI Inorganic clays of medium plasticity		14							53										
		15				UDS													
		16	5.50																
		17				SPT	486		55										

NKPC												
Bore Log						Fig No. 4.98/2						
Project National Thermal Power Corp. Ltd. KGPP Stage II, Kawas						Bore Hole No. 48						
Location Arca -5		Co-ordinate 2300-S/550-E		Date of Execution								
Total Depth (m) : 30.00		Bore Dia meter 150 mm		Start		Completeion						
RL : 2.655 m Scale : 1 : 100		Water Table (m) 1.40		4/4/98		6/4/98						
Method of Boring :- Auger Drilling Upto 4.5 m						Casing						
Rotary Drilling Upto 30.00 m												
Soil Description	Depth	Thickness of Layer	Soil	Reduce Level	Sample		Penetration Tests N-Values					Remarks
					Type	Lab	20	40	60	80	100	
	18											
	19			-16.345	SPT	487						>100
SP Poorly graded sands; little or no fines	20											
	21											
	22				SPT							>100
	23											
	24	8.95										
	25				SPT							>100
	26											
	27											
	28				SP1							>100
CH Inorganic clays of high plasticity	29	2.05		-25.340								
	30			-27.345	SP1	488						70

NKPC												
Bore Log						Fig No. 4.99						
Project National Thermal Power Corp. Ltd. KGPP Stage II, Kawas						Bore Hole No. 49						
Location Area -5		Co-ordinate 2250-S/525-E		Date of Execution								
Total Depth (m) : 25.00		Bore Dia meter 150 mm		Start		Completion						
RL : 2.695 m Scale : 1 : 100		Water Table (m) 1.90		8/4/98		9/4/98						
Method of Boring :- Auger Drilling Upto 5.00 m						Casing						
Rotary Drilling Upto 25.00 m												
Soil Description	Depth	Thickness of Layer	Soil	Reduce Level	Sample		Penetration Tests N-Values					Remarks
		(m)		(m)	Type	Lab	20	40	60	80	100	
CI Inorganic clays of medium plasticity	1	3.50			UDS	563						
	2											
	3											
SP Poorly graded sands; little or no fines	4	6.50		-0.805	SPT		17					Water Struck at 3.50 m
	5				UDS	564						
	6											
	7				SPT		28					
	8											
	9											
	10				SPT	565	52					
CL Inorganic clays of low plasticity	11	7.45		-7.305	SPT				74			
	12											
	13											
	14				SPT	566	79					
	15											
	16											
	17				SPT		73					

NKPC

Bore Log

Fig No. 4.99/2

Project National Thermal Power Corp. Ltd. KGPP Stage II, Kawas

Bore Hole No. 49

Location Area -5

Co-ordinate 2250-S/525-E

Date of Execution

Total Depth (m) : 25.00

Bore Dia meter 150 mm

Start

Completion

RL: 2.695 m Scale: 1:100

Water Table (m) 1.90

8/4/98

9/4/98

Method of Boring :-	Auger Drilling	Upto	5.00 m
---------------------	----------------	------	--------

Casing

Rotary Drilling Upto	25.00 m
----------------------	---------

[illegible]

NKPC													
Bore Log						Fig No. 4.100							
Project National Thermal Power Corp. Ltd. KGPP Stage II, Kawas						Bore Hole No. 50							
Location Area -5		Co-ordinate 2200-S/500-E				Date of Execution							
Total Depth (m) : 30.00		Bore Dia meter 150 mm				Start		Completion					
RL : 2.610 m Scale : 1 : 100		Water Table (m) 2.10				7/4/98		10/4/98					
Method of Boring :- Auger Drilling Upto 5.00 m						Casing							
Rotary Drilling Upto 30.00 m													
Soil Description	Depth	Thickness of Layer	Soil	Reduce Level	Sample		Penetration Tests N-Values					Remarks	
		(m)		(m)	Type	Lab	20	40	60	80	100		
Clayey soil visually	1	3.50			UDS								
	2												
	3												
SP Poorly graded sands; little or no fines	4	7.50		-0.89	SPT	445	11					Water Struck at 3.50 m	
	5				UDS	446							
	6												
	7				SPT		18						
	8				UDS								
	9												
	10				SPT	447	32						
	11												
Clayey soil visually	12	6.00		-8.39	SPT								
	13												
	14				SPT								
	15												
	16												
	17												
				-14.39	SPT								

NKPC												
Bore Log						Fig No. 4.100/2						
Project National Thermal Power Corp. Ltd. KGPP Stage II, Kawas						Bore Hole No. 50						
Location Area -5			Co-ordinate 2200-S/500-E			Date of Execution						
Total Depth (m) : 30.00			Bore Dia meter 150 mm			Start			Completion			
RL : 2.610 m Scale : 1 : 100			Water Table (m) 2.10			7/4/98			10/4/98			
Method of Boring :- Auger Drilling Upto 5.00 m						Casing						
Rotary Drilling Upto 30.00 m												
Soil Description	Depth	Thickness of Layer	Soil	Reduce Level	Sample		Penetration Tests N-Values					Remarks
					Type	Lab	20	40	60	80	100	
SW Well graded sands, gravelly sands; little or no fines	18											
	19											
	20				SPT	448					74	
	21											
	22											
	23	11.00			SPT							>100
	24											
	25				SPT							>100
CH Inorganic clays of high plasticity	26											
	27											
	28				SPT							100
	29											
	30	2.00			SPT	449						84

NKPC						Bore Log						Fig No. 4.101					
Project National Thermal Power Corp. Ltd. KGPP Stage II, Kawas						Bore Hole No. 51											
Location Area -5			Co-ordinate 2200-S/550-E			Date of Execution											
Total Depth (m) : 30.00			Bore Dia meter 150 mm			Start			Completion								
RL : 2.635 m Scale : 1 : 100			Water Table (m) 1.90			7/4/98			8/4/98								
Method of Boring :- Auger Drilling Upto 5.00 m						Casing											
Rotary Drilling Upto 30.00 m																	
Soil Description		Depth	Thickness of Layer	Soil	Reduce Level	Sample		Penetration Tests N-Values					Remarks				
			(m)		(m)	Type	Lab	20	40	60	80	100					
CI Inorganic clays of medium plasticity		1	5.60		-2.965	UDS	489						Water Struck at 3.50 m				
		2				SPT		10									
		3															
		4															
		5				UDS	490										
SP Poorly graded sands; little or no fines		6	5.40		-14.365	SPT			21								
		7															
		8				UDS	Slipped										
		9															
		10				SPT	491	36									
		11				SPT		30									
CI Inorganic clays of medium plasticity		12	6.00		-14.365	UDS	492										
		13															
		14				SPT		60									
		15															
		16															
		17				SPT		68									

NKPC												
Bore Log						Fig No. 4.101/2						
Project National Thermal Power Corp. Ltd. KGPP Stage II, Kawas						Bore Hole No. 51						
Location Area -5		Co-ordinate 2200-S/550-E				Date of Execution						
Total Depth (m) : 30.00		Bore Dia meter 150 mm				Start		Completion				
RL : 2.635 m Scale : 1 : 100		Water Table (m) 1.90				7/4/98		8/4/98				
Method of Boring :- Auger Drilling Upto 5.00 m						Casing						
Rotary Drilling Upto 30.00 m												
Soil Description	Depth	Thickness of Layer	Soil	Reduce Level	Sample		Penetration Tests N-Values					Remarks
					Type	Lab	20	40	60	80	100	
SP Poorly graded sands; little or no fines	18	6.00		-20.365	SPT	493						
	19											
	20											
	21											
	22											
CL Inorganic clays of low plasticity	23	7.00		-27.365	SPT	494						
	24											
	25											
	26											
	27											
	28											
	29											
	30											

NKPC						Bore Log						Fig No. 4.102	
Project National Thermal Power Corp. Ltd. KGPP Stage II, Kawas						Bore Hole No. 52							
Location Area -5			Co-ordinate 2150-S/525-E			Date of Execution							
Total Depth (m) : 25.00			Bore Dia meter 150 mm			Start			Completeion				
RL: 2.555 m Scale : 1 : 100			Water Table (m) 1.40			8/4/98			10/4/98				
Method of Boring :- Auger Drilling Upto 4.5 m						Casing							
Rotary Drilling Upto 25.00 m													
Soil Description	Depth	Thickness of Layer	Soil	Reduce Level	Sample		Penetration Tests N-Values					Remarks	
					Type	Lab	20	40	60	80	100		
CI Inorganic clays of medium plasticity	1	2.60		-0.045	UDS	523							Water Struck at 3.00 m
	2												
CH Inorganic clays of high plasticity	3	2.90		-2.945	SPT		7						
	4												
	5												
SP Poorly graded sands; little or no fines (Visually)	6	5.50		-8.445	SPT		21						
	7												
	8												
	9												
	10												
	11												
CI Inorganic clays of medium plasticity	12	6.00		-14.445	SPT	525					75		
	13												
	14												
	15												
	16												
	17												

Fig No. 4.102/2

Bore Hole No. 52

Co-ordinate 2150-S/525-E

Date of Execution

Bore Dia meter 150 mm

Start

Completion

Water Table (m) 1.40

8/4/98

10/4/98

Method of Boring :- Auger Drilling Upto	4.5 m
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Casing

Rotary Drilling Upto	25.00 m
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NKPC

General civil, structural & architectural specifications for all anticipated buildings shall be as per Annexure-VI

Annexure VI							
Sl. No.	Building Structure Name	Size/Floor elevations	Features of Construction/Size	Type of Roof	Side Cladding	Floor Finish	Remarks
1	Power House Building						
a.	TG Bay	Grade, Mezanine & Operating floor	RCC framed Structure/Steel Structure with RCC Slab	Steel Truss with colour coated GI sheet	Metal claddingwith colour coated GI sheets on sides with steel doors. Windows with aluminum frame and min. 6mm thick reflective toughened glass	Granolithic floor finish(IPS) with non-metallic floor hardener at Grade level & mezanine floor. 20mm thick full body vitrified tile at operating floor.	
b.	MCC & Control Room	Control Room at operating floor MCC as per Bidder's layout	RCC framed Structure/Steel Structure with RCC slab	RCC slab over control room bay, False floor & aluminium (tile type) perforated false ceiling with acoustic treatment for control room area.	Brick masonry wall with aluminium frame glazed doors, windows as specified elsewhere in the specification and fixed glazed partitions of 11mm thick 2 hours fire rating for control room. Wall shall have finish of aluminium composite panel in exterior and interior finish of adequate type	PVC anti-static flooring-Access Flooring System (False Floor) for control room. False flooring for MCC panela if at elevated floor or RCC trenches for MCC panels if at 0.0m floor. Granolithic floor finish (IPS) with non-metallic floor hardener for other areas.	
c.	STG Foundation	Deck level as per Bidder's layout	RCC framed Structure				
2.	Boiler Area	As per functional requiriment	RCC foundation & pedestals for supporting of boiler and auxiliary equipments			Paving: RCC M 25 grade -150 mm thick for Boiler area with 200 mm metal soling. Paving area shall be as per plot plan.	
3.	Boiler Waste pit Hall	Size as per functional requirement	RCC framed Structure	Steel Truss with colour coated GI sheet	RCC Wall		
4.	Boiler Receipt platform (Tipping Floor)	Elevation as per functional requirement	RCC framed Structure	Steel Truss with colour coated GI sheet			
5.	Auxiliary Cooling Tower	Foundation for Auxiliary Cooling Tower					
6.	Air Cooled Condenser	As per system requirement	RCC framed structure upto fan deck level	RCC slab at fan deck level	Open all sides	50 mm thick Granolithic flooring (IPS) with 100 mm RCC+200 mm stone soling-1.0 m wide all around the columns.	
7.	Raw Cum Fire Water Storage Tank	Capacity as per functional requirement	RCC Tank				1.0 m Freeboard shall be considered above maximum water level
8.	Raw & Fire water Pump House	Floors at 0.00 m level	RCC framed Structure	RCC slab	Brick/block masonry wall with steel doors & windows	50 mm thick Granolithic flooring(IPS)	
9.	WTP MCC & Control Room, Lab & Chem. Storage & DM Plant Shed	Floors at 0.00 m level	RCC framed Structure	Steel Truss with Colour Coated Steel GI Sheet	Brick/block masonry wall/ Colour Coated GI Sheeting Wall in control room shall have Aluminium composite panel finish, lab shall have dado of acid alkali resistant tile up to 1200 mm height.	50 mm thick Granolithic flooring(IPS), minimum 9mm thick vitrified ceramic tiles for control room & acid alkali resistant tiling for lab	
10.	Chimney	RCC Chimney- height as specified elsewhere in the specification	1. Brick lined RCC Chimney with suitable foundation system: The chimney shell shall be constructed using slip form shuttering. Grade of concrete for chimney shell and all other superstructure shall be minimum M30 and grade of concrete for chimney foundation shall be minimum M30. Only OPC cement shall be used for Chimney shell and other super structure. Thickness of RCC shell shall be minimum 250mm. 2. Chimney brick Lining: 115mm thick brick lining with 100 mm air gap and 100 thick insulation between brick lining and RCC shell shall be provided on the internal surface of chimney shell. Top 10.0 m height of chimney lining, and the lining in hopper & baffle area shall be made of acid resistant brick conforming to IS 4860, Class-I and balance portion of chimney lining shall be made of fire brick conforming to IS: 6. The brick lining shall be supported on RCC corbels provided in the shell at an interval of approximately 7m to 10m. 3. Ladder & Platforms: Galvanised cage ladder shall be provided on the external surface of chimney shell for the entire height of chimney. 3 Nos. RCC external platforms with RCC kerb wall & GI handrailing shall be provided all around the chimney shell spaced approximately uniformly along the height. The cage ladder and external platforms shall be so located that it provides access to gas sampling ports, aviation warning lights etc.. 4. The other components of the chimney shall include: RCC platform with hopper and baffle wall inside the chimney at the flue duct entry location, suitable connection of steel flue gas duct to the brick liner with nonmetallic fabric type expansion joint, openings alongwith sleeves in shell for gas sampling ports and ventilation, grade level slab of RCC with metallic hardener floor finish, personnel access metallic door in chimney shell, ventilation openings in RCC corbel, castable refractory lining on concrete surfaces in direct contact with flue gas, cast iron cap along with fixing arrangement at top of chimney, all finishing works and other items, though not specifically mentioned but reasonably implied and necessary to complete the job in all respects. 5. Analysis & Design of chimney: Analysis and design of chimney shall be done as per IS 4998.				
11.	Transformers & Switch Yard	RCC pedestals & foundation for supporting the Transformers & switch yard equipments					Fire wall-350 mm Block/Brick wall/GI Chain link fencing of mesh size 75x75 mm-3mm thick to 2.4 m height Height of firewall shall be as per statutory requirement.

Sl. No.	Building Structure Name	Size/Floor elevations	Features of Construction/Size	Type of Roof	Side Cladding	Floor Finish	Remarks
12.	Weigh Bridge	RCC foundation for weigh bridge with approach platforms				50 mm thick Granolithic flooring(IPS)/Bitumen pavement	
13.	Weigh Bridge Control Room	Floors at 0.00 m level	RCC framed Structure	RCC slab	Brick masonry walls with aluminium doors & windows and acrylic emulsion paint finish	9mm thick (minimum) vitrified Ceramic tile flooring over 100 mm thick PCC	
14.	Time & Security Office (area of building 20 sq.m.) one toilet block additional to it and Drivers rest room (area 30sq.m.) with additional facility of toilet and drinking water	Floor levels as per functional requirement	RCC framed Structure	RCC slab	Brick masonry walls with aluminium doors & windows with 6 mm thick toughened glass	9mm thick (minimum) vitrified Ceramic tile flooring over 100 mm thick PCC	Interior, Internal partition, furniture, sanitary work & air condition work Shall be in bidder scope.
15.	Admin. & Canteen Building (G+1). Admin building (on first floor) part shall have 50 sq.m. of office area , 30 sq.m. of conference room area and 20 sq.m. of plant chief room and 40 Sqm. common area(total 140 sq.m.) in addition to it adequate no. of toilet and drinking water facility shall be provided . On ground floor level 140 sq.m. canteen shall be provided , in this area minimum space for seating of 25 persons at a time ,a kitchen with pantry shall be provided .other than above stated facilities adequate no of toilet(ladies and gents toilets) ,drinking water and hand wash area shall be provided for canteen. (Admin building and Seating area in canteen shall be air conditioned)	Floors at 0.00 m & 4.50m level	RCC framed Structure	RCC slab	Brick masonry walls with aluminium frame glazed doors, windows. Glass mosaic tile dado up to false ceiling in canteen seating area shall be provided. Admin building area shall have Acrylic emulsion paint finish.	9mm thick (minimum) vitrified Ceramic flooring in admin building office area and canteen building seating area, 11 mm thick wooden flooring in conference and chief room, dust pressed ceramic tile in kitchen, pantry and toilet with dado up to 2200 mm.	
16.	Workshop & Store Room	Floor levels as per functional requirement	RCC framed Structure	RCC slab	Brick masonry wall with steel doors & aluminium windows with 6 mm thick toughened glass	150 mm thick-RCC Flooring with 200mm stone soling	
17.	Car Parking Shed (for 6 nos. of car)	Floors at 0.00 m	Steel structure	Steel Truss with colour coated GI sheet	Open	150 mm thick-RCC Flooring with 200mm stone soling/Interlock tiles	
18.	Rain Water Harvesting pit	Size as per requirement for Rain water from Roofs of TG Bay, MCC & Control Room, Admin Building, Canteen Building	RCC raft & wall	Open tank	The tank shall be water proof	Underground tank	
19	Trucks Waiting area	The area shall be enough to hold required nos. of trucks mentioned elsewhere in the specification.					
20	Road	Road length as per plot plan and surface considered as rigid	Rigid Pavement				
21	Drainage		RCC wall for drain				
22	Sewerage Treatment Plant		As per specification				
23	Boundary Wall & Gate	Length as per plot plan	As per specification				

Any other building/facility required for completion of all systems.

