PQR FOR 400kV GIS SWITCHYARD

5.13.1 **Route-I:**

The Bidder/~~Sub-vendor~~ should have designed, manufactured, erected/ supervised erection, tested/ supervised testing and commissioned/ supervised commissioning of one (1) Gas Insulated Switchgear (GIS) equipment(s) installation having at least six (6) bays of 400kV or above voltage class with short circuit current of not less than 40 kA for 1 second, which should have been in successful operation for minimum two (2) years. from the original scheduled date of this tender.

~~**Route-II:**~~

~~The Bidder/Sub-vendor should have designed, constructed/erected, tested and commissioned one (1) Air Insulated Substation/ Switchyard of 400 kV or above voltage class having at least six (6) bays which should have been in successful operation for a minimum period of two(2) years.~~

~~**AND**~~

~~The Bidder/Sub-vendor associates with a GIS manufacturer for sourcing of GIS equipments who meets the requirement indicated at 5.13.1 above. The associate will also be fully responsible for the performance of the GIS portion of the contract.~~

~~In such an event the Bidder shall arrange a Letter of Technical Support to this effect from its Associate as per the format enclosed in the bidding document. This Letter of Technical Support should be submitted prior to the placement of order on approved vendor.~~

Route-III:

The Bidder/~~Sub-vendor~~ should have established manufacturing facilities for GIS equipment in India based on technological support of an associate (who meets the requirement at 5.13.1 above) and Bidder/~~Sub-vendor~~ should have designed, manufactured, and supplied one (1) Gas Insulated Switchgear (GIS) equipment(s) installation having at least six (6) bays of 400kV or above voltage class. The associate will be fully responsible for the performance of the GIS portion of the contract.

In such an event the Bidder shall arrange a Letter of Technical Support to this effect from its Associate as per the format enclosed in the bidding document. This Letter of Technical Support should be submitted prior to the placement of order on approved vendor.

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

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BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS ENGINEERING MANAGEMENT
NOIDA

DOCUMENT NO.	TB-PBTU-GSECL UKAI-GIS	Rev 00	Prepared	Checked	Approved
TYPE OF DOC.	TECHNICAL SPECIFICATION	NAME	BY	DKS	VK
TITLE 400kV Gas Insulated Switchgear with its accessories		SIGN			
		DATE	31.05.2024	31.05.2024	31.05.2024
		GROUP	TBEM		
		WO No.			

CUSTOMER	GSECL
PROJECT	Pre Bid Tie up for, EPC Tender for Design, Engineering, manufacturing, Supply, Erection, Testing and Commissioning of 400kV Switchyard of 1x800 MW ULTRA SUPERCRITICAL UNIT NO. #7ON ASH DYKE AREA AT UKAI TPS.

Contents

Remarks:
Bidder to note that data and details of Guaranteed Technical Particulars shall not be reviewed during Technical Evaluation/ Review, hence compliance of Guaranteed Technical Particulars in line with Technical Specification has to be ensured by the bidder.

Rev. No.	Date	Altered	Checked	Approved	
Distribution				To	
				Copies	

SECTION 1: CHECKLIST FOR TECHNICAL EVALUATION

Along with the technical offer/ bids, the bidder should submit this checklist confirming the inclusion of the enclosures as listed below,

Sl. No.	Documents to be enclosed	Bidder to confirm (Please tick "Confirmed")
1.	Supporting documents for compliance of Technical Qualifying Requirement.	Confirmed
2.	Unpriced BOQ duly mentioning "Quoted" for all the items, signed and sealed.	Confirmed
3.	Annexure-A & B duly filled, signed and sealed.	Confirmed

Note: Any bidder not meeting the above requirement is liable for non-evaluation.
The above checklist is reviewed and verified for,

NIT Reference No.:

Name of Bidder:

Name of Project:

Date: Bidder's Stamp & Signature

Standard Specification for GIS

CONTENTS

1. SCOPE

This technical specification covers the requirements of (1) design, type testing, engineering, fabrication, manufacturing, shop assembly, inspection including and testing at manufacturer's works, proper packing, supply and delivery to project site, (2.) supervision of material reconciliation, installation/ erection, (3.) execution of site testing & commissioning along with necessary kits, tools & equipment, putting GIS with LCC & its Accessories into successful operation complete with all materials, support structures, anchoring bolts, chemical anchor, accessories, commissioning spares & maintenance spares, special spanners, special tools & tackles, any specific required ancillary services, SF6 gas for first filling & spare etc. including design studies, training of Customer/ BHEL personnel for offered GIS & its Accessories complete in all respects for efficient & trouble-free operation mentioned under this specification.

The complete technical specification comprises of following sections:

Section-1	:	Standard & Project Specific Technical Specification & Bill of Quantities
Section-2	:	Equipment Specification under scope of Supplies
Section-3	:	Project Details & General Technical Requirements (For All Equipment under the Project)
Section-4	:	Annexures Annexure A- Compliance Certificate Annexure B- Schedule of Technical Deviations

The following order of priority shall be followed. In case of conflict between requirements specified in various documents, the more stringent one shall be followed. BHEL/Customer concurrence shall, however, be obtained before taking a final decision in such matters.

1. Statutory Regulations
2. Section-1 (Standard Specification for GIS)
3. Section-1 (Project Specific Specification for GIS)
4. Section-2
5. Section-3

Bidder shall furnish list of conflicts/ ambiguities/ deviations, if any, along with their technical offer and also furnish the basis that is considered for submitting technical offer. BHEL will address the bidder's listed conflicts prior to award. In case of ambiguity, bidder shall inform BHEL of their interpretation. In case bidder fails to convey the same prior to award, BHEL decision on interpretation shall be considered final if need arises during the execution. No additional cost or extra time on account of conflicts/ ambiguities/ deviations shall be admissible.

In general, no deviation from the requirements specified in various clauses of this specification shall be allowed and hence, a certificate to this effect shall have to be furnished along with the offer (Annexure-A), however bidder shall furnish list of conflicts/ ambiguities/ deviations (Annexure-B), if any. Any deviation not specifically brought out in Annexure-B (Schedule of Technical Deviations) **shall not be admissible** for any time and commercial implication at later stage. Except to the technical deviations listed in this schedule, bidder's offer shall be considered in full compliance to the tender specifications

irrespective of any such deviation indicated / taken elsewhere in the submitted offer and hence, any conflicts/ ambiguities/ deviations mentioned elsewhere in technical offer shall not be reviewed.

The scope of supplies shall be as per commercial terms and conditions enclosed separately with the notice inviting tender/ enquiry.

2. PROJECT SPECIFIC TECHNICAL REQUIREMENTS

Project specific technical requirements shall be as per Section-1 (Part-B) of technical specification.

3. GENERAL TECHNICAL REQUIREMENTS

The other general requirements for GIS with LCC & its Accessories shall be as follows,

1. The positioning of the circuit breaker in the GIS shall be such that it shall be possible to access the circuit breaker of any feeder from the front side for routine inspection, maintenance and repair without interfering with the operation of the adjacent feeders.
2. The physical layout shall ensure free movement of the SF6 Gas Cart and easy access to all components of the GIS for operation and maintenance purposes.
3. The service activities shall include consumables/ commissioning spares required during commencement of GIS installation, testing and commissioning in all respect.
4. Bidder shall offer their latest type tested model to accommodate the specified & allocated space as per attached layout drawing of GIS.
5. Bidder shall conduct insulation co-ordination studies including VFTO report in line with IEC for establishing surge arrester rating, quantity and any other requirement for successful operation of GIS, however, additional supply of surge arrester in line with above required shall be paid as per Bill of Quantity, as applicable.
6. Bidder shall check and ensure adequacy of system protection for successful operation of GIS. After checking of system by bidder, GIS shall be installed and if any failure, malfunction of any part occurs after/ during commissioning, same shall be replaced immediately without any extra cost.
7. In case, Controlled Switching Device is specifically required as per BOQ/ Technical specification, same shall have display facility at the front for the display of settings and measured values. In case, CSD does not have complete display facility for settings and measured values, bidder to supply one number laptop PC with pre-installed, licensed software for each site. Special cable required for integration is deemed inclusive in bidder's scope.
8. The quantity of SF6 gas for GIs shall include quantity for initial installation of complete GIS System, including wastage during installation, testing and successful commissioning. Hence, Supply of additional quantity to cater the losses during installation, testing & commissioning shall be deemed to include in bidder's scope.
9. The offered GIS with LCC & its Accessories shall be complete in all respect in compliance to technical specification and relevant IS/ IEC/ IEEE standards as applicable. Any other equipment/ material required to complete the specified GIS scope of work are inclusive of bidder's scope of supply & services.
10. All essential and desirable accessories are deemed inclusive of offer i.e. and not limited to Gas Monitoring Devices, Pressure Switches, PD sensors, Pressure relief device, insulator, expansion joint/ flexible, bellows/ compensators like lateral mounting units, Axial compensators, Parallel compensators, tolerance compensators and vibration compensators etc. complete in all respect.
11. Length & route of GIB is purely indicative and same shall be finalized during detailed engineering stage.
12. BHEL reserve rights to amend Bay sequence during contract stage, no separate claim

shall be admissible in this regard.

13. Any Item not quoted mentioned "Not Applicable" in Bill of Quantity and found applicable as per technical specification and system requirement shall be supplied without any commercial implication to BHEL/ Customer.
14. Gas Insulated Bus Bars running across the length of the switchgear/ main bay to tie bay to interconnect each of the bay modules (as per layout) along with necessary interfaces (as applicable under the technical requirement) is deemed to be inclusive in the scope of bidder, however, it shall be payable/ not payable as per Bill of Quantity.
15. Special Tools &, tackles, Testing & Maintenance Equipment/ Instruments shall be supplied and demonstrated at site as per requirement of Bill of Quantity, however same shall not be used for erection/ installation, testing and commissioning of GIS, hence bidder to bring Special Tools &, tackles, Testing & Maintenance Equipment/ Instruments at site for during erection/ installation, testing & commissioning on returnable basis.
16. Final documentation shall be submitted in hard copy (six copies) as well as soft (Three CDs/DVDs/ Pen Drives).
17. Bidder to submit all supporting documents in English. If document submitted by bidder is other than English language, self-attested English translated document should also be submitted.
18. Total contract value may vary up to ±30% at contract stage.

4. METHODOLOGY FOR MEASUREMENT OF GIB DUCT

1. Length measurement of Gas Insulated Bus (GIB) duct shall be considered from the end of last GIS Bay equipment (VT, LA etc.) to end termination point (SF6 to air bushing / SF6 to oil bushing/ Cable connection module etc.).
2. Any change in bay pitch (distance between bays): In a case where shifting of GIS bays shall be called by BHEL (during contract stage) due to layout requirement/ cost optimization/ revision/ change in civil architectural requirement or due to expansion joint requirement in the GIS building, Bidder to incorporate the same with full compliance of technical requirement. Payment for additional length of main bus bar shall be payable against Bill of Quantity item under head "Gas Insulated Bus Duct", subject to condition that such shifting is not attributed to bidder.

5. SUPPORT STRUCTURE & HARDWARE (INCLUDING STRUCTURE STEEL)

1. Structural Steel, Support Structure & Hardwares (required for installation of complete GIS system with LCC & its Accessories etc.) are deemed to be inclusive in bidder's scope of supply, whether, same may/ may not be indicated with break-up in Bill of Quantity.
2. All steel structure members shall be hot-dip galvanized after fabrication (excluding floor embedded items for which OEM standard practice & recommendation shall be followed). All field assembly joints shall be bolted. Field welding shall generally not be acceptable. Noncorrosive metal or plated steel shall be used for bolts and nuts throughout the work, however for complete details, please refer Section-2.
3. Lattice/ pipe structure materials for support of GIS, Bus Ducts, SF6 to oil bushing/ SF6 to cable connection, SF6 to air bushing/ connection including anchor fastener, bolts, foundation bolts, base plate / channel / metallic / structural member for placement of GIS system, all floor and wall embedded Items, wall crossing arrangements, rails and/ or other items structural items as required. Bidder shall provide suitable foundation channels and anchor bolts to support the switchgear assemblies. All mounting bolts, Anchor Fasteners, foundation bolts, nuts and washers, equipment fixing hardware shall be provided to fasten the switchgear base frames to the foundation channels as applicable
4. The GIS Equipment shall be complete with all necessary supports, ladders, galleries, staircases, catwalks, movable platforms or walkways (for accessing the equipment above

two meters for maintenance and operation), mechanism cabinets, internal cable raceways etc. for each bay and it shall be of modular construction and extendable design.

5. Structural steel for complete GIS system with LCC & its Accessories is deemed to be inclusive in bidder's scope of supply.

6. INTERNAL CABLING

1. Power, control & instrumentation cables for Cabling (1.) within GIS, (2.) GIS to LCC, (3.) LCC to LCC (excluding incoming power cable) shall be deemed inclusive in bidder's scope. The details for same may/ may not be indicated with Bill of Quantity. However, bidder to ensure completeness for GIS system with LCC & its Accessories
2. In addition to above, cables required for other accessories including Gas monitoring system, PD monitoring system etc. shall also be included in bidder's scope.
3. The other materials including cable lugs, glands, shrouds, ferrules, ties etc. required for completeness of cabling work is included in bidder's scope.
4. Bidder shall provide complete cable schedule along with termination during detailed engineering stage for carrying out the activities at site.
5. Bidder shall ensure that termination blocks in the panels both for incoming feeder cables shall be suitable for termination of requisite cable.

7. EARTHING MATERIALS FOR GIS

Bidder to submit detailed calculations and layout drawings for earthing system during detailed engineering stage based on technical specification, bidder's design philosophy, IS/ IEC/ IEEE requirement as applicable. Bidder to provide the bill of quantity of earthing materials requirement for entire GIS system with LCC & its Accessories. However, following may please be noted in this regard,

1. Supply of 40 mm MS ROD, 75X12 mm GI Flat, 50X06 mm GI Flat is **not in bidder's scope** of supply. These materials shall be supplied by BHEL as a free issue item and shall be used in line with approved earthing philosophy and technical requirement. However, any other earthing materials (Cu Flat/ braid, Al Flat/ Braid, Lug, hardware etc.), other than mentioned above, shall be in bidder's scope of supply.
2. Installation/ erection/ laying of earthing system for GIS shall be done by BHEL/ its contractor, however, supervision shall be provided by bidder as per approved design philosophy.
3. Special requirement for earthing (as mentioned in Section-2) shall be duly taken care while designing the earthing system for GIS and its associated system.

8. DRAWINGS / DOCUMENTS FOR MANUFACTURING CLEARANCE

The drawings/ documents, as follows shall be used for providing technical clearance for manufacturing of GIS and furthermore, it shall be used for delay analysis, if any, from bidder. The first drawing submission will be counted from the date of submission of reasonably correct drawings.

Sl. No.	Overall Drawings approval required in Cat I /Cat II
	Lot1
1	GIS- Gas Schematics with Single Line Diagram (Including CT VT Parameters)
2	GIS- Guaranteed Technical Particulars (Including all GIS equipment)
3	GIS- Layout, Plan & Section Drawing
4	GIS- Interfacing Drawings for Cable Connection Module / SF6 to Air Bushing /

	SF6 to Oil Module (as applicable) with its Guaranteed Technical Particulars
5	GIS- Type Test Reports (Including all GIS equipment)
6	GIS- Quality Assurance Plan & Inspection Test Schedule
	Lot 2
7	GIS- Secondary Engineering Base Design & Control Schematics for GIS and Local Control Cabinet
8	GIS- Maintenance Equipment Catalogue with Guaranteed Technical Particulars, test reports
9	GIS- Civil Design Specification with Foundation Loading Diagram (Including interfacing details)
10	GIS – Support Structure, Platform, Wall & Floor Inserts & Hardware drawing & BOM
11	GIS- Earthing Layout with Design
12	GIS- Quantification for main Items, Spares, Consumables
13	Design Calculations for GIS including insulation co-ordination studies with VFTO report, earthing design calculations etc.
	Miscellaneous Drawing
15	GIS- 3D OGA Drawing compatible with Autocad & Primtech for GIS System (3D-Model with complete editable data base)
16	Manuals on unloading, safe storage, transportation, installation, testing, commissioning, routine check, preventive maintenance

9. TYPE TESTING

Bidder to comply the requirement of Type Tests as mentioned Section-2. All equipment being supplied shall in general conform to type tests as per technical specification and shall be subject to type, routine & acceptance tests in accordance with requirements stipulated in Section-2.

10. QUALITY PLAN

The successful bidder shall submit Quality Assurance Plan (including manufacturing Quality Plan, Factory Acceptance Test etc.) for major components such as breakers, disconnecting switches, lightning arrestors, earth switches, etc. with in-process inspection methods, tests, records, etc. for BHEL/ Customer approval. Customer hold points shall also be included in the plan, which shall be mutually agreed by the BHEL/ Customer and Bidder and approved. In case bidder has reference Quality Assurance Plan agreed with BHEL/ Customer, same shall be submitted for specific project to BHEL/ Customer approval. There shall be no commercial implication to BHEL/ Customer on account of Quality Plan approval.

Superior quality control system shall be adopted to assure high product quality. Raw

materials of the best commercial grade quality and high reliability shall be used in the manufacture of GIS. High reliability of materials shall be ensured so as to keep maintenance work to a minimum. All materials shall be procured, manufactured, inspected and tested by vendor/ sub-vendor as per approved quality plan. The supplier shall perform all tests necessary to ensure that the material and workmanship conform to the relevant standards and comply with the requirements of the specification. Charges for all these tests for all the equipment & components shall be deemed to be included in bidder's scope.

GIS and its associated materials shall be subject to inspection by BHEL/ Customer or authorized representative at bidder/ manufacturers' works. Hence, Bidder shall furnish all necessary information concerning the supply to BHEL/ Customer. During fabrication, the equipment shall be subject to inspection by BHEL/ Customer or by an agency authorized by BHEL/ Customer to assess the progress of work as well as to ascertain that only quality raw material is used.

11. SITE SERVICES

Site service activities shall be carried out at in stages as per requirement or front availability at site, and hence multiple visits for completion of work are envisaged as per site requirements hence any claim in this regards shall be admissible as per Bill of Quantity.
Further, bidder shall carry out following supervision activities at site,

1. Supervision of complete installation / erection of GIS with LCC & its Accessories
2. Verification of materials for proper storage along with storage instructions/ training to site persons for long storage.
3. Support and assistance for reconciliation of surplus materials and handing over of spares to customer
4. Final documentation including AS BUILT documents

12. TESTING & COMMISSIONING

1. The GIS System shall be subjected to the site tests as per technical specifications, IEC-62271-203. Bidder to submit site acceptance testing (SAT) procedures and get the same approved from BHEL / Customer before commencement of testing at site.
2. Carrying out successful HV/ Power Frequency Testing of GIS as per IEC shall be in scope of bidder, which includes HV test kit with operator, accessories & tools required for completion of HV testing. In case, HV testing could not be completed in one go, same shall be payable/ not payable as per details mentioned in Bill of Quantity.
3. BHEL shall provide extend support and assistance at site for smooth conduction of HV Testing including unloading, assembling of HV test kit, dismantling, packing & loading back for transportation.
4. Complete Field testing and commissioning of GIS system with LCC & its Accessories are under the scope of Bidder.
5. Start-up & Commissioning spares are included in bidder's scope of supply and shall be included in the base price. Adequate stock of start-up & commissioning spares shall be made available at the site such that commissioning of the equipment/ systems, performance testing and handing over the equipment/ systems to customer can be carried out without any hindrance or delays.
6. Bidder shall ensure the availability of spare parts and maintenance support services for the offered equipment at least for 15 years from the date of supply. Bidder shall give a notice of at least one year to the Customer & BHEL (both) before phasing out the products/spares to enable the owner for placement of order for spares and services.

13. ARRANGEMENT OF GENERAL/ SPECIAL TOOLS & TACKLES, TESTING INSTRUMENTS

1. Special tools & tackles for installation/ erection including SF6 gas cart/ plant shall be arranged by bidder and list for same shall be provided by during contract stage only. However, same shall be bought at site on **returnable** basis only. In addition to above, all testing instruments including HV Test Kit etc. required for successful installation, testing, commissioning of GIS shall also to be arranged by bidder on returnable basis and hence, cost of the same shall be deemed inclusive in the offer.
2. General tools & tackles shall be arranged by BHEL, however, details & list of such requirement including general tools-tackles, spanners, gauges, slings, other lifting devices, crane, welding machines, drills, general instruments etc. general in nature required for installation of GIS shall be provided bidder during contract stage only. In case bidder fails to convey the same along with technical bid, BHEL decision on interpretation of general tools tackle shall be considered final and any tools & tackles required, at later stage, shall be brought at site by bidder without any claim.
3. The bidder is clarified that no mandatory spares shall generally be used during the commissioning of the equipment.

14. PACKING AND DISPATCH

1. The equipment shall be carefully packed for transport by sea, rail and road in such a manner that it is protected against the climatic conditions and for any damage during transportation, transit and storage. Packing of the equipment shall be suitable for long storage (minimum 1 year).
2. The GIS transport units shall be shipped in the largest factory assembled units within transport and loading limitations and considering handling facilities on site to reduce the erection and installation work on site to a minimum. Where possible all items of equipment or factory assembled units shall be boxed in substantial crates or containers to facilitate handling in a safe and secure manner.
3. Each individual piece to be shipped, whether crate, container or large unit, shall be marked special notations such as ‘Fragile’, ‘This side up’, ‘Centre of gravity’, ‘Weight’, ’Owner's particulars’, ’PO no.’ etc., and other details as per purchase order & technical specification.
4. The equipment may be stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage in areas with heavy rains and high ambient temperature.
5. Special precautions shall be taken to protect any parts containing electrical insulation against the ingress of moisture. This applies particularly to the equipment of which each gas section shall be sealed and pressurized prior to shipping. Dry nitrogen/air or dry SF6 gas (in full compliance to technical requirement) shall be used and the pressure shall be such as to ensure that, allowing for reasonable leakage, it will always be greater than the atmospheric pressure for all variations in ambient temperature and the atmospheric pressure encountered during shipment to site and calculating the pressure to which the sections shall be filled to ensure positive pressure at all times during shipment.
6. All blanking plates, caps, seals, etc., necessary for sealing the gas sections during shipment to site shall be provided. Any seals, gaskets, `0' rings, etc. that will be used as part of the arrangement for sealing off gas sections for shipment of site, shall not be used in the final installation of the equipment at site. Vendor to provide quantity of components accordingly considering permanent installation and commissioning.

15. SPECIFIC- EXCLUSIONS (NOT IN BIDDER’S SCOPE)

Bidder to note the following exclusions, which are not in their scope of supply & services,

1. Installation / Erection of GIS with LCC & its Accessories except supervision work.

2. Cable laying & terminations, however supervision work & termination of special cables shall be in bidder's scope.
3. Open & Closed stores at site. (Bidder to provide space requirement in during contract stage only)
4. Local transportation/ conveyance for bidder's engineers shall be arranged by BHEL between local stay and site.
5. Office assistance shall be provided BHEL including sitting facility etc.
6. Receipt & unloading of material at site except verification of materials received at site
7. Terminal connector for SF6 to Air Bushing to conductor or any other interfacing equipment.
8. Watch & Ward of GIS material at BHEL Store
9. Civil Works i.e. GIS related civil works.
10. EOT crane, Air Conditioning & Ventilation System, Illumination System & Fire detection & alarm system, however complete input shall be provided for EOT and other system
11. Control Relay & Protection Panels, Numerical Relays, Bus Bar Protection Panel, SAS & ECS system, ACDB, DCDB, Battery & Charger
12. Earthing material i.e. 40 mm MS Rod, 50X6 GI Flat & 75X12 GI Flat for earthing
13. Outdoor AIS Equipments
14. Power & Control cable beyond LCC
15. BHEL/ Customer/ Third party inspector travel, lodging & boarding charges during testing / inspection.

Rev. No.	Date	Initiated by	Reviewed by	Approved by	Updates
04B	03.05.2024	By	DKS	VK	Revised for non POWERGRID projects

Project Specific Specification for GIS

Contents

This technical specification is required for Pre-bid tie-up for participation in the following tender:

Name of the Customer	GSECL
Name of Main Contractor	Bharat Heavy Electricals Limited
Name of the Project/ Tender	Pre Bid Tie up for, EPC Tender for Design, Engineering, manufacturing, Supply, Erection, Testing and Commissioning of 400kV Switchyard of 1x800 MW ULTRA SUPERCRITICAL UNIT NO. #7ON ASH DYKE AREA AT UKAI TPS.
Location	Ukai

400kV Gas Insulated Switchgear:

Bay details:

The SF6 gas insulated switchgear (50 Hz) shall be of the indoor metal-enclosed type. 400kV SF6 gas insulated switchgear shall have one and a half breaker bus bar arrangement. The Switchgear shall be complete with all necessary terminal boxes, SF6 gas filling, interconnecting power and control wiring, grounding connections, gas monitoring equipment & piping and support structures along with necessary base plate, Anchor Fastener for foundation bolts. In addition, all necessary stairs, platforms, supports, fixed ladders, portable scissor lift and walkways etc. as required for operation & maintenance work shall also be provided.

SF6 gas insulated metal enclosed bus bars, Circuit Breakers, Isolators, safety ground switches, High speed fault making ground switches, Current transformers, Surge arresters, GIS ducts, Local Bay control cabinets, On line Partial Discharge Monitoring system for GIS switchgear, GIS Busducts, SF6 gas monitoring equipments, Bus VTs, etc.

Bay details are as shown in the Single Line diagram & layout drawing attached.

a) 400kV GIS modules as per Bill of Quantity (BOQ) and description given in section-2.
b) Controlled Switching devices as per Bill of Quantity (BOQ).
c) Testing and Maintenance equipment as per Bill of Quantity (BOQ).
d) Any other equipment/material required to complete the specified GIS scope of work.

1. BILL OF QUANTITIES:

Please refer the followings

Section1_Annexure- BOQ_GSECL

a) During tender stage No of bays of GIS may vary. No of bays of GIS shall be finalized after receipt of Notification of award (NOA) from Customer/ BHEL.
b) Overall contract value may vary ±30%.

2. SPECIFIC TECHNICAL PARAMETERS

Please refer the following documents for project specific technical requirement,

- General Specification for 400kV GIS

Detailed technical requirement of GIS shall be as per SECTION-2.

Any other items not specifically mentioned in the specification but which are required for erection, testing and commissioning and satisfactory operation of the substation are deemed to be included in the scope of the specification unless specifically excluded.

Any clarification(s) for GIS published by M/s Customer/ BHEL with reference to subject project will also valid for this specification.

3. OTHER TECHNICAL REQUIREMENTS

- SF6 GAS REQUIRED FOR PLACING GIS INTO SUCCESSFUL OPERATION - Complete in all respect in compliance to technical specification and requirements.
- STRUCTURE MATERIAL INCLUDING FOUNDATION BOLTS, EMBEDDED ITEMS, RAILS AND/ OR OTHER MATERIALS ETC - Complete in all respect in compliance to technical specification and requirements. In the event of changes in present scope, payment shall be made on pro-rata basis of number of circuit breaker bays only.

4. SPECIFIC TECHNICAL REQUIREMENTS FOR CSD

Complete interfacing with GIS and CSD shall be in bidder's scope. Any additional item like transducer, contact multiplication relay, switches, special/ screened cables, modification hardwired, modification in schematics for interfacing and for complying to the TS requirement shall be in bidder's scope.

All wiring necessary for interface of GIS/ CRP with bidder supplied CSD is deemed to be included in the scope of bidder. Cables, lugs, ties etc. required for connection of CSD in existing relay panel is deemed to be included in bidder's scope.

The CSD should have display facility at the front for the display of settings and measured values. In case where CSD does not have complete display facility for settings and measured values, bidder to supply one number laptop PC with pre-installed, licensed software for each site. Cost of the same shall be deemed included in offer.

Special cables (i.e., screened/ FO cable) other than 1.1kV LT Power & Control Cables required for CB / CSD / Relay Panel interfacing shall be in bidder's scope only.

5. TECHNICAL QUALIFYING REQUIREMENTS:

Please refer **Annexure-PQR** for qualification criteria. Bidder to submit complete supporting documents complying technical qualifying requirement along with the technical bid

6. TYPE TESTING, INSPECTION, TESTING & INSPECTION CERTIFICATE

All GIS equipment being supplied shall conform to type tests as per technical specification and shall be subject to routine & acceptance tests in accordance with requirements stipulated under respective sections.

For the complete details of type test requirements, please refer Section-2 and Section-3 of technical specification.

----------XXXXX----------

ANNEXURE: BOQ_400kV GIS_SUPPLY_GSECL UKAI
REV No: 00
DATE: 31.05.2024

Sl. No.	Item Description	nit	Qty.	Remarks
1.0	**SUPPLY- GIS: 400KV, 63KA FOR 1S, GAS INSULATED SWITCHGEAR (GIS) AS PER TS (Two bus with One & Half Breaker Scheme)**			
1.01	GIS SUPPLY: 400KV, 2000A, 63 kA, SF6 GIS **BUS BAR MODULE** (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	SET	2	
1.02	GIS SUPPLY: 400KV, 63 kA, SF6 BUS **VT BAY MODULE** (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	SET	2	400kV **PT BAY** MODULE shall include following but not limited to, (a) 1 SET- 1 NO x3 phase Disconnector, complete with operating mechanism. (b) 1 SET- 1 NO x3 phase Maintenance Grounding Switch, complete with operating mechanism (c) 1 SET- 1 NO x3 phase High Speed make proof Earthing Switch, complete with operating mechanism. (d) 3 NO- 1 phase multi winding Voltage Transformer In addition to above, Gas device, UHF sensors, Pressure Switches, Expansion joints/ Flexible connections, Insulators etc. as applicable shall be included, however, Online PD Monitoring System, Local Control Cubicle and End Terminations, if applicable shall be covered separately. GIS shall be complete with all necessary terminal boxes, inspection windows, SF6 gas, grounding connection, pipings for gas monitoring system, trays, support structures with mounting hardwares, walkways, interconnecting cables with glands, ferrules, lugs etc. Please refer section-2 (TS for 400kV GIS)- Technical Specification.
1.03	GIS BAY SUPPLY: 400kV, 2000A, 63 kA, SF6 GIS **GT FEEDER BAY** MODULE (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	SET	1	400kV GIS **GT FEEDER BAY MODULE** shall include following but not limited to, (a) 1 SET- 1 NO x3 phase **Circuit Breaker,** compatible for **Controlled Switching Facility,** complete with operating mechanism (b) 3 SET- 1 NO x3 phase Disconnector, complete with operating mechanism. (c) 4 SET- 1 NO x3 phase Maintenance Grounding Switch, complete with operating mechanism. (d) 6 NO- 1 phase multi ratio Current Transformer (e) 3 NO- 1 phase multi ratio Current Transformer for metering purpose (f) 3 NO- 1 phase multi winding Voltage Transformer In addition to above, Gas device, UHF sensors, Pressure Switches, Expansion joints/ Flexible connections, Insulators etc. as applicable, however, **Controlled Switching Device (CSD), Online PD Monitoring System (OPMS), Local Control Cubicle (LCC) and End Terminations**, if applicable shall be covered separately. GIS shall be complete with all necessary terminal boxes, inspection windows, SF6 gas, grounding connection, pipings for gas monitoring system, trays, support structures with mounting hardwares, walkways, interconnecting cables with glands, ferrules, lugs etc. Please refer section-2 (TS for 400kV GIS)- Technical Specification.
1.04	GIS BAY SUPPLY: 400kV, 2000A, 63 kA, SF6 GIS **ST FEEDER BAY** MODULE (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	SET	1	400kV GIS **ST FEEDER BAY MODULE** shall include following but not limited to, (a) 1 SET- 1 NO x3 phase **Circuit Breaker,** compatible for **Controlled Switching Facility,** complete with operating mechanism (b) 3 SET- 1 NO x3 phase Disconnector, complete with operating mechanism. (c) 4 SET- 1 NO x3 phase Maintenance Grounding Switch, complete with operating mechanism. (d) 6 NO- 1 phase multi ratio Current Transformer (e) 3 NO- 1 phase multi ratio Current Transformer for metering purpose (f) 3 NO- 1 phase multi winding Voltage Transformer In addition to above, Gas device, UHF sensors, Pressure Switches, Expansion joints/ Flexible connections, Insulators etc. as applicable, however, **Controlled Switching Device (CSD), Online PD Monitoring System (OPMS), Local Control Cubicle (LCC) and End Terminations**, if applicable shall be covered separately. GIS shall be complete with all necessary terminal boxes, inspection windows, SF6 gas, grounding connection, pipings for gas monitoring system, trays, support structures with mounting hardwares, walkways, interconnecting cables with glands, ferrules, lugs etc. Please refer section-2 (TS for 400kV GIS)- Technical Specification.

Sl. No.	Item Description	nit	Qty.	Remarks
1.05	GIS BAY SUPPLY: 400kV, 2000A, 63 kA, SF6 GIS **LINE FEEDER BAY** MODULE (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	SET	2	400kV GIS **LINE FEEDER BAY MODULE** shall include following but not limited to, (a) 1 SET- 1 NO x3 phase **Circuit Breaker with PIR,** compatible for Controlled Switching Facility, complete with operating mechanism (b) 3 SET- 1 NO x3 phase Disconnector, complete with operating mechanism. (c) 3 SET- 1 NO x3 phase Maintenance Grounding Switch, complete with operating mechanism. (d) 1 SET- 1 NO x3 phase High Speed make proof Earthing Switch, complete with operating mechanism. (e) 6 NO- 1 phase multi ratio Current Transformer (f) 3 NO- 1 phase multi ratio Current Transformer for metering purpose (g) 3 NO- 1 phase multi winding Voltage Transformer In addition to above, Gas device, UHF sensors, Pressure Switches, Expansion joints/ Flexible connections, Insulators etc. as applicable, however, Controlled Switching Device (CSD), Online PD Monitoring System, Local Control Cubicle and End Terminations, if applicable shall be covered separately. GIS shall be complete with all necessary terminal boxes, inspection windows, SF6 gas, grounding connection, pipings for gas monitoring system, trays, support structures with mounting hardwares, walkways, interconnecting cables with glands, ferrules, lugs etc. Please refer section-2 (TS for 400kV GIS)- Technical Specification.
1.06	GIS BAY SUPPLY: 400kV, 2000A, 63 kA, SF6 GIS **SPARE FEEDER BAY** (FULLY EQUIPPED) MODULE (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	SET	2	400kV GIS **SPARE FEEDER BAY MODULE** shall include following but not limited to, (a) 1 SET- 1 NO x3 phase **Circuit Breaker with PIR,** compatible for Controlled Switching Facility, complete with operating mechanism (b) 3 SET- 1 NO x3 phase Disconnector, complete with operating mechanism. (c) 3 SET- 1 NO x3 phase Maintenance Grounding Switch, complete with operating mechanism. (d) 1 SET- 1 NO x3 phase High Speed make proof Earthing Switch, complete with operating mechanism. (e) 6 NO- 1 phase multi ratio Current Transformer (f) 3 NO- 1 phase multi ratio Current Transformer for metering purpose In addition to above, Gas device, UHF sensors, Pressure Switches, Expansion joints/ Flexible connections, Insulators etc. as applicable, however, Controlled Switching Device (CSD), Online PD Monitoring System, Local Control Cubicle and End Terminations, if applicable shall be covered separately. GIS shall be complete with all necessary terminal boxes, inspection windows, SF6 gas, grounding connection, pipings for gas monitoring system, trays, support structures with mounting hardwares, walkways, interconnecting cables with glands, ferrules, lugs etc. Please refer section-2 (TS for 400kV GIS)- Technical Specification.
1.07	GIS BAY SUPPLY: 400kV, 2000A, 63 kA, SF6 GIS **LINE FEEDER BAY (GIS TO EXISTING AIS INTERCONNECTION)** MODULE (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	SET	2	400kV GIS **LINE FEEDER BAY MODULE** shall include following but not limited to, (a) 1 SET- 1 NO x3 phase **Circuit Breaker**, compatible for Controlled Switching Facility, complete with operating mechanism (b) 3 SET- 1 NO x3 phase Disconnector, complete with operating mechanism. (c) 3 SET- 1 NO x3 phase Maintenance Grounding Switch, complete with operating mechanism. (d) 1 SET- 1 NO x3 phase High Speed make proof Earthing Switch, complete with operating mechanism. (e) 6 NO- 1 phase multi ratio Current Transformer (f) 3 NO- 1 phase multi ratio Current Transformer for metering purpose In addition to above, Gas device, UHF sensors, Pressure Switches, Expansion joints/ Flexible connections, Insulators etc. as applicable, however, Controlled Switching Device (CSD), Online PD Monitoring System, Local Control Cubicle and End Terminations, if applicable shall be covered separately. GIS shall be complete with all necessary terminal boxes, inspection windows, SF6 gas, grounding connection, pipings for gas monitoring system, trays, support structures with mounting hardwares, walkways, interconnecting cables with glands, ferrules, lugs etc. Please refer section-2 (TS for 400kV GIS)- Technical Specification.
1.08	GIS BAY SUPPLY: 400kV, 2000A, 63 kA, SF6 GIS **TIE FEEDER BAY MODULE** (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	SET	2	400kV GIS **TIE FEEDER BAY MODULE** shall include following but not limited to, (a) 1 SET- 1 NO x3 phase **Circuit Breaker with PIR,** compatible for Controlled Switching Facility, complete with operating mechanism (b) 2 SET- 1 NO x3 phase Disconnector, complete with operating mechanism. (c) 2 SET- 1 NO x3 phase Maintenance Grounding Switch, complete with operating mechanism.. (d) 6 NO- 1 phase multi ratio Current Transformer In addition to above, Gas device, UHF sensors, Pressure Switches, Expansion joints/ Flexible connections, Insulators etc. as applicable, however, Controlled Switching Device (CSD), Online PD Monitoring System, Local Control Cubicle and End Terminations, if applicable shall be covered separately. GIS shall be complete with all necessary terminal boxes, inspection windows, SF6 gas, grounding connection, pipings for gas monitoring system, trays, support structures with mounting hardwares, walkways, interconnecting cables with glands, ferrules, lugs etc. Please refer section-2 (TS for 400kV GIS)- Technical Specification.

Sl. No.	Item Description	nit	Qty.	Remarks
1.09	GIS BAY SUPPLY: 400kV, 2000A, 63 kA, SF6 GIS **TIE FEEDER BAY MODULE** (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS) AS PER TS	SET	2	400kV GIS **TIE FEEDER BAY MODULE** shall include following but not limited to, (a) 1 SET- 1 NO x3 phase **Circuit Breaker,** compatible for Controlled Switching Facility, complete with operating mechanism (b) 2 SET- 1 NO x3 phase Disconnector, complete with operating mechanism. (c) 2 SET- 1 NO x3 phase Maintenance Grounding Switch, complete with operating mechanism.. (d) 6 NO- 1 phase multi ratio Current Transformer In addition to above, Gas device, UHF sensors, Pressure Switches, Expansion joints/ Flexible connections, Insulators etc. as applicable, however, Controlled Switching Device (CSD), Online PD Monitoring System, Local Control Cubicle and End Terminations, if applicable shall be covered separately. GIS shall be complete with all necessary terminal boxes, inspection windows, SF6 gas, grounding connection, pipings for gas monitoring system, trays, support structures with mounting hardwares, walkways, interconnecting cables with glands, ferrules, lugs etc. Please refer section-2 (TS for 400kV GIS)- Technical Specification.
1.10	GIS SUPPLY: 400KV, ONLINE PD MONITORING SYSTEM **(OPMS)** FOR 400KV GIS SYSTEM	Lot	1	Please refer section-2 (TS for 400kV GIS)- Technical Specification.
1.11	GIS SUPPLY: 400KV, CONTROLLED SWITCHING DEVICE **(CSD)** FOR 420KV, 3- PH CIRCUIT BREAKER	SET	4	It is considered for GT/ ST BAYS WITH ASSOCIATED TIE BAYS. 1 SET= 1 NO. OF EACH TYPE & RATING Please refer section-2 (TS for 400kV GIS)- Technical Specification.
1.12	SUPPLY- GIS : 400KV, 2000A, 1 PHASE GAS INSULATED BUS DUCT (INCLUDING SF6 GAS, STRUCTURE WITH HARDWARES AND EARTHING MATERIALS)	MTRS	1300	Please refer section-2 (TS for 400kV GIS)- Technical Specification.
1.13	GIS SUPPLY: 400KV, 2000A, 1 PHASE SF6 TO AIR BUSHING (POLYMER) (INCLUDING SF6 GAS, STRUCTURE WITH HARDWARES AND EARTHING MATERIALS)	NO	24	Please refer section-2 (TS for 400kV GIS)- Technical Specification. It is considered for GT, ST & LINE BAYS only.
1.14	GIS SUPPLY: 390KV, 1 PHASE SURGE ARRESTER WITH SURGE COUNTER (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS)	NO	24	Please refer section-2 (TS for 400kV GIS)- Technical Specification. It is considered for ALL BAYS except TIE BAYS only.
1.15	GIS SUPPLY: 400KV, 2000A, 1 PHASE SF6 TO OIL BUSHING (POLYMER) (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS)	NO	1	Please refer section-2 (TS for 400kV GIS)- Technical Specification.
1.16	GIS SUPPLY: 400KV, 1 PHASE VOLTAGE TRASNFORMER (INCLUDING SF6 GAS, STRUCTURE, HARDWARES & EARTHING MATERIALS)	NO	1	Please refer section-2 (TS for 400kV GIS)- Technical Specification.
1.17	GIS SUPPLY: LOCAL CONTROL CUBICLES	SET	12	Please refer section-2 (TS for 400kV GIS)- Technical Specification. It is considered for ALL BAYS only.
2.0	**SUPPLY- GIS: SPECIAL TOOLS AND TESTING & MAINTENANCE INSTRUMENTS AS PER TS**			
2.01	GIS SUPPLY: SF6 GAS FILLING AND EVACUATING PLANT	SET	1	Please refer section-2 (TS for 400kV GIS)- Technical Specification.
2.02	GIS SUPPLY: SF6 GAS PROCESSING UNIT	SET	1	Please refer section-2 (TS for 400kV GIS)- Technical Specification.
2.03	GIS SUPPLY: SF6 GAS LEAKAGE DETECTOR (PORTABLE)	NO.	1	Please refer section-2 (TS for 400kV GIS)- Technical Specification.
2.04	GIS SUPPLY: HYGROMETER	NO.	1	Please refer section-2 (TS for 400kV GIS)- Technical Specification.
2.05	GIS SUPPLY: DUST COUNTER (PORTABLE)	NO.	1	Please refer section-2 (TS for 400kV GIS)- Technical Specification.
2.06	GIS SUPPLY: SPECIAL GAS MASK FOR GIS MAINTENANCE	SET	5	Please refer section-2 (TS for 400kV GIS)- Technical Specification.
2.07	GIS SUPPLY: VACUUM METER	NO.	1	Please refer section-2 (TS for 400kV GIS)- Technical Specification.
2.08	GIS SUPPLY: DIGITAL CONTACT RESISTANCE METER	NO.	1	Please refer section-2 (TS for 400kV GIS)- Technical Specification.
2.09	GIS SUPPLY: PARTIAL DISCHARGE MEASUREMENT SET	SET	1	Please refer section-2 (TS for 400kV GIS)- Technical Specification.
2.10	GIS SUPPLY: MOBILE PLATFORM	SET	1	Please refer section-2 (TS for 400kV GIS)- Technical Specification.
3	**SPARES- GIS: 400KV, 63KA FOR 1S, GAS INSULATED SWITCHGEAR (GIS) AS PER TS**			
3.01	GIS SPARES: TRIP COILS FOR CIRCUIT BREAKER	NO.	4	Each type and rating
3.02	GIS SPARES: CLOSING COILS FOR CIRCUIT BREAKER	NO.	4	Each type and rating
3.03	GIS SPARES: GASKETS	SET	6	Each type and rating
3.04	GIS SPARES: MOTOR FOR CIRCUIT BREAKER OPERATING MECHANISM (IF APPLICABLE)	NO.	2	Each type and rating
3.05	GIS SPARES: VALVE BLOCK WITH DRIVE CYLINDER FOR CIRCUIT BREAKERS	SET	2	Each type and rating

Sl. No.	Item Description	nit	Qty.	Remarks
3.06	GIS SPARES: MOTOR FOR EARTHING SWITCH	NO.	1	Each type and rating
3.07	GIS SPARES: MOTOR FOR DISCONNECTORS	NO.	1	Each type and rating
3.08	GIS SPARES: OPERATING MECHANISM FOR DISCONNECTORS	SET	1	Each type and rating
3.09	GIS SPARES: OPERATING MECHANISM FOR EARTHING SWITCH	SET	1	Each type and rating
3.10	GIS SPARES: SF6 GAS CYLINDER WITH 40 KGS OF SF6 GAS	NO.	3	Each type and rating
3.11	GIS SPARES: CONTROL SWITCH AND AUXILIARY RELAY	NO.	4	Each type and rating
3.12	GIS SPARES: MCB (AS APPLICABLE)	NO.	4	Each type and rating
3.13	GIS SPARES: CURRENT TRANSFORMERS	SET	1	Each type and rating
3.14	GIS SPARES: 400KV SF6 AIR BUSHING	NO.	3	Each type and rating
~~3.15~~	~~GIS SPARES: 400KV CVT- 400 kV CVT~~	~~NO.~~	~~3~~	~~Each type and rating~~
~~3.16~~	~~GIS SPARES: 400KV CVT- OIL SEALS~~	~~SET~~	~~1~~	~~Each type and rating~~
~~3.17~~	~~GIS SPARES: 400KV CVT- INSULATORS~~	~~SET~~	~~1~~	~~Each type and rating~~
~~3.18~~	~~GIS SPARES: 400KV CVT- GASKETS (ALL SIZES USED)~~	~~SET~~	~~1~~	~~Each type and rating~~
~~3.19~~	~~GIS SPARES: 400KV CVT- OIL FILLING, DRAINING AND SAMPLING PLUGS~~	~~SET~~	~~1~~	~~Each type and rating~~
~~3.20~~	~~GIS SPARES: 400KV CVT- OIL LEVEL GAUGE~~	~~NO.~~	~~3~~	~~Each type and rating~~
~~3.21~~	~~GIS SPARES: SWITCHYARD EQUIPMENT ACCESSORIES- 400KV GLAZED BROWN INSULATOR~~	~~SET~~	~~2~~	~~Each type and rating~~
3.22	GIS SPARES: SWITCHYARD EQUIPMENT ACCESSORIES- SF6 GAS PRESSURE RELIEF DEVICES	SET	2	1 SET= 3 number of each type
3.23	GIS SPARES: SWITCHYARD EQUIPMENT ACCESSORIES- SF6 PRESSURE GAUGE WITH COUPLING DEVICE CUM SWITCH OR DENSITY MONITORS AND PRESSURE GAUGE, AS APPLICABLE	SET	1	1 SET= 1 number of each type
3.24	GIS SPARES: SWITCHYARD EQUIPMENT ACCESSORIES- MOLECULAR FILTER FOR SF6 GAS WITH FILTER BAGS	SET	1	1SET= 20% TOTAL QUANTITY OF ABSORBER BAGS USED IN GIS
3.25	GIS SPARES: SWITCHYARD EQUIPMENT ACCESSORIES- COVERS WITH ALL ACCESSORIES NECESSARY TO CLOSE A COMPARTMENT IN CASE OF DISMANTLING OF ANY PART OF THE ENCLOSURE TO ENSURE THE SEALING OF THE COMPARTMENT FOR 1 PHASE ENCLOSURE	SET	1	1 SET= 3 NOS. OF EACH TYPE
3.26	GIS SPARES: SWITCHYARD EQUIPMENT ACCESSORIES- LOCKING DEVICE TO KEEP THE DIS-CONNECTORS AND EARTHING SWITCHES IN CLOSE OR OPEN POSITION IN CASE OF REMOVAL OF THE DRIVING MECHANISM (IF APPLICABLE)	NO.	3	
3.27	GIS SPARES: SWITCHYARD EQUIPMENT ACCESSORIES- BUS SUPPORT INSULATOR OF EACH TYPE FOR SINGLE PHASE ENCLOSURE	SET	1	1 SET= 6 NOS. OF EACH TYPE
3.28	GIS SPARES: SWITCHYARD EQUIPMENT ACCESSORIES- SF6 TO AIR BUSHING FOR 1 PHASE ENCLOSURE	NO.	2	
3.29	GIS SPARES: SWITCHYARD EQUIPMENT ACCESSORIES- RELAY OF EACH TYPE & RATING	SET	1	1 SET= 1 NOS. OF EACH TYPE & RATING
3.3	GIS SPARES: SWITCHYARD EQUIPMENT ACCESSORIES- ALL TYPES OF CORONA SHIELD	SET	1	1 SET= 3 NOS. OF EACH TYPE
3.31	GIS SPARES: SWITCHYARD EQUIPMENT ACCESSORIES- WINDOW SCOPE/ OBSERVING WINDOW (IF APPLICABLE)	SET	1	1 SET= 3 NOS. OF EACH TYPE
~~3.32~~	~~GIS SPARES: LA 400KV SIDE~~	~~NO.~~	~~3~~	
3.33	GIS SPARES: LOCAL CONTROL PANEL	SET	1	1 SET= 100% spares for 1 panel
3.34	GIS SPARES: COMPLETE MODULE FOR 400 KV BREAKER	SET	1	
~~3.35~~	~~GIS SPARES: COMPLETE MODULE FOR 400 KV LA (WITH EARTH SWITCH)~~	~~SET~~	~~1~~	
~~3.36~~	~~GIS SPARES: COMPLETE MODULE FOR 400 KV LA (WITHOUT EARTH SWITCH)~~	~~SET~~	~~1~~	
3.37	GIS SPARES: COMPLETE MODULE FOR 400KV CT	SET	1	
3.38	GIS SPARES: COMPLETE MODULE FOR 400KV PT/ VT	SET	1	

Sl. No.	Item Description	nit	Qty.	Remarks
3.39	GIS SPARES: SF6 GAS	SET	1	1 SET= 10% of total filled quantity
3.40	GIS SPARES: DUCT INSULATOR	SET	1	1 SET= 10% of total installed quantity
3.41	GIS SPARES: SET OF GASKETS, O RINGS	SET	5	
3.42	GIS SPARES: SF6 GAS FILLING KIT	SET	1	
3.43	GIS SPARES: CRM, DCRM KIT WITH TRANSDUCER OF APPROPRIATE BREAKER FITTINGS	SET	1	
~~3.44~~	~~GIS SPARES: 400KV AIS- COMPLETE SET OF 1 NO. OF SINGLE PHASE DISCONNECT OR INCLUDING MAIN CIRCUIT, ENCLOSURE AND DRIVING MECHANISM~~	~~SET~~	~~1~~	
~~3.45~~	~~GIS SPARES: 400KV AIS- COMPLETE CIRCUIT BREAKER 1 PHASE POLE OF EACH TYPE & RATING COMPLETE WITH INTERRUPTER, MAIN CIRCUIT AND ENCLOSURE WITH OPERATING MECHANISM~~	~~SET~~	~~1~~	

4.0	**SPARES- GIS: REFERENCE UNIT PRICE FOR ADDITION / DELETION OF SUPPLY ITEMS** (Unit Prices of Individual Equipment included here or in manadatory spares are required for any Addition/Deletion of Equipment and replacement of damaged items. Bidder to ensure that the unit prices have a logical relationship with prices of assemblies in main items. Quoting for unit prices is mandatory and shall be considered for evaluation)			
4.01	SUPPLY- GIS: SPARES: 400KV, OPERATING MECHANISM FOR CIRCUIT BREAKER COMPLETE IN ALL RESPECT	Set	1	
4.02	SUPPLY- GIS: SPARES: 400KV, OPERATING MECHANISM FOR DISCONNECTOR	Set	1	
4.03	SUPPLY- GIS: SPARES: 400KV, OPERATING MECHANISM FOR MAINTENANCE EARTHING SWITCH COMPLETE IN ALL RESPECT	Set	1	
4.04	SUPPLY- GIS: SPARES: 400KV, OPERATING MECHANISM FOR FAST ACTING/ HIGH SPEED GROUNDING SWITCH COMPLETE IN ALL RESPECT	Set	1	
4.05	SUPPLY- GIS: SPARES: 400KV, MAINTENANCE EARTHING SWITCH COMPLETE IN ALL RESPECT	Set	1	
4.06	SUPPLY- GIS: SPARES: 400KV, FAST ACTING/ HIGH SPEED GROUNDING SWITCH COMPLETE IN ALL RESPECT	Set	1	
4.07	SUPPLY- GIS: SPARES: 400KV, SINGLE PHASE BUS BAR	Mtrs	1	Complete in all respect.
4.08	SUPPLY- GIS: SPARES: 400KV, GIS METALLIC ENCLOSURE	Kgs	50	
4.09	SUPPLY- GIS: SPARES: 400KV, EXPANSION JOINTS	Set	1	1set= 1 nos. of each type and each rating.
4.10	SUPPLY- GIS: SPARES: 400KV, FLEXIBLE CONNECTIONS	Set	1	1set= 1 nos. of each type and each rating.
4.11	SUPPLY- GIS: SPARES: 400KV, BARRIER INSULATOR	Set	1	1set= 1 nos. of each type and each rating.
4.12	SUPPLY- GIS: SPARES: 400KV, NON-BARRIER INSULATOR	Set	1	1set= 1 nos. of each type and each rating.
4.13	SUPPLY- GIS: SPARES: 400KV, GAS SEALS	Set	1	1set= 1 nos. of each type and each rating.
4.14	SUPPLY- GIS: SPARES: 400KV, GAS DENSITY MONITOR SWITCH	Set	1	1set= 1 nos. of each type and each rating.
4.15	SUPPLY- GIS: SPARES: 400KV, GAS PRESSURE SWITCH	Set	1	1set= 1 nos. of each type and each rating.
4.16	SUPPLY- GIS: SPARES: 400KV, TEE BEND	Set	1	1set= 1 nos. of each type and each rating.
4.17	SUPPLY- GIS: SPARES: 400KV, ANGLE BEND	Set	1	1set= 1 nos. of each type and each rating.
4.18	SUPPLY- GIS: SPARES: 400KV, L-BEND	Set	1	1set= 1 nos. of each type and each rating.

ANNEXURE: BOQ_400kV GIS_SERVICE_GSECL UKAI
REV No: 00
DATE: 31.05.2024

Sl. No.	Description	Unit	Quantity	Remarks
5.0	**SERVICES- GIS : 400KV, 63KA FOR IS, GAS INSULATED SWITCHGEAR (GIS) AS PER TS**			
5.01	SERVICES- 400kV GIS: SUPERVISION OF ERECTION OF GIS	Bays	12	Supervision of erection of GIS with main bus, complete as per TS in all respect including LCC and its accessories. It also includes verification of materials for proper storage at site for final storage. Earthing, SF6 Gas Filing works, Internal Cabling from GIS to LCC, including Structure Works are covered under this item. GIS Bus Duct, SF6 to Air Bushing (SAB)/ SF6 to Oil Bushing (SOB), Surge Arrester, VT are not covered in this BOQ item.
5.02	SERVICES- 400kV GIS: SUPERVISION OF ERECTION OF 1- PHASE GAS INSULATED BUS DUCT	MTR	1300	Supervision of erection of GIB complete as per TS in all respect. GIB shall be considered from first equipment of GIS. Earthing, SF6 Gas Filing works, Internal Cabling with tray work including Structure Works are covered under this item.
5.03	SERVICES- 400kV GIS: SUPERVISION OF ERECTION OF 1 PHASE SF6 TO AIR BUSHING	SET	24	Supervision of erection of SF6 to Air Bushing complete as per TS in all respect. Earthing, SF6 Gas Filing works, Internal Cabling with tray work, including Structure Works are covered under this item.
5.04	SERVICES- 400kV GIS: SUPERVISION OF ERECTION OF 1 PHASE SF6 TO OIL BUSHING (POLYMER)	SET	1	Supervision of erection of SF6 to Oil Bushing complete as per TS in all respect. Earthing, SF6 Gas Filing works, Internal Cabling with tray work, including Structure Works are covered under this item.
5.05	SERVICES- 400kV GIS: SUPERVISION OF ERECTION OF 1 PHASE SURGE ARRESTER WITH SURGE COUNTER	SET	24	Supervision of erection of Surge Arrester complete as per TS in all respect. Earthing, SF6 Gas Filing works, Internal Cabling with tray work, including Structure Works are covered under this item.
5.06	SERVICES- 400kV GIS: SUPERVISION OF ERECTION OF 1 PHASE VOLTAGE TRASNFORMER	SET	1	Supervision of erection of Voltage Transformer complete as per TS in all respect. Earthing, SF6 Gas Filing works, Internal Cabling with tray work, including Structure Works are covered under this item.
5.07	SERVICES- 400kV GIS: TESTING & COMMISSIONING OF GIS	Bays	12	Testing and commissioning of complete GIS system including main bus, LCC and associated system (LA, VT, CSD etc.) is to be executed by bidder. All the special testing instruments, kits, T&P etc. are to be arranged by bidder on returnable basis. Please refer relevant section of technical specification for details.
5.08	SERVICES- 400kV GIS : TESTING & COMMISSIONING OF GAS INSULATED BUS DUCT	MTR	1300	Testing and commissioning of GIB complete as per TS in all respect. GIB shall be considered from first equipment of GIS. All the special testing instruments, kits, T&P etc. are to be arranged by bidder on returnable basis. Please refer relevant section of technical specification for details.

Sl. No.	Description	Unit	Quantity	Remarks
5.09	SERVICES- 400kV GIS : FINAL SUCCESSFUL HV/ POWER FREQUENCY TESTING OF GIS INCLUDING ARRANGING OF HV TEST KIT ALONG WITH OPERATOR	Bays	12	Carrying out successful HV/ Power Frequency Testing of GIS as per IEC including Arrangement of HV Test kit with operator (on returnable basis) shall be in scope of bidder, which includes charges of HV test kit with operator, accessories & tools required for completion of HV testing. The quoted price shall include GIS bays including Main Bus, GIB, SAB/SOB and other common items as per TS complete in all respect. In this BOQ item, mobilization and demobilization for HV test kit is considered for once. In case of more, for reasons not attributable to bidder, same shall be paid extra as per BOQ Item.
5.1	SERVICES- 400kV GIS : INSULATION CO-ORDINATION STUDIES FOR GIS SYSTEM	LOT	1	1 Lot means Complete study report as per technical specification, Including VFTO report.
5.11	SERVICES- 400kV GIS : TRAINING FOR GIS AT SITE	DAY	2	
5.12	SERVICES- 400kV GIS : TRAINING FOR GIS AT MANUFACTURER WORKS	DAY	2	

6.0	**SERVICES- GIS : REFERENCE UNIT PRICE FOR ADDITION / DELETION OF SERVICES:** (UNIT PRICES OF INDIVIDUAL SERVICES INCLUDED HERE ARE REQUIRED FOR ANY ADDITION/DELETION OF EQUIPMENT AND REPLACEMENT OF DAMAGED ITEMS. VENDOR TO ENSURE THAT THE UNIT PRICES HAVE A LOGICAL RELATIONSHIP WITH PRICES OF ASSEMBLIES IN MAIN ITEMS. QUOTING FOR UNIT PRICES IS MANDATORY AND SHALL BE CONSIDERED FOR EVALUATION)			
6.01	SERVICES- 400kV GIS: REF. UNIT PRICE OF GIS INDIVIDUAL ITEM/ EQUIPMENT - **SERVICES FOR SUPERVISION OF ERECTION OF GIS**	MANDAY	10	Charges for repetition of services - (if required due to reasons not attributed to the bidder) This item will be executed only if repetition of services is required by BHEL.
6.02	SERVICES- 400kV GIS: REF. UNIT PRICE OF GIS INDIVIDUAL ITEM/ EQUIPMENT - **SERVICES FOR TESTING & COMMISSIONING OF GIS**	MANDAY	10	Charges for repetition of services - (if required due to reasons not attributed to the bidder) This item will be executed only if repetition of services is required by BHEL.
	DEMOBILIZATION AND REMOBILIZATION CHARGES			
6.03	SERVICES- 400kV GIS: DEMOBILIZATION AND REMOBILIZATION CHARGES FOR GIS **ERECTION SUPERVISION TEAM**	Set	2	THIS BOQ ITEM SHALL BE PAYABLE IF REQUIRED FOR REASONS NOT ATTRIBUTABLE TO BIDDER.
6.04	SERVICES- 400kV GIS: DEMOBILIZATION AND REMOBILIZATION CHARGES FOR GIS **TESTING & COMMISSIONING TEAM**	Set	2	BOQ ITEM SHALL BE PAYABLE IF REQUIRED FOR REASONS NOT ATTRIBUTE TO BIDDER. HV TESTING IS NOT PART OF THIS ITEM.
6.05	SERVICES- 400kV GIS: DEMOBILIZATION & REMOBILIZATION CHARGES OF **HV TEST KIT** ALONG WITH OPERATOR	Lot	1	In this BOQ item, mobilization and demobilization chages for HV test kit is considered for second time or more , for reasons not attributable to bidder. HV testing charges shall be paid per bay basis as per main HV testing charge.

SLD for 400kV Switchyard

LEGEND			
SYMBOLS	DESCRIPTION	SYMBOLS	DESCRIPTION
	GENERATOR TRANSFORMER(GT)	G 3~	GENERATOR
	UNIT TRANSFORMER(UT)	EDG	EMERGENCY DIESEL GENERATOR (EDG)
	STATION / STANDBY TRANSFORMER (ST)		TRANSFORMER
M 3~	INDUCTION MOTOR THREE PHASE		NEUTRAL GROUNDING TRANSFORMEOR(NGTr.)
	EXCITATION TRANSFORMER		RECTIFIER
	IPB		INVERTER
	SPBD	MDBFP	MOTOR DRIVEN BOILER FEED WATER PUMP
	NSPBD		EARTH
	MCCB		EARTH SWITCH
	DRAWOUT		CABLE CONNECTION

LINE - 1 | SPARE (FULLY EQUIPPED) | LINE - 2 | LINE - 3 (Extension with existing AIS)

GIS Limit | VT | HES | PIR | PIR+ CSD | CSD | 400kV GIS SWITCHYARD

2000A, 400KV, 63KA FOR 1 SEC - MAIN BUS - 2

2000A, 400KV, 63KA FOR 1 SEC - MAIN BUS - 1

REFER NOTE-17

SPARE (FULLY EQUIPPED) | LINE - 4 (Extension with existing AIS)

LEGEND	
SYMBOLS	DESCRIPTION
	CONTACTOR MAN MAKE CONTACT OF A CONTACTOR (CONTACT OPENED IN THE UNOPERATED POSITION)
3	CURRENT TRANSFORMER
NC	NORMALLY CLOSE
NO	NORMALLY OPEN
	CONNECTING LINK, CLOSED
	DISCONNECTOR (ISOLATOR)
	MCB
	BATTERY
	NEUTRAL GROUNDING RESISTER (NGR)
SC	LIGHTNING ARRESTER
	INTERLOCK

11kV BUS, 7A1, 50kA FOR 1SEC, 3Ph, 3W | 11kV BUS, 7A2, 50kA FOR 1SEC, 3Ph, 3W | 11kV BUS, 7B1, 50kA FOR 1SEC, 3Ph, 3W | 11kV BUS, 7B2, 50kA FOR 1SEC, 3Ph, 3W | 11kV BUS, ST A1, 50kA FOR 1SEC, 3Ph, 3W | 11kV BUS, ST A2, 50kA FOR 1SEC, 3Ph, 3W | 11kV BUS, ST B1, 50kA FOR 1SEC, 3Ph, 3W | 11kV BUS, ST B2, 50kA FOR 1SEC, 3Ph, 3W

FOR TENDER PURPOSE ONLY

DATE	REV	DRN	CHKD	APPD	REMARKS

GUJARAT STATE ELECTRICITY CORPORATION LIMITED

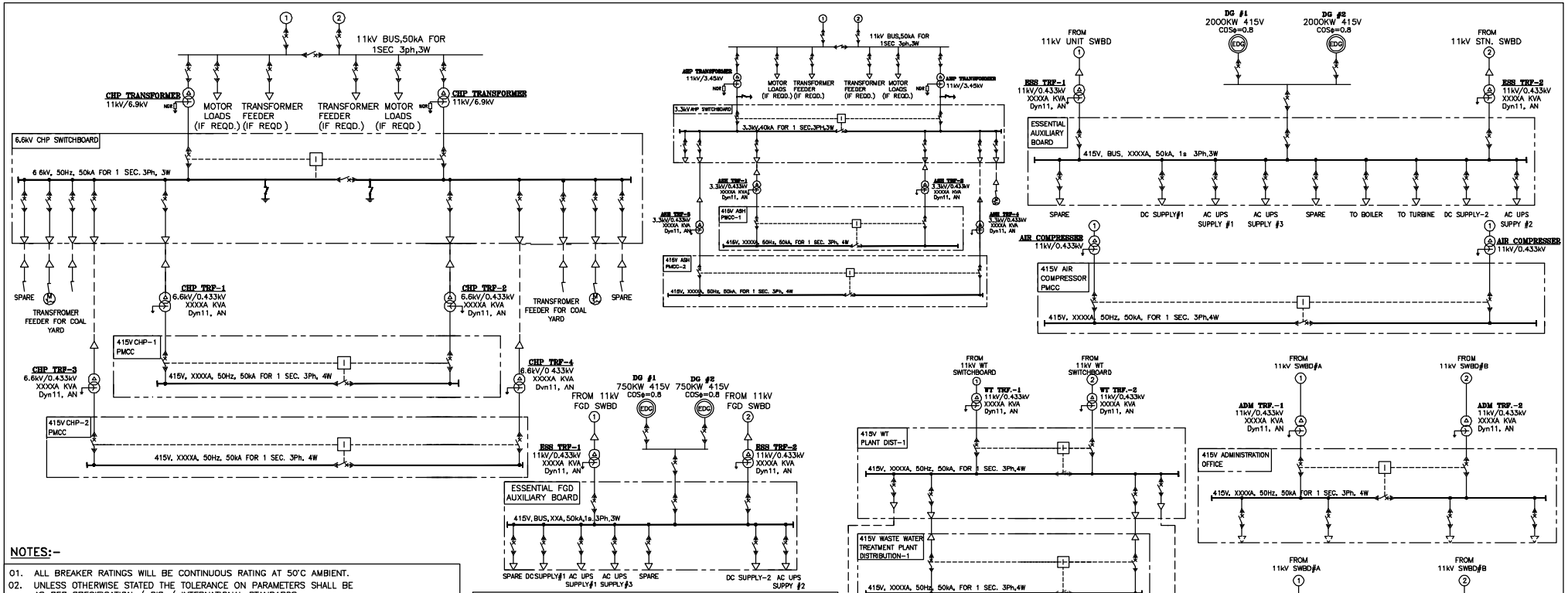
PROJECT: 1 X 800 MW ULTRA SUPER CRITICAL ON ASH DYKE AREA AT UKAI TPS

OWNER'S ENGINEER: STEAG ENERGY SERVICES (INDIA) PVT. LTD.

TITLE: MAIN SINGLE LINE DIAGRAM

DRAWING No.	SHEET	SIZE
ETG106-EPC-EE-GN-SLD-001	1 OF 2	A3

DATE:	SCALE:	DRAWN BY:	CHECKED BY:	APPROVED BY:	REV.
14.05.2024	NTS	KMA	NC	KEA	01



NOTES:–

01. ALL BREAKER RATINGS WILL BE CONTINUOUS RATING AT 50°C AMBIENT.
02. UNLESS OTHERWISE STATED THE TOLERANCE ON PARAMETERS SHALL BE AS PER SPECIFICATION / BIS / INTERNATIONAL STANDARDS.
03. UNLESS OTHERWISE STATED BASE MVA IS THE HIGHEST RATED CAPACITY.
04. MINIMUM FAULT LEVEL WITH STAND :–
    400kV.....63kA FOR 1 SEC.
    11kV..... ... ...50kA FOR 1 SEC.
    6.6kV.. .....50kA FOR 1 SEC.
    3.3kV.....40kA FOR 1 SEC.
    415kV.....50kA FOR 1 SEC.
    220V DC.....25kA FOR 1 SEC.
05. 415V SYSTEM WILL BE 3 PHASE. 3 WIRE WITH NEUTRAL SOLIDLY EARTHED. 11kV AND 3.3kV SYSTEM NEUTRALS WILL BE RESISTANCE EARTHED LIMITING EARH FAULT CURRENT TO 300A FOR 10 SEC.
06. 220V DC LEAD ACID / Ni–Cd BATTERIES WILL BE RATED TO CATER THE DC LOADS OF UNIT AS WELL AS STATION LOAD DURING COMPLETE BLACKOUT CONDITION.
07. BATTERIES WILL BE UNGROUNDED HAVING FLOATING NEUTRAL.
08. GEN. BUSDUCTS WILL BE ISOLATED PHASE TYPE. 11/6.6kV & 3.3kV HV BUSDUCTS WILL BE SEGREGATED PHASE BUSDUCT AND 415V LT BUSDUCTS WILL BE NON SEGREGATED PHASE BUSDUCT AND 415V LT BUSDUCTS WILL BE NON SEGREGATED TYPE.
09. UNDER NORMAL OPERATION OF 415V PMCC/MCC/ACDB HAVING TWO INCOMING BREAKERS/ISOLATORS AND ONE BUS SECTION BREAKER/ISOLATOR, THE INCOMING BREAKERS/ISOLATORS WILL BE CLOSED AND BUS SECTION BREAKER / ISOLATOR WILL BE OPEN
10. 11kV SYSTEM UNIT BUSES EMPLOY FAST BUS TRANSFER SCHEME FOR RESTORATION OF SUPPLY FROM STATION TRANSFORMER IN CASE OF SUPPLY FAILURE FROM THE RESPECTIVE UNIT TRANSFORMER. MANUAL LIVE CHANGEOVER WITH CHECK SYNCHRONISATION AND SLOW AUTO CHANGEOVER FACILITY AS A BACK–UP IS ALSO PROVIDED FOR THESE BUSES. 11kV SYSTEM STATION BUSES EMPLOY MANUAL LIVE CHANGEOVER.
11. 6.6kV/415V SYSTEM BUSES ARE PROVIDED WITH MANUAL LIVE CHANGEOVER WITH CHECK SYNCHRONIZATION AS WELL AS AUTOMATIC SLOW CHANGEOVER.
12. UNIT 415V BUS SECTIONS ARE ADDITIONALLY PROVIDED WITH MANUAL LIVE CHANGEOVER FACILITY WITH CHECK SYNCHRONIZATION AND AUTOMATIC CHANGEOVER, WITH THEIR RESPECTIVE DG BUS
13. ALL BATTERY CHARGERS SHALL HAVE PROVISION FOR RECEIVING 2 INPUT SUPPLIES ALONG WITH SUITABLE AUTOMATIC CHANGEOVER BETWEEN THE SOURCES.
14. MVA RATING OF THE TRANSFORMER, AS INDICATED ABOVE, SHALL BE CONSIDERED AS THE MINIMUM REQUIREMENT FOR THE PROJECT, TRANSFORMER OFFERED BY THE BIDDER SHALL BE SIZED ACCORDING TO THE MAXIMUM DEMAND CONSIDERING ALL THE NORMAL RUNNING LOADS IN SERVICE AND STARTING OF ONE NO. HIGHEST RATED MOTOR WITH DRIVEN EQUIPMENT, NO LOAD VOLTAGE CORRECTION FACTOR 5% WHILE SIZING OF TRANSFORMER AT MOST STRINGENT CONDITION PLUS MINIMUM 10% MARGIN
15. BRUSHLESS EXCITATION SYSTEM IS ALSO ACCEPTABLE.
16. RATING OF ALL ELECTRICAL EQUIPMENT IN THE SLD IS TENTATIVE AND INDICATIVE ONLY FOR TENDER PURPOSE.
17. THIS LINES (LINE–3 & 4) WILL BE INTERCONNECTED TO EXISTING 400kV AIS SWITCHYARD FOR POWER EVACUATION ONLY IN CASE OF OUTAGE OF 500MW POWER PLANT
18. SEPARATE DG SETS (1W+1S) OF MINIMUM 750kVA FOR EACH DG SHALL BE CONSIDERED FOR FGD ESSENTIAL AUXILIARY SYSTEMS

ABBREVIATIONS

GT	GENERATOR STEP–UP TRAFO. TRANSFORMER	EMCC	EMERGENCY MOTOR CONTROL CENTER
ST	STATION/STANDBY TRANSFORMER	ACB	AIR CIRCUIT BREAKER
STG	STEAM TURBINE GENERATOR	MCCB	MOLDED CASE CIRCUIT BREAKER
GCB	GENERATOR CIRCUIT BREAKER	LP	LIGHTING PANEL
U T	UNIT TRANSFORMER	UPS	UNINTERRUPTED POWER SUPPLY
IPBD	ISOLATED PHASE BUS DUCT	ESP	ELECTROSTATIC PRECIPITATOR
NSPBD	NON–SEGREGATED PHASE BUS DUCT	AHP	ASH HANDLING PLANT
SPBD	PHASE SEGREGATED PHASE BUS DUCT	WTP	WATER TREATMENT PLANT
EDG	EMERGENCY DIESEL GENERATOR	LHP	LIGNITE HANDLING PLANT
NGR	NEUTRAL GROUNDING RESISTER	FGD	FLUE GAS DESULPHERIZATION
NGT	NEUTRAL GROUNDING TRANSFORMER	CW	CIRCULATING WATER
LA	LIGHTNING ARRESTER	CWPHT A & B CT	COOLING TOWER
SWGR	SWITCHGEAR	ESS	ESSENTIAL AUXILIARY BOARD
PMCC	POWER & MOTOR CONTROL CENTER	MLDB	MAIN LIGHTING DISTRIBUTION BOARD
MCC	MOTOR CONTROL CENTER	HSBT	HIGH SPEED BUS TRANSFER
UAT	UNIT AUXILIARY TRANSFORMER	SAT	STATION AUXILIARY TRANSFORMER
UST	UNIT SERVICE TRANSFORMER	SST	STATION SERVICE TRANSFORMER

FOR TENDER PURPOSE ONLY

DATE	REV	DRN	CHKD	APPD	REMARKS

GUJARAT STATE ELECTRICITY CORPORATION LIMITED

PROJECT: 1 X 800 MW ULTRA SUPER CRITICAL ON ASH DYKE AREA AT UKAI TPS

OWNER'S ENGINEER: STEAG ENERGY SERVICES (INDIA) PVT. LTD.

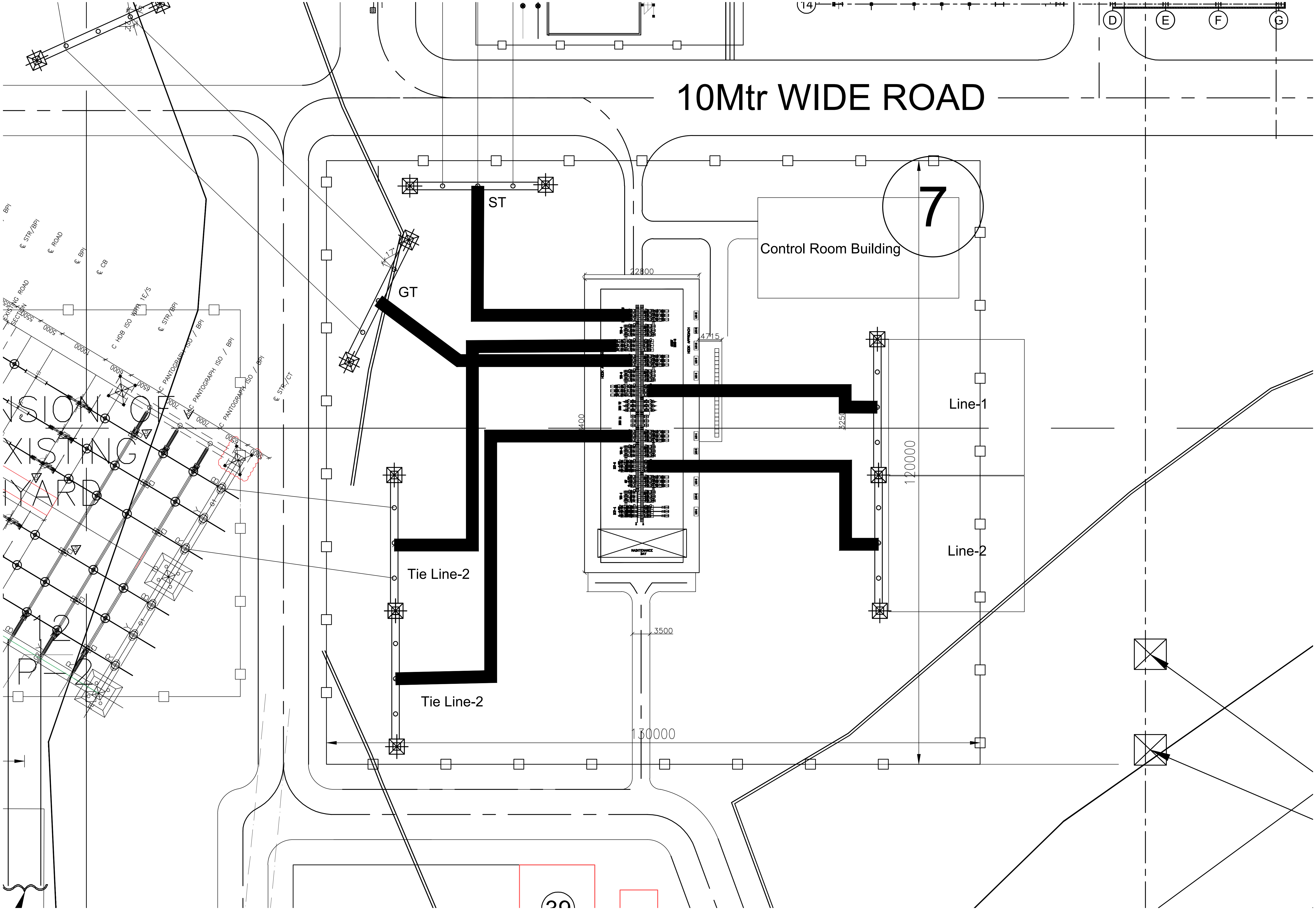
TITLE: MAIN SINGLE LINE DIAGRAM

DRAWING No.		SHEET	SIZE
	ETG106-EPC-EE-GN-SLD-001	2 OF 2	A3

DATE:	SCALE:	DRAWN BY:	CHECKED BY:	APPROVED BY:	REV.
14.05.2024	NTS	KMA	NC	KEA	01

NIT No.83363_61Q2500151 Dtd: 24-06-2024

PLOT PLAN_400kV SWITCHYARD
For Reference Purpose



GSECL	**GUJARAT STATE ELECTRICITY COPRORATION LIMITED**	VOLUME - VI
	1X800 MW ULTRA SUPER CRITICAL UNIT NO#7 ON ASH DYKE AREA AT UKAI TPS	PART - A
	BID SPECIFICATION NO.: ETG106-EPC-UKAI/UNIT # 7-CS-01	
	AMENDMENTS	REV. - 0

ELECTRICAL

Note: Bidder to note that highlighted portion of Section 2 is related to 400kV GIS. However, Bidder to ensure to go through the complete document to avoid any anomaly/discrepancy in future.

GSECL

Amendment for the tender for "Design, Engineering, Manufacture, Supply, Construction, Erection, Testing & Commissioning works for the EPC Package of Coal Fired UKAI THERMAL POWER PROJECT EXTENSION UNIT-7 (1 X 800 MW SUPERCRITICAL UNIT ON ASH DYKE AREA) on the basis of single point responsibility turnkey contract".

Tender No. GSECL/P&P/EPC/800MW/

Amendment Sr. No.	Volume	Part	Section No. / Section Title	Clause No.	Page no.	Bid Specification	Amendment to be considered by the Bidders
EE-1	II	-	Section-2/Lead Technical Specifications	2.16.15 xl	56	Roof top Solar system of adequate capacity shall be installed at various buildings of plant and connected to nearby 415V MCC	Rooftop solar system is withdrawn from the scope. However, necessary provision of 415V module for solar roof top power feeder with all required components & with space for net metering in any of the LT switchgear on each building shall be made.
EE-2	III	B	Section-1 / Electrical Technical Specification	1.02.01 iii)	2	Metering & Protection SLDs – Generator, GTs, UTs, Station transformers, UATs, 11kV & 6.6kV, 3.3kV Switchgears, 400kV switchyard, Roof Top Solar PV plants at Buildings etc.	Metering & Protection SLDs – Generator, GTs, UTs, Station transformers, UATs, 11kV & 6.6kV, 3.3kV Switchgears, 400kV switchyard, etc.
EE-3	III	B	Section-1 / Electrical Technical Specification	1.02.02 xv)	3	Roof Top Solar PV Plants at Buildings.	**Deleted**
EE-4	III	B	Section-1 / Electrical Technical Specification	1.04.06	6	Fault level shall be limited to 50 kA for 1 sec for 415V system. For higher voltage systems it shall be limited to 50kA, 3 Secs for 11 kV and 6.6KV systems and 40 kA, 3 secs for 3.3 kV systems. For EHV, the fault level for 400kV system shall be of 63kA for 1 sec	Fault level shall be limited to 50 kA for 1 sec for 415V system. For higher voltage systems it shall be limited to 50kA, **1 Secs** for 11 kV and 6.6KV systems and 40 kA, **1 secs** for 3.3 kV systems. For EHV, the fault level for 400kV system shall be of 63kA for 1 sec
EE-5	III	B	Section-1 / Electrical Technical Specification	1.05.00 Sr. No. 9	10	Fault Level 11 kV System -50 kA for 3 seconds 50 kA , 3 secs for 6.6kV and 40 kA, 3 secs for 3.3kV.	Fault Level 11 kV System -50 kA for 1 second 50 kA , 1 secs for 6.6kV and 40 kA, 1 secs for 3.3kV.
EE-6	III	B	Section-1 / Electrical Technical Specification	1.08.00	11	HT Switchgears 11kV , 6.6 kV & 3.3kV - **3 seconds**	HT Switchgears 11kV , 6.6 kV & 3.3kV - **1 second**

GSECL

Amendment for the tender for "Design, Engineering, Manufacture, Supply, Construction, Erection, Testing & Commissioning works for the EPC Package of Coal Fired UKAI THERMAL POWER PROJECT EXTENSION UNIT-7 (1 X 800 MW SUPERCRITICAL UNIT ON ASH DYKE AREA) on the basis of single point responsibility turnkey contract".

Tender No. GSECL/P&P/EPC/800MW/

Amendment Sr. No.	Volume	Part	Section No. / Section Title	Clause No.	Page no.	Bid Specification	Amendment to be considered by the Bidders
EE-7	III	B	Section-1 / Electrical Technical Specification	1.13.03	16	The IPBD shall be based on following factors: i) Continuous current rating with **10 %** design margin as per IS 8084	The IPBD shall be based on following factors: i) Continuous current rating with **2.5 %** design margin as per IS 8084.
EE-8	III	B	Section-1 / Electrical Technical Specification	1.15.00	20	Bushings up to 52 kV shall be Epoxy RIP type and above 52 kV shall be Epoxy RIS type. No oil cooled bushings shall be used.	In GT and ST - HV Bushing Shall be RIP/RIS type. Neutral and LV bushing shall be RIP/Oil communication type Porcelain bushing.
EE-9	III	B	Section-1 / Electrical Technical Specification	1.26.04	31	Online resistance (IR) monitoring in all HT motors of 3.3kV & above.	**Deleted**
EE-10	III	B	Section-1 / Electrical Technical Specification	3.04.04 i)	101	The Generator Transformers shall be 3 limbed or 4 limbed core type construction. Core will be made of laminations of high-grade non-ageing, cold-rolled super grain-oriented (CRGO), silicon steel of high permeability without burrs. Each lamination will be insulated with high quality insulation coating, which will not deteriorate due to pressure and hot oil. Thickness of laminations shall be 0.3 mm or less.	The Generator Transformers shall be 3 limbed or 4 limbed core type construction. Core will be made of laminations of high-grade non-ageing, cold-rolled super grain-oriented (CRGO), silicon steel of high permeability without burrs known as **HI-B steel** trade name. Each lamination will be insulated with high quality insulation coating, which will not deteriorate due to pressure and hot oil. Thickness of laminations shall be 0.3 mm or less.
EE-11	III	B	Section-1 / Electrical Technical Specification	3.04.10 iv	105	iv) **In addition** cooling equipment shall conform to the requirement stipulated below: a) Transformer cooling shall be affected by use of a No. of detachable type unit coolers. Capacity of each cooler shall be limited to maximum of 20% of the total cooling requirements. The coolers shall be tank mounted.	iv) **Or alternatively** Unit coolers can be provided. It shall be noted that total capacity of unit coolers furnished for each transformer shall be minimum 120% of actual requirements i.e**. 6x20% unit coolers.**

GSECL

Amendment for the tender for "Design, Engineering, Manufacture, Supply, Construction, Erection, Testing & Commissioning works for the EPC Package of Coal Fired UKAI THERMAL POWER PROJECT EXTENSION UNIT-7 (1 X 800 MW SUPERCRITICAL UNIT ON ASH DYKE AREA) on the basis of single point responsibility turnkey contract".

Tender No. GSECL/P&P/EPC/800MW/

Amendment Sr. No.	Volume	Part	Section No. / Section Title	Clause No.	Page no.	Bid Specification	Amendment to be considered by the Bidders
						b) Each cooler shall have its own cooling fans, oil flow indicator, shut off valves at the top and bottom (80 mm size) lifting lugs, top and bottom oil filling valves, air release plug at the top, a drain plug and sampling valve and thermometer pocket fitted with captive screw cap on the inlet and outlet.	v) The below requirement shall be considered as applicable for the cooling systems as defined above. a) Each cooler shall have its own cooling fans, oil flow indicator, shut off valves at the top and bottom (80 mm size) lifting lugs, top and bottom oil filling valves, air release plug at the top, a drain plug and sampling valve and thermometer pocket fitted with captive screw cap on the inlet and outlet.
						c) Total capacity of unit coolers furnished for each transformer shall be minimum 120% of actual requirements.	Deleted as the same is covered above, b) Blank c) Blank From d) to r) will remain unchanged.
EE-12	III	B	Section-1 / Electrical Technical Specification	3.04.24	116	Bushings up to 52 kV shall be Epoxy RIP type and above 52 kV shall be Epoxy RIS type. No oil cooled bushings shall be used.	In GT and ST - HV Bushing Shall be RIP/RIS type. Neutral and LV bushing shall be RIP/Oil communication type Porcelain bushing.
EE-13	III	B	Section-1 / Electrical Technical Specification	3.18.00 Sr. No. 14	135	Impedance at 75 deg.C on 70MVA base	The impedance shall be selected for **75MVA** as base, the rating of the transformer.
EE-14	III	B	Section-1 / Electrical Technical Specification	5.05.02	165	The core shall be constructed from high-grade non-aging, low loss, high permeability, cold rolled, super grain oriented, silicon steel laminations, known as HI-B steel trade name.	The core shall be constructed from high-grade non-aging, low loss, high permeability, cold rolled, super grain oriented, silicon steel laminations, known as **M4 steel** trade name.

Amendment for the tender for "Design, Engineering, Manufacture, Supply, Construction, Erection, Testing & Commissioning works for the EPC Package of Coal Fired UKAI THERMAL POWER PROJECT EXTENSION UNIT-7 (1 X 800 MW SUPERCRITICAL UNIT ON ASH DYKE AREA) on the basis of single point responsibility turnkey contract".

Tender No. GSECL/P&P/EPC/800MW/

Amendment Sr. No.	Volume	Part	Section No. / Section Title	Clause No.	Page no.	Bid Specification	Amendment to be considered by the Bidders
EE-15	III	B	Section-1 / Electrical Technical Specification	5.05.05	166	Bushings of rating below 52 kV shall be RIP type	For transformer bushings rated 52kV and above shall be RIP/RIS type. For transformer bushing rated below 52kV shall be RIP/Oil communication type porcelain bushing.
EE-16	III	B	Section-1 / Electrical Technical Specification	7.04.01 iv	189	The bus conductors shall be designed to carry rated current under normal site operating conditions without exceeding a hot spot temperature of 85 deg. C. At silver plated joints maximum temperature allowable is 105 C. Also the temperature of the bus enclosure shall not exceed 25 deg. C while carrying the specified short circuit current for three seconds(s) when a fault occurs at the operating temperature.	The bus conductors shall be designed to carry rated current under normal site operating conditions without exceeding a hot spot temperature of **90 deg. C**. for bolted joints (Plain or tinned). At silver plated joints maximum temperature allowable is 105 C. Also the temperature of the bus enclosure shall not exceed 25 deg. C while carrying the specified short circuit current for three seconds(s) when a fault occurs at the operating temperature.
EE-17	III	B	Section-1 / Electrical Technical Specification	Datasheet 3.4 (a)	197	Bus Conductor degC 35 °C (55 °C at silver plated joints)	Bus Conductor degC **40 °C** for plain joints (55 °C at silver plated joints)
EE-18	III	B	Section-1 / Electrical Technical Specification	8.04.02 i) c)	204	85°C (35°C rise over ambient 50°C)-For busbars	Deleted
EE-19	III	B	Section-1 / Electrical Technical Specification	8.04.04 xv)	207	Inbuilt Motorised and Remote Rack in and Rack out facility for all MV & HV switchgear breakers shall be provided.	Inbuilt Motorised with Remote **or Trolley mounted (manually handled)** Rack in and Rack out facility for all MV & HV switchgear breakers shall be provided.

GSECL

Amendment for the tender for "Design, Engineering, Manufacture, Supply, Construction, Erection, Testing & Commissioning works for the EPC Package of Coal Fired UKAI THERMAL POWER PROJECT EXTENSION UNIT-7 (1 X 800 MW SUPERCRITICAL UNIT ON ASH DYKE AREA) on the basis of single point responsibility turnkey contract".

Tender No. GSECL/P&P/EPC/800MW/

Amendment Sr. No.	Volume	Part	Section No. / Section Title	Clause No.	Page no.	Bid Specification	Amendment to be considered by the Bidders
EE-20	III	B	Section-1 / Electrical Technical Specification	11.05.13	271	Wireless temperature monitoring system to be provided and same shall be integrated to DDCMIS/ separate HMI.	Wireless temperature monitoring system **for all PMCC and EMCC to be provided** and same shall be integrated to DDCMIS/ separate HMI.
EE-21	III	B	Section-1 / Electrical Technical Specification	11.06.02	273	All service like essential motors for safe shutdown of the unit, UPS incomers, battery charger AC supply, lighting, etc. shall be connected to this MCC. DG supply shall be extended to emergency MCC in less than 15 sec from loss of power.	All service like essential motors for safe shutdown of the unit, UPS incomers, battery charger AC supply, lighting, etc. shall be connected to this MCC. DG supply shall be extended to emergency MCC in case of loss of power.
EE-22	III	B	Section-1 / Electrical Technical Specification	Datasheet d)	299	Material of bus bars - For rating up to 2000A, Al. or Al. alloy For rating above 2000A, Cu	Material of bus bars- Al. or Al. alloy
EE-23	III	B	Section-1 / Electrical Technical Specification	14.10.06	327	Online Insulation Resistance monitoring system shall be provided in all HT motors.	Deleted
EE-24	III	B	Section-1 / Electrical Technical Specification	15.06.03 ii)	348	Each motor actuator shall also have two (2) torque limit switches with four (4) normally opened and four (4) normally closed contacts each.	Each motor actuator shall also have two (2) torque limit switches **with two (2) normally opened and two (2) normally closed contacts each**.
EE-25	III	B	Section-1 / Electrical Technical Specification	17.03.01 i)	380	11 kV unearthed system having phase fault current of 50 kA and earth fault current of 300 A.	11 kV **& 6.6kV** unearthed system having phase fault current of 50 kA and earth fault current of 300 A.
EE-26	III	B	Section-1 / Electrical Technical Specification	17.03.01 ii)	380	6.6/3.3 kV unearthed system having phase fault current of 40 kA and earth fault current of 300 A.	3.3 kV unearthed system having phase fault current of 40 kA and earth fault current of 300 A.

GSECL

Amendment for the tender for "Design, Engineering, Manufacture, Supply, Construction, Erection, Testing & Commissioning works for the EPC Package of Coal Fired UKAI THERMAL POWER PROJECT EXTENSION UNIT-7 (1 X 800 MW SUPERCRITICAL UNIT ON ASH DYKE AREA) on the basis of single point responsibility turnkey contract".

Tender No. GSECL/P&P/EPC/800MW/

Amendment Sr. No.	Volume	Part	Section No. / Section Title	Clause No.	Page no.	Bid Specification	Amendment to be considered by the Bidders
EE-27	III	B	Section-1 / Electrical Technical Specification	ANNEXURE-H 1.01.14	666	All components required for Integration of protection relay and IEDs being proposed under this contract with the existing switchyard SAS system for control, protection and monitoring for 400kV tie lines at 400 kV AIS side shall be in the scope of bidder. Protection & Control system shall be provided with Numerical relays.	SAS shall be provided for 400kV GIS plus 2 Nos tie line and bays (AIS/GIS) to be constructed in existing 400kV AIS. However, provision for integration of all line, transformer, ICT and reactor bays shall be considered in the new SAS for two nos. tie bays. If required, CVT or other equipment required for standalone operation of extended tie bays shall be considered in Bidder's scope. However, protection viz, Busbar, LBB, etc. and feedbacks of existing AIS with the proposed extension of 2 Nos Tie line bays shall be considered in the bidders scope.
EE-28	III	B	Section-1 / Electrical Technical Specification	30.01.01 f)	715	SCADA: Existing 400 kV AIS SCADA is not in working condition. Hence complete new SCADA system shall be considered for existing 400 kV switchyard Bays & New AIS Tie line Bays. The design and technical specification shall be as per the existing system and the SCADA specification specified in GIS chapter of this specification. Make of SCADA system of both GIS switchyard and AIS switchyard shall be same.	SAS shall be provided for 400kV GIS plus 2 Nos tie line and bays (AIS/GIS) to be constructed in existing 400kV AIS. However, provision for integration of all line, transformer, ICT and reactor bays shall be considered in the new SAS for two nos. tie bays. If required, CVT or other equipment required for standalone operation of extended tie bays shall be considered in Bidder's scope. However, protection viz, Busbar, LBB, etc. and feedbacks of existing AIS with the proposed extension of 2 Nos Tie line bays shall be considered in the bidders scope.
EE-29	III	B	Section-1 / Electrical Technical Specification	30.03.01 e)	718	e) Rated short time withstand current capacity 40 kA rms for three (3) second	e) Rated short time withstand current capacity 63 kA rms for One (1) second

Amendment for the tender for "Design, Engineering, Manufacture, Supply, Construction, Erection, Testing & Commissioning works for the EPC Package of Coal Fired UKAI THERMAL POWER PROJECT EXTENSION UNIT-7 (1 X 800 MW SUPERCRITICAL UNIT ON ASH DYKE AREA) on the basis of single point responsibility turnkey contract".

Tender No. GSECL/P&P/EPC/800MW/

Amendment Sr. No.	Volume	Part	Section No. / Section Title	Clause No.	Page no.	Bid Specification	Amendment to be considered by the Bidders
EE-30	III	B	Section-1 / Electrical Technical Specification	1.37.09	44	Lightning protection system shall be provided as per latest IS /IEC 62305. Lightning protection system shall comprise vertical air terminations, horizontal air terminations, down conductors, test links and earth electrodes. Advanced type charge Accumulation Device (SERTEC) shall be applied for only buildings against lightning protection. However, the advanced technology shall be discussed during detail Engineering and shall be acceptable only if it is agreeable/approved from customer upon submission of credentials.	Lightning protection system shall be provided as per latest IS /IEC 62305. Lightning protection system shall comprise vertical air terminations, horizontal air terminations, down conductors, test links and earth electrodes. Advanced type charge Accumulation Device shall be applied for only buildings against lightning protection. However, the advanced technology shall be discussed during detail Engineering and shall be acceptable only if it is agreeable/approved from customer upon submission of credentials.

GSECL

Amendment for the tender for "Design, Engineering, Manufacture, Supply, Construction, Erection, Testing & Commissioning works for the EPC Package of Coal Fired UKAI THERMAL POWER PROJECT EXTENSION UNIT-7 (1 X 800 MW SUPERCRITICAL UNIT ON ASH DYKE AREA) on the basis of single point responsibility turnkey contract".

Tender No. GSECL/P&P/EPC/800MW/

Amendment Sr. No.	Volume	Part	Section No. / Section Title	Clause No.	Page no.	Bid Specification	Amendment to be considered by the Bidders
EE-31	III	B	Section-1 / Electrical Technical Specification	22.22.09	493	ii) Observing and analyzing BENDER devices with communication capabilities,	ii) Observing and analysing the devices with communication capabilities,
EE-32	III	B	Section-1 / Electrical Technical Specification	22.22.09	494	iii) Data transmission management information systems and visualization system via an integral OPC interface. The protocol converter can be integrated into existing person computer. After entering an IP address and connection to the network and to BMS network, a standard web browser (e.g. Internet Explorer, Netscap Navigator) of a personal computer shall allow access to the entire data of a Insulation Monitoring & Fault Location system. In this way, all important measuring data the system shall be directly available. The parameterization of the BENDER system shall be protected by a password.	iii) Data transmission management information systems and visualization system via an integral OPC interface. The protocol converter can be integrated into existing person computer. After entering an IP address and connection to the network and to BMS network, a standard web browser (e.g. Internet Explorer, Chrome, Edge) of a personal computer shall allow access to the entire data of the Insulation Monitoring & Fault Location system. In this way, all important measuring data the system shall be directly available. The parameterization of the system shall be protected by a password.
EE-33	IV	-	BID DRAWINGS	Sr. No.24, 25	31, 32	Main Key SLD 24.ETG106-EPC-EE-GN-SLD-001 SHEET 1 OF 2 Rev.00 25.ETG106-EPC-EE-GN-SLD-001 SHEET 2 OF 2 Rev.00	Main Key SLD (Attached as Volume-VI, Part-B **Amendment Annexure- 8.1 & 8.2.**) 24.ETG106-EPC-EE-GN-SLD-001 SHEET 1 OF 2 Rev.01 25.ETG106-EPC-EE-GN-SLD-001 SHEET 2 OF 2 Rev.01
EE-34	VI	A		New		---	Technical Specification of LOTO (Lockout Tag out) System, (Attached as Volume-VI, Part-A **Amendment Annexure- 9.**)
EE-35	VI	A		New		---	PQR of 400KV GIS (Attached as Volume-VI, Part-A **Amendment Annexure- 10.**)
EE-36	VI	A		New		---	Existing Switchyard Drawings (Attached as Volume-VI, Part-A **Amendment Annexure- 11.**)

GSECL	**GUJARAT STATE ELECTRICITY COPRORATION LIMITED**	VOLUME - VI
	1X800 MW ULTRA SUPER CRITICAL UNIT NO#7 ON ASH DYKE AREA AT UKAI TPS	PART - B
	BID SPECIFICATION NO.: ETG106-EPC-UKAI/UNIT # 7-CS-01	
	PRE-BID RESOLUTIONS	REV. - 0

ELECTRICAL

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Pre-bid resolution for the tender for "Design, Engineering, Manufacture, Supply, Construction, Erection, Testing & Commissioning works for the EPC Package of Coal Fired Tender No. GSECL/P&P/EPC/800MW/

BID CLARIFICATION- ELECTRICAL

Sr. No.	Section No. / Section Title	Sub Section No. / Sub Section Title	Page No.	Clause No.	Bid Specification	Bidder's Query	Pre-bid Resolution
1	Volume-III - Part-B - Section-1 / Electrical Technical Specification	2.00.00 GENERATOR AND ACCESSORIES	63	2.05.00 XIII) IV)	At least six (6) numbers of dual axis optical sensor type vibration picksups at each end of over hang portion of the winding shall be provided, symmetrically located around the periphery with connection to Turbine Supervisory system for vibration monitoring and analysis. The connection between the pickups and Turbine Supervisory system for vibration monitoring shall be provided. Also a standalone station for the vibration monitoring system shall be provided.	As Generator winding bars are tightly fitted/bounded with each other and further suitable support has been provided to each bars. Hence, very less vibration seen in tangent direction and vibration always seen in radial direction only. Hence, as per OEM standard practice and to meet tender specification requirements, Bidder propose to provide 12 No. single axis (instead of dual axis) optical sensors each side (TE EE side) for measuring radial vibration only.	Tender Terms & conditions prevails
2	Vol-III Part-B Section-1 / Electrical Technical Specification	14.00.00 AC & DC MOTORS	329	14.13.05 i).	Motors up to 1000 KW …… 600% subject to IS Tolerance of plus 20%	As per IS 12615: 2018, Break-away starting current is limited to 770% of full load current for premium efficiency class IE3 motors. Accordingly, for motors of Generator Auxiliaries, starting current shall be limited to 770% of full load current.	Tender Cl. 14.13.05, iv, prevails for energy efficient motors.
3	Vol-III Part-B Section-1 / Electrical Technical Specification	14.00.00 AC & DC MOTORS	339	14.48.00	Starting current of the DC motors shall be limited to 200% of the full load current of the motor and is subject to IS tolerance.	For DC motors fast response & less starting time is required. Therefore, stating current for DC motors of Generator Seal oil system shall be limited to 300% of full load current as per standard & proven practice of BHEL.	Tender Terms & conditions prevails. However any specific issues shall be finalised during DE.
4	Vol-II Section-2 / Lead Technical Specification	2.00.00 BROAD SCOPE OF SUPPLY AND SERVICES	54	2.16.15 ELECTRICAL	xvi) Actuators- All motor driven actuators of the plant shall be Non integral type.	Customer is requested to clarify type of starter for electric actuators	It is Non Integral starter.
5	Vol-III Part-B Section-1 / Electrical Technical Specification	15.00.00 ELECTRICAL ACTUATORS - NON INTEGRAL STARTER	346	15.06.00 SPECIFIC REQUIREMENT OF MOTOR OPERATED NON INTEGRAL VALVE ACTUATORS	viii) The actuators shall have MCC based starters along with over load relays.	Actuator over load protection(OLR) not in part of actuator	Noted, the same shall be part of the respective MCC Starter.
6	Vol-III Part-B Section-1 / Electrical Technical Specification	15.00.00 ELECTRICAL ACTUATORS - NON INTEGRAL STARTER	346	15.06.00 SPECIFIC REQUIREMENT OF MOTOR OPERATED NON INTEGRAL VALVE ACTUATORS	v) A lockable local/remote selector switch shall also be provided for selecting mode of operation.	Local/Remote selection is not part of Electrical actuators.	Noted, the same shall be part of the respective MCC Starter.

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BID CLARIFICATION- ELECTRICAL

Sr. No.	Section No. / Section Title	Sub Section No. / Sub Section Title	Page No.	Clause No.	Bid Specification	Bidder's Query	Pre-bid Resolution
7	Vol-III Part-B Section-1 / Electrical Technical Specification	15.00.00 ELECTRICAL ACTUATORS - NON INTEGRAL STARTER	346	15.06.00 SPECIFIC REQUIREMENT OF MOTOR OPERATED NON INTEGRAL VALVE ACTUATORS	xi) .... For regulating service, the actuator with integral starter shall be suitably time rated for the duty cycle involved with necessary number of starts per hour, but in no case less than 150 starts per hour. It shall be capable of starting at 85% of rated voltage.	For regulating services, we consider inching duty actuators which are also NON-Integral Starter as in ON/OFF duty additionally with Contactless EPT.	Services with Non-integral starter shall be considered. Tender prevails for other services and requirements.
8	Vol-III Part-B Section-1 / Electrical Technical Specification	15.00.00 ELECTRICAL ACTUATORS - NON INTEGRAL STARTER	347	15.06.00 SPECIFIC REQUIREMENT OF MOTOR OPERATED NON INTEGRAL VALVE ACTUATORS	xiv) The actuator with direct online start from module shall be complete with all accessories viz torque limit switch, end of-travel switch, adjustable position limit switch, hand-wheel etc. shall be supplied.	Considered Actuator without integral Starter as per Contract. Hence the module based starter is not considered to be part of Electrical Actuator.	Noted.
9	Vol-III Part-B Section-1 / Electrical Technical Specification	15.00.00 ELECTRICAL ACTUATORS - NON INTEGRAL STARTER	347	15.06.00 SPECIFIC REQUIREMENT OF MOTOR OPERATED NON INTEGRAL VALVE ACTUATORS	xvii) Local controls with 'OPEN - STOP - CLOSE' pushbutton station. A lockable selector switch with 'LOCAL - OFF - REMOTE' function at MCC or Local. Local controls shall be supplied with indicating lights red for 'OPEN', yellow for 'FAULT' and green for 'CLOSED.	L/R selector switch, Push buttons for open, close, stop and command, annunciations/Indications for fault are not considered as part of Electrical Actuator.	Tender terms & conditions prevail.
10	Vol-III Part-B Section-1 / Electrical Technical Specification	15.00.00 ELECTRICAL ACTUATORS - NON INTEGRAL STARTER	348	15.06.03 Limit Switches	i) Each motor actuator shall have Six (6) rotary drum position limit switches with two for open each with 2 NO + 2NC contacts and two for close each with 2 NO + 2 NC contacts positions, each with adjustable setting between fully open and fully closed positions.	4 position limit switches & 2 torque limit switches each with 2NO, 2NC contacts are considered. All 4 Position limit switches can be adjusted independently at any intermediate position.	Tender terms & conditions prevail.

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BID CLARIFICATION- ELECTRICAL

Sr. No.	Section No. / Section Title	Sub Section No. / Sub Section Title	Page No.	Clause No.	Bid Specification	Bidder's Query	Pre-bid Resolution
11	Vol-II Section-2 / Lead Technical Specification	2.00.00 BROAD SCOPE OF SUPPLY AND SERVICES	54	2.16.15 xiv) ELECTRICAL	Local Control Panel/JB/PBs- Local Control panels for all auxiliaries and power supply arrangement, JBs as required for all systems and local stop PB stations for all unidirectional motors and bidirectional drive motors (except for MOV), DC starter panels etc.	Bidder understand that the requirement of Local control panels is generic requirement and to be provided based on the system requirement. Kindly note that critical equipment like ID/FD/PA FANS and their LOS are directly controlled from DCS. Local control panels and local start PB are not recommended and not provided in any of the projects, considering the critical nature of the equipment for ensuring plant availability. Hence, bidder proposes that local control panels and local start are not provided for the ID/FD/ PA fans & their LOS. These shall be DCS controlled only. Owner may kindly review critically and confirm. The mandatory spares list (Volume-V, Annexure-3) is missing. Kindly provide the same.	Tender Terms prevails. Local start/stop operation from local pushbuttons (LPB) is envisaged for all uni-directional drives & bidirectional drives. Moreover Bidder to consider the following signals in addition to the signals mentioned in the Cl. 1.08.08 of Volume III Part-C Drive Control Philosophy for both LT & HT UNIDIRECTIONAL & BIDIRECTIONAL DRIVES: --- Provide separate DO "LPBS Start Permit". --- Provide separate DI "Emergency stop LPBS pressed" --- Provide separate DI "Thermal Overload/ Trip on Overload" --- Provide separate AI "Current Feedback" (only for drives >30KW) --- For LT drives provide the feedback of Remote Selected from MCC in the DI "SWGR/MCC available" mentioned in the Drive Control Philosophy. --- For HT & breaker operated drives, provide separate DI "SWGR in Remote" in addition to "Switchgear Available" DI mentioned in the Cl. 1.08.08 Drive Control Philosophy.
12	Vol-III Part-B Section-1 / Electrical Technical Specification	15.00.00 / ELECTRICAL ACTUATORS - NON INTEGRAL STARTER	348	15.06.02 Motor --> vii)	vii) The actuators shall be designed to be self locking upon loss of power. **Motor shall be designed to close in 30 secs from full open position** and shall have adequate capacity to open and close under full unbalanced design pressure.	Please note that for **Guillotine Gates**, open-close operation within 30 seconds is technically not possible. Guillotine Gates will take much more time (around 3 to 8 minutes) for open-close operation depending on the stroke height of Gates (which depends on the Duct height). This is in-line with Guillotine Gates supplied by the bidder till date for all projects, including those installed in GSECL Ukai, Wanakbori & Sikka projects. The open-close timing of 30 seconds is possible only for quarter-turn actuators used for Multi-louver Dampers. Please accept.	Tender terms & conditions prevail. However the same shall be decided as per process requirement.
13	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	37	1.30.09	The minimum sizes of L.T power cable to be chosen are as below:- AL - 16 mm2 (3 core) & Cu - 2.5 mm2 (3 core)	Bidder proposes minimum sizes 10 sq.mm for power cable (AL) . This is is being followed for various power utilities. Owner may review and confirm.	Tender terms & conditions prevail.

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BID CLARIFICATION- ELECTRICAL

Sr. No.	Section No. / Section Title	Sub Section No. / Sub Section Title	Page No.	Clause No.	Bid Specification	Bidder's Query	Pre-bid Resolution
14	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	38	1.30.12	HV & MV cables & LV power cables shall be laid in ladder type cable trays. Control & Instrumentation cables shall be laid in perforated trays. Even in vertical risers control & instrumentation cables shall be laid in perforated type trays.	Bidder proposes ladder type cable trays for both power and control cables. Perforated cable trays shall be provided for the C&I cables. This is based on standard practice being followed for the various EPC projects Owner may kindly review and confirm	Tender terms & conditions prevail.
15	Vol-III Part-B Section-1 / Electrical Technical Specification	9.00.00 LT SERVICE TRANSFORMERS	240	9.01.01	The scope of supply shall include Cast Resin Encapsulated dry type indoor transformers of ratings to be decided by the Bidder based on selection criteria given in this specification.	Bidder understands that both ONAN outdoor and dry type indoor transformers are acceptable for the auxiliary LT transformers. Accordingly , bidder proposes ONAN outdoor auxiliary LT transformers for ESP and FGD applications. This is based on standard practice being followed for the various EPC projects Owner may kindly review and confirm.	AN shall be considered for main BTG plant systems. AN and ONAN shall be considered for BOP areas/ESP/FGD.
16	Vol-III Part-B Section-1 / Electrical Technical Specification	9.00.00 LT SERVICE TRANSFORMERS	241	9.01.12	For each switchgear, 2X100% rated transformer shall be considered.	In case the load on any LT board increase beyond 2.5 MVA, bidder proposes 3 x 50 % instead of 2 x 100% transformer configuration. Owner may kindly review and confirm	Tender terms & conditions prevail.
17	Vol-III Part-B Section-1 / Electrical Technical Specification	9.00.00 LT SERVICE TRANSFORMERS	241	9.01.12	Transformer shall be rated to meet the loads connected on both the bus sections of switchgear with 20% design margin on total load of Transformer.	Bidder proposes 10% design margin for the LT transformers in-line with general LT transformer design practice. The 10% margin is being followed for the various EPC projects. This also limits the transformer sizing to be within commercially available size. Owner may kindly review and confirm.	Tender terms & conditions prevail.
18	Vol-III Part-B Section-1 / Electrical Technical Specification	10.00.00 ESP ELECTRICAL EQUIPMENT	259	10.03.06	ix) Additional One no OWS and EWS shall be provided for each ESP control room with 132 column dot matrix printer and One no A4 Laser printer along with modular furniture.	Dot matrix printers are out-dated. Hence bidder proposes that only the A4 laser printer shall be provided. Owner may review and confirm.	Noted. Instead of dot matrix printer, A3 size Laser printer shall be considered.

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Sr. No.	Section No. / Section Title	Sub Section No. / Sub Section Title	Page No.	Clause No.	Bid Specification	Bidder's Query	Pre-bid Resolution
19	Vol-III Part-B Section-1 / Electrical Technical Specification	11.00.00 415 SWITCHGEARS AND DC BOARDS	268	11.03.02	POWER-CUM-MOTOR CONTROL CENTER (PMCC), shall mean a continuous line-up of vertical sections housing breaker panels, MCCBs, and contactor-operated modules in single front construction.	Bidder proposes double front panels for the LT PMCC. The various incomer, bus coupler, outgoing breaker feeders etc. shall be single front. However, the other MCCB, contactor operated modules are proposed to be double front. Kindly note that providing single front for all the feeders will make the LT panels very long and difficult to size the MCC room. This is based on standard practice being followed for the various EPC projects Owner may kindly review and confirm.	Noted.
20	Vol-III Part-B Section-1 / Electrical Technical Specification	14.00.00 AC & DC MOTORS	326	14.04.01	iii) All LT motors rated 0.37 kW and higher with S1 duty (at 50 deg.C ambient temperature), shall be of Premium Efficiency class –IE3,conforming to IS 12615.	The ESP geared rapping motor is fractional horse power drive and is operated intermittently for ESP application. Since the ESP rapping motor operation is intermittent, IE3 motors are not provided. Instead IE2 rated motors are provided. This is in-line with other projects also. Owner may kindly review and confirm	Tender terms & conditions prevail.
21	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	382	17.03.06	xx) All control cables shall be 2.5 mm² copper cables.	Bidder proposes 1.5 sq.mm size for control cable (copper) . This is is being followed for various power utilities. Owner may review and confirm.	Tender terms & conditions prevail.
22	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	405	17.15.01	All multicore cables shall be laid in touching formation. LT power cables above 95 sq.mm size shall be laid in single layer touching formation in trays while cables up to & including 95 sq.mm shall be laid in maximum of 2 layers.	For ESP related cables, bidder proposes 2 layers for the power cables. This is required to meet the routing requirements of the ESP cables, especially at control room cable exits, along the ESP and at ESP roof top. This is based on standard practice being followed for the various EPC projects. Owner may kindly review and confirm	Tender terms & conditions prevail.
23	Vol-III Part-B Section-1 / Electrical Technical Specification	18.00.00 EMERGENCY DIESEL GENERATOR SETS	413	18.01.01	three Nos. of adequately rated SKID mounted Diesel Generator Set located in a separate building.	Bidder understands that two os DG Set of minimum 2000 KVA and two nos DG Set of minimum 750 KVA are required for Main plant and FGD plant respectively.	Bidder understanding is correct.

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BID CLARIFICATION- ELECTRICAL

Sr. No.	Section No. / Section Title	Sub Section No. / Sub Section Title	Page No.	Clause No.	Bid Specification	Bidder's Query	Pre-bid Resolution
24	Vol-III Part-B Section-1 / Electrical Technical Specification	18.00.00 EMERGENCY DIESEL GENERATOR SETS	415	18.04.01	The Emergency DG set shall be connected to 415V Isolation Panel which in turn shall be connected to 415V Emergency MCC for safe shutdown of the power plant.	We propose to offer DG AMF panel with isolation breaker.	Tender terms & conditions prevail.
25	Vol-III Part-B Section-1 / Electrical Technical Specification	18.00.00 EMERGENCY DIESEL GENERATOR SETS	418	18.05.02	The capacity of Common bulk oil Tank shall be of minimum rated for 8 hours (at rated capacity) consumption of all the three DG set at a time,	Bidder proposes to provide two nos 990 litres fuel day tank for each DG set .So, Kindly consider deleting requirement of common bulk oil tank.	Noted.
26	Vol-III Part-B Section-1 / Electrical Technical Specification	18.00.00 EMERGENCY DIESEL GENERATOR SETS	422	18.05.07	DG Set shall be located inside acoustic enclosure and suitable for outdoor duty.	As per clause 18.04.08- " The DG set will be installed indoor in DG Building. All equipments and accessories shall be provided with tropical finish to prevent fungus growth" Please clarify whether DG to be located outdoor or inside a building.	The DG with acoustic enclosure shall be installed inside a building with all auxiliaries.
27	Vol-III Part-B Section-1 / Electrical Technical Specification	18.00.00 EMERGENCY DIESEL GENERATOR SETS	426	18.05.10	DG sets rated 1000 kVA and above shall be connected through non segregated phase Busduct to the respective AMF panel. Busduct entry shall be from the top.	Noted. Bidder understands that DG AMF panel and EMCC shall be connected through power cables.	Tender terms & conditions prevail.
28	Vol-III Part-B Section-1 / Electrical Technical Specification	18.00.00 EMERGENCY DIESEL GENERATOR SETS	428	18.05.14	All relays shall be of multifunctional numerical communicable type. e) Under voltage relay with timer f) Over voltage relay with timer g) Reverse Power relay h) Voltage controlled inverse time over current relay i) Inverse time earth fault relay j) Differential Protection k) Restricted earth Fault protection l) Voltage sensing relay to sense voltage developed is correct so that breakers are permitted to close. Having reset ratio better than 0.95 m) Under / over frequency relay, with built-in-timers n) Frequency sensing relay to check that the frequency of the DG Sets is O.K. enabling the breakers to close.	We shall offer single numerical multifunction relay which shall have all the protections listed in the specifications.	Noted. Single numerical multifunction relay for each DG Set to be considered. However, if any protection is not covered in single multifunctional numerical relay, separate relay shall be considered.

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Sr. No.	Section No. / Section Title	Sub Section No. / Sub Section Title	Page No.	Clause No.	Bid Specification	Bidder's Query	Pre-bid Resolution
29	Vol-III Part-B Section-1 / Electrical Technical Specification	18.00.00 EMERGENCY DIESEL GENERATOR SETS	431	18.05.15	Constructional Features	Constructional features of engine shall be as per manufacturers design. DG shall be sourced from GSECL approved sources only.	Noted for approved vendor list , Tender terms & conditions prevail for construction features.
30	Vol-III Part-B Section-1 / Electrical Technical Specification	18.00.00 EMERGENCY DIESEL GENERATOR SETS	433	18.05.18	The acoustic enclosure shall provided at 800mm distance from the DG set. It shall be fabricated from 2.0mm thick CRCA sheet with ISMC(hot dip galvanised) frame of suitable size.	Acoustic shall be fabricated from 1.6 mm/ 2mm CRCA sheets as per manufacturers design.	Tender terms & conditions prevail.
31	Vol-III Part-B Section-1 / Electrical Technical Specification	18.00.00 EMERGENCY DIESEL GENERATOR SETS	435	18.07.00	The bidder shall indicate tests (as per ISO 3046-1986/BS 5514-1984/any other standard procedures acceptable/mutual procedure acceptable to both the owner and bidder) recommended to be carried out at site during installation and commissioning to ensure satisfactory performance of all the equipment supplied. These tests shall be carried out by the bidder in case order is placed on 6 Hours at maximum load, continuous running at low load to be performed in addition to the following test at site:- i) Fuel Consumption. ii) Lube oil Consumption iii) Generator Efficiency iv) Full Load test v) All the type test as mentioned above in factory test	Kindly note that type tests cannot be repeated at site. Further Type test report of engine and alternator not older than 10 years from the bid opening date of this tender shall be submitted to GSECL during detailed engg.	Noted for not repeating type test at site. But the type test shall be carried out as per tender Cl.18.06.01.
32	Vol-III Part-B Section-1 / Electrical Technical Specification	18.00.00 EMERGENCY DIESEL GENERATOR SETS	436	18.08.00	Combined Load test of D.G. set along with AMF panel up to full load at 0.8 p.f. and for a combined load of D.G. Set at low load for 8 hrs. continuous run.	Please note that load test shall be done as per available plant load only.	Noted. However maximum available load shall be arranged by bidder for loading of the DG set for tests at site.
33	Vol-III Part-B Section-1 / Electrical Technical Specification	18.00.00 EMERGENCY DIESEL GENERATOR SETS	437	18.11.00	vii) Testing & Commissioning DG set Following tests will be conducted at site: a) Full load test will be conducted for 12 hours continuously including one hour overloading (with 10% overload per day and for a period of three days (totally 36 hours of load test) by directly loading the DG set.	Load test has already been defined at clause 18.07.00 . Hence we request to delete this clause from tender.	18.11.00 Vii(a) Full load test shall be conducted for 12 hours continuously including one hour overloading (with 10% overload) by directly loading the DG set at factory during FAT.

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Sr. No.	Section No. / Section Title	Sub Section No. / Sub Section Title	Page No.	Clause No.	Bid Specification	Bidder's Query	Pre-bid Resolution
34	Vol-III Part-B Section-1 / Electrical Technical Specification	18.00.00 EMERGENCY DIESEL GENERATOR SETS	437	18.11.00	xi) Guarantees a) The following performance parameters of the plant will be indicated and guaranteed by the Contractor. Values indicated for 100 % load(item no. i, ii, iii, iv and v) are to be demonstrated at site:- • Power output of diesel generator set at the generator terminals, kW. • Auxiliary power consumption (for fuel oil, lubricating oil, jacket cooling, etc.), kW, in case of separate motor driven pumps. • Heat rate, kCal / kWh • Heat rate tolerance, % • Net calorific value of the fuel used to calculate above heat rate, kCal / kg.	Please note PG test at site shall be done at maximum available load on EMCC.Further , Heat rate , Heat rate tolerance and net calorific value of fuel cannot be demonstrated at site.	Commissioning PG tests at site shall be performed arranging maximum available load on EMCC plus available loading rheostats if any.
35	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	7	1.04.14	The voltage level for motors shall be as follows: a) Up to 0.2 KW : Single phase 240V AC / 3 phase 415V AC b) Above 0.2 KW and up to 160 KW : 3 phase, 415V AC c) Above 160 KW and up to 1500 KW : 3 phase, 6.6 kV & 3.3KV AC d) Above 1500 KW : 11 kV For CHP system motors, 6.6kV voltage ratings shall be considered.	For CHP System motors, 3.3kV voltage ratings are applicable, which is general standard practice.	Tender terms & conditions prevail.
36	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	12	1.09.06	Maximum continuous motor ratings shall be at least 15% above design duty point or the maximum load demand of the driven equipment under entire operating range taking into account voltage and frequency variation.	Maximum continuous motor ratings shall be at least **10%** above design duty point or the maximum load demand of the driven equipment under entire operating range taking into account voltage and frequency variation, which is general standard practice.	Noted However if the margin is specified over and above 10% in any of the motors under mechanical equipment specification, then higher the margin shall be followed.
37	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	26	1.22.03	Each switchgear/MCC/distribution board shall be fed by 2x100% transformers/feeders and these shall be rated to carry the maximum load expected to be imposed.	Each switchgear/MCC/distribution board shall be fed by **2x100% / 3x50%** transformers/feeders and these shall be rated to carry the maximum load expected to be imposed.	Tender terms & conditions prevail.

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Sr. No.	Section No. / Section Title	Sub Section No. / Sub Section Title	Page No.	Clause No.	Bid Specification	Bidder's Query	Pre-bid Resolution
38	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	33	1.27.07	Maximum continuous motor ratings shall be at least 15% above design duty point or the maximum load demand of the driven equipment under entire operating range taking into account voltage and frequency variation.	Maximum continuous motor ratings shall be at least **10%** above design duty point or the maximum load demand of the driven equipment under entire operating range taking into account voltage and frequency variation., which is general standard practice.	Noted However if the margin is specified over and above 10% in any of the motors under mechanical equipment specification, then higher the margin shall be followed.
39	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	43	1.36.03 (iii)	The minimum design vertical spacing for trays shall be 300 mm measured from the bottom of the upper tray to the top of the lower tray. At least a 250 mm clearance shall be maintained between the top of a tray and beams, piping, or other obstacles to facilitate installation of cables in the tray. A working space of not less than 600 mm shall be maintained on at least one side of each tray. Tray covers shall be provided on the top most tray of each tier of cable trays	Tray covers shall be provided on the top most tray of each tier of cable trays only if horizontal formation is provided.	Tray cover shall be provided on top most tray of each tier of cable trays in horizontal formation. Rest of the conditions prevails. However, tray cover on outer most tray in vertical formation up to @ 2 mtr. shall be provided where there is chance of cable damage on account of hitting by an object.
40	Vol-III Part-B Section-1 / Electrical Technical Specification	11.00.00 415 SWITCHGEARS AND DC BOARDS	305	Annexure-1 (IMC)	Each motor/heater feeder shall consist of MPCB/MCCB (with S/C release only), Power contactor & intelligent motor controller (IMC) to ensure Type-2 Co-ordination.	IMC is not considered for Local Control panels like Scoop coupling panel, All the local panels for Electro mechanical application like Sump Pump, MD, SM, Coal/Lime sampling unit, DE/DSS LCP, Travelling tripper etc. Kindly confirm. PMCC/MCC located in switchgear room will be pro-vided with IMC(Intelligent Motor controller)	Bidder to follow IMC for all drives as specified in tender Cl.11.06.05, xv.
41	Vol-III Part-B Section-1 / Electrical Technical Specification	23.00.00 ILLUMINATION SYSTEM	523	Illumination levels	Avg lux level of 50 with Industrial type LED Luminaire for Cable galleries/vault	Bidder understands that for overhead cable rack, Pipe cum cable rack illumination is not applicable.	Illumination applicable for complete plant. However for pipe rack cum cable racks illumination shall be covered under nearby outdoor illumination system.
42	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	382	17.03.06 xxv)	Motor rating Cable size (i) 0-5.5kW 3C-2.5/4/6/10 mm² Cu as per voltage drop (ii) 5.6-11kW 3C-16 mm² Al (iii) 11.1-22kW 3C-35 mm² Al (iv) 22.1-45kW 3C-95 mm² Al (v) 45.1-75kW 3C-185 mm² Al (vi) 75.1-below 90kW 2x3C-185 mm² Al	Bidder understands that the final cable size shall be decided as per voltage drop calculation.	Final cable size shall be as per the cable sizing criteria and laying conditions as per relevant standard. However, cable size as shown in the specification shall be considered as minimum.

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43	Vol-III Part-B Section-1 / Electrical Technical Specification	3.00.00 POWER TRANSFORMER	98	3.03.01 (Vii)	Permissible maximum losses for Generator Transformer, shall be as per Annexure-A of CEA standard specification.	It may be kindly noted that as per Annexure –A- of CEA standard specification , maximum loss is not indicated for 325 MVA GT. Kindly Clarify.	Annexure - A of CEA specifies losses for 315 MVA. Accordingly bidder shall propose the losses for 325MVA transformer.
44	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS - ELECTRICAL 3.00.00 POWER TRANSFORMER	20 116	1.15.00 3.04.24	Bushings up to 52 kV shall be Epoxy RIP type and above 52 kV shall be Epoxy RIS type. No oil cooled bushings shall be used LV Bushing palm shall be Silver / Tin plated.	Please note that Bushing above 52 kV Shall be RIP/RIS type and below 52 kV Shall be Oil communication type Porcelain bushing for Generator Transformer & Station Transformer. This is standard practice followed for various customers including NTPC, POWERGRID etc. We recommend: For GT : HV- RIP/RIS Neutral & LV : Oil communication type Porcelain bushing FOR ST HV- RIP/RIS Neutral(HVN & LVN) & LV : Oil communication type Porcelain bushing Customer to kindly review the same and confirm.	In GT and ST - HV Bushing Shall be RIP/RIS type. Neutral and LV bushing shall be RIP/Oil communication type Porcelain bushing.
45	Vol-III Part-B Section-1 / Electrical Technical Specification	3.00.00 POWER TRANSFORMER	118	3.04.31 (v)	All supporting structures and hardware shall be hot dip galvanized.	Please note that all hardware shall be hot dipped galvanized, however supporting structure e.g. A-frame etc. are of very large size and facility for hot dip galvanizing for such a large size structure is not available. Hence the supporting structure shall be painted with anti-corrosion paint instead of hot dipped galvanizing. Detailed painting scheme shall be submitted for approval during detail engineering. This is standard practice followed for various customers including NTPC, POWERGRID etc.	Noted for A-frame and large size supporting structure. Rest shall be as per tender terms & conditions.

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46	Vol-III Part-B Section-1 / Electrical Technical Specification	3.00.00 POWER TRANSFORMER		3.15.02 (viii)	Short circuit test	As per Technical Specification. Short Circuit test to be conducted on Generator transformer & Station Transformer. We request Customer may please review their requirement and exclude this test because of following reasons: I) SC test is a special test and very costly and time consuming also. Transformer will be sent for short circuit testing to a laboratory which will require approx. 6 months, therefore total delivery time should be extended by approx. 6 months for performing short circuit test. II) BHEL has excellent record of short circuit testing for various rating of Power transformers. III) BHEL had already conducted and successfully passed Short circuit test on similar design of 315 MVA, 27/420/√3 kV,1-phase Generator transformer and 144 MVA, 400/11.5-11.5, 3-phase Station transformer NHPTL Bina. Our design and facilities has well proven for Short circuit testing. The offered design of Generator Transformer and Station Transformer are similar design to Short Circuit tested GT & ST in respect to IEC 60076 – Part 5 criteria. Short Circuit Test report for the above mentioned Generator transformer and Station Transformer shall be furnished to customer for review and no Short Circuit Test shall be conducted.	SC Test Report of similar transformer as per latest CEA guideline and its amendments from time to time along with validity criteria shall be submitted for approval.
47	Vol-III Part-B Section-1 / Electrical Technical Specification	3.00.00 POWER TRANSFORMER	131	Datasheet Generator Transformer	Datasheet Generator Transformer Rated power : 3X325 MVA Rated voltage ratio (line to line) : 420/√3 kV/* (* denotes rated generator voltage) Short-circuit impedance at 75ºC at principal tap : 15% (max) on 275 MVA base without positive tolerance	Kindly furnish the final MVA, Voltage , Impedance at rated MVA , tapping etc. for both GT & ST.	GT: 325MVA , 420/√3 kV/* (* denotes rated generator voltage), 20% , (+) 5 to (-) 5 per cent, in steps of 2.5 per cent . ST - 150/75/75 MVA , 400/11.5/11.5KV , 25% , (+) 10 to ( ) 10 per cent, in steps of 1.25 per cent . The specified impedance values are of tentative and minimum requirement and shall be subject to approval of transformer sizing and power system studies

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48	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS - ELECTRICAL	23	1.20.07	The Switchgear shall have an Internal Arc Classification of IAC FLR 50kA 1 sec.	We request GSECL to have STC for 11kV & 3.3kV as 50kA and 40kA respectively. Regarding the Internal Arc test, given its high energy & destructive testing method, we request GSECL to consider 40kA rating for 1s only as AFLR, aligning with prevailing industry standards	Refer System Particulars 1.05.00 page 10 for STC. For Internal Arc withstand test refer 8.08.02 (iii) page 233
49	Vol-III Part-B Section-1 / Electrical Technical Specification	8.00.00 11KV & 6.6/3.3 KV SWITCHGEAR	202	8.04.01 (III)			
50	Vol-III Part-B Section-1 / Electrical Technical Specification	4.00.00 IPBD, NGT, LASCPT	141	4.03.01	IPBD shall be rated for short circuit duration of 3 seconds.	During short circuit, bus duct shall be under stress for a very short time, i.e., for micro seconds. Rest of the time only temperature will rise. Hence, rated short time current duration shall be 1 sec instead of 3 sec. Also, due to high impedance of Busduct, it is not possible to test Busduct for Short Circuit duration of 3 seconds.	Tender terms & conditions prevails for designing the short circuit withstand duration of 3 secs. However testing of Busduct short circuit withstand duration shall be as per standards/accredited NABL lab.
51	Vol-III Part-B Section-1 / Electrical Technical Specification	4.00.00 IPBD, NGT, LASCPT	146	4.04.04 (b)	The Bus Conductor shall be of high conductivity, painted aluminium alloy as per IS: 5082, IS:5032 supported on wet process porcelain insulators.	The Bus Conductor will be mounted on cast resin insulator as per Clause No. 4.04.05 (a).	Shall be as per tender Cl. 04.04.05,a)
52	Vol-III Part-B Section-1 / Electrical Technical Specification	4.00.00 IPBD, NGT, LASCPT	146	4.04.05 (c)	The Conductor shall be fastened on the set of 3 insulators, 120° apart.	The conductor shall be fastened on the set of 3 insulators, 90° apart, inline with BHEL's type tested design.	Noted.
53	Vol-III Part-B Section-1 / Electrical Technical Specification	4.00.00 IPBD, NGT, LASCPT	150	4.04.12 (ii)	The bidder shall guarantee and demonstrate at site the air leakage rate of not more than 5% of total enclosure volume per hour after installation.	Busduct is designed as per IS:8084. Air leakage rate shall be as per IS: 8084 Appendix-F Clause 4.2 (i.e. 50% pressure drop in 15 sec).	Tender terms & conditions prevail.

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54	Vol-III Part-B Section-1 / Electrical Technical Specification	4.00.00 IPBD, NGT, LASCPT 7.00.00 6.6 KV & 11KV SEGREGATED PHASE BUS-DUCTS 12.00.00 NON SEGREATED PHASE BUSDUCT	154 193 315	4.05.01 (IPBD) 7.07.02 (SPBD) 12.17.03 (NSPBD)	TYPE TESTS - if the Bidder is not able to submit report of the type test(s) which are not listed below and are not conducted within last five years from the date of bid opening.	As per "Guidelines for the Type Tests for major equipment of Power sector" issued by CEA vide OFFICE MEMORANDUM No. 10/3/HE&TD/2021 Dtd. 01.10.2021, ANNEXURE-III, Equipment S. No. 21 (IPBD), 22 (SPBD), 23 (NSPBD) periodicity of type test is given as 10 years. Same shall be accepted.	Tender terms & conditions prevail.
55	Vol-III Part-B Section-1 / Electrical Technical Specification	4.00.00 IPBD, NGT, LASCPT	156	Generator Busduct Datasheet 1 (e	Bus support insulator / Min.Creapage distance / 31mm/kV	As per IS:2099 Clause 7.1 (c), Creepage distance for heavily polluted atmosphere is 25mm/kV. Also, Insulators are mounted inside sealed Enclosure. Creepage distance as 25mm/kV is sufficient. Same type of insulators were provided in projects i.e. 5x800MW MUNDRA TPS, 2x800MW YERAMARUS TPS, 1x800MW KOTHAGUDEM TPS, 1x800MW WANAKBORI etc. and running successfully.	Tender terms & conditions prevail.
56	Vol-III Part-B Section-1 / Electrical Technical Specification	7.00.00 6.6 KV & 11KV SEGREGATED PHASE BUS-DUCTS	188	7.04.01 (i)	Busbar of bus ducts shall be of high tensile strength electrolytic aluminium alloy having Grade at least 63401 as per IS, supported on wet process porcelain insulators.	The Bus Conductor will be mounted on cast resin insulator as per Clause No. 7.04.07 (ii).	Noted.
57	Vol-III Part-B Section-1 / Electrical Technical Specification	7.00.00 6.6 KV & 11KV SEGREGATED PHASE BUS-DUCTS	189	7.04.01 (ii)	All joints shall be at least 10 microns thick silver plated for low contact resistance.	As per standard practice of BHEL and all the successfully running projects, Plain type conductors are used and suitable for Segregated Phase Busduct. No. of bolted joints will be very high and it will increase the cost of Busduct significantly.	Tender terms & conditions prevail.

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58	Vol-III Part-B Section-1 / Electrical Technical Specification	7.00.00 6.6 KV & 11KV SEGREGATED PHASE BUS-DUCTS	189	7.04.02 (i)	The standard shipping section length shall not be more than 3 meters.	Standard shipping length of Busduct will be 3720mm.	Noted.
59	Vol-III Part-B Section-1 / Electrical Technical Specification	7.00.00 6.6 KV & 11KV SEGREGATED PHASE BUS-DUCTS	197	Datasheet-SPBD 3.4 (a)	Bus Conductor - 35 °C	As per IS:8084 Table-2, max. temperature rise for plain bolted joints are 50°C (over ambient of 40°C). Total temperature is 90°C. Hence, if ambient is considered as 50°C, max. temperature rise allowed shall be 40°C for plain bolted joints.	Noted
60	Vol-III Part-B Section-1 / Electrical Technical Specification	7.00.00 6.6 KV & 11KV SEGREGATED PHASE BUS-DUCTS	197	Datasheet-SPBD 7.0 (a)	Enclosure - Degree of protection - IP 54 (indoor)/IP 55 (outdoor)	Degree of protection test can be carried out as per Appendix 'F' of IS: 8084.	Tender terms & conditions prevail.
61	Vol-III Part-B Section-1 / Electrical Technical Specification	12.00.00 NON SEGREATED PHASE BUSDUCT	310	12.05.01	enclosure shall be of aluminium and for bus rating below 2000A, enclosure shall be of sheet steel fabricated type.	Enclosure will be of Aluminium for bus rating below 2000A and above 2000A also.	Tender terms & conditions prevail.
62	Vol-III Part-B Section-1 / Electrical Technical Specification	12.00.00 NON SEGREATED PHASE BUSDUCT	311	12.05.02	Circumferential neoprene rubber gaskets shall be provided for dust tight joints with adjacent enclosure section.	Cross-section of Neoprene Rubber Gasket shall be rectangular type.	Tender terms & conditions prevail.
63	Vol-III Part-B Section-1 / Electrical Technical Specification	12.00.00 NON SEGREATED PHASE BUSDUCT	312	12.08.01 12.08.05	Bus support insulators shall be interchangeable, high creep, high strength, wet process, fine glazed porcelain. Alternatively good quality cast resin insulators may be offered. Material shall be Epoxy SMC moulded /FRP/porcelain.	The bus conductor supporting insulators shall be FRP (i.e. SRBGF, GRADE UP2, IS: 10192 / IS: 2824).	Tender terms & conditions prevail.

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64	Vol-II Section-2 / Lead Technical Specification	2.00.00 BROAD SCOPE OF SUPPLY AND SERVICES	56	2.16.15.xl)	Roof top Solar system of adequate capacity shall be installed at various buildings of plant and connected to nearby 415V MCC.	No technical document related to solar package is found. Please share the same, after receipt of which, pre-bid queries will be raised.	Rooftop solar system is withdrawn from the scope. However, in Building structural design load margin for setting up 40 KW and above feasible capacity of solar roof top installation shall be considered. Also, necessary provision of 415V module for solar roof top power feeder with all required components & with space for net metering in any of the LT switchgear on each building shall be made.
65	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS - ELECTRICAL	2	1.02.01.iii)	Metering & Protection SLDs – Generator, GTs, UTs, Station transformers, UATs, 11kV & 6.6kV, 3.3kV Switchgears, 400kV switchyard, Roof Top Solar PV plants at Buildings etc.	No technical document related to solar package is found. Please share the same, after receipt of which, pre-bid queries will be raised.	
66	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS - ELECTRICAL	3	1.02.02.xv)	Roof Top Solar PV Plants at Buildings	No technical document related to solar package is found. Please share the same, after receipt of which, pre-bid queries will be raised.	
67	Vol-III Part-B Section-1 / Electrical Technical Specification	3.00.00 POWER TRANSFORMER	134-136	3.18.00	Data Sheet UNIT TRANSFORMER	Confirmation of HV KV Class	Tender terms and condition prevails.
						Confirmation on RIP/RIS Bushing for 36 KV /17.5 KV	For transformer bushings rated 52kV and above shall be RIP/RIS type. For transformer bushing rated below 52kV shall be RIP/Oil communication type porcelain bushing.
						System Fault Level at HV side to be confirmed	Tender terms and condition prevails.
						Confirmation on Losses	Tender terms and condition prevails.
						Impedance provided on 70 MVA base (rating-75 MVA)	Tender terms and condition prevails. The impedance shall be selected for 75MVA as base, the rating of the transformer..
						CT Details to be confirmed	Tender terms and condition prevails.

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68	Vol-III Part-B Section-1 / Electrical Technical Specification	5.00.00 AUXILIARY POWER & SERVICE TRANSFORMERS	176-178	5.17.00	Data Sheet AUXILIARY POWER & SERVICE TRANSFORMERS	Confirmation on Rated Power	Tender terms and condition prevails.
						Confirmation of KV Class	Tender terms and condition prevails.
						Confirmation on Impedance	Tender terms and condition prevails.
						Confirmation on Losses	Tender terms and condition prevails.
						Confirmation on Type of Terminations	Tender terms and condition prevails.
						Confirmation on any special requirement wrt.Transformer	Tender terms and condition prevails.
						Confirmation on Current Density	Tender terms and condition prevails.
69	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	20	1.15.00	GENERATOR TRANSFORMER (GT) …….....If gantry near GT is proposed, then the 400kV conductor from gantry to transformer bushing shall be of continuous run with required rating. If required, SF6 bus ducts shall be terminated at HV side of GT and connected to the GIS enclosure of GT bay.	Owner is requested to freeze the type of EHV connection of Generator Transformer as well as Station transformer, since the SF6 to Oil and SF6 to Air Terminal connection have differential cost.	EHV connection of Generator Transformer as well as Station transformer and Lines shall be through SF6 to Air Bushings only.
70	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	26	1.22.02	SERVICE TRANSFORMER Power at 11000V level shall be transformed to 415V level through 11/0.433kV transformers at various load centres to cater to the L.T. loads of plants and systems at and near the respective load centres.	Bidder understand service transformer is dry type for 400kV GIS auxiliary power requirement. Kindly Confirm.	Bidder understanding is correct.
71	Vol-III Part-B Section-1 / Electrical Technical Specification	29.00.00 400KV GAS INSULATED SWITCHGEAR	587	29.02.01(i)	The inter-connecting 400kV transmission lines between 400kV GIS & 400kV extension bays of existing Air insulated Switchgear (AIS) (including bus bar extension) shall also be considered under this EPC specification Scope.	Bidder understand that The Interconnection between 400kV AIS and GIS is overhead type connection and there is sufficient space available to form 400kV Interconnection for two circuits as per Tender . Kindly confirm	As per the layout it is feasible to interconnect through overhead ACSR conductor. However, Bidder shall propose the option of GIS or AIS for interconnection between existing and proposed switchyard based on the availability of space as ascertained during site visit by the Bidder. In case of GIS, Two Main Bus system shall be considered provided submission of undertaking from OEM's regarding non availability of two main bus plus transfer bus system in GIS. For AIS, the same shall be with Two Main and Transfer bus system as per existing system.

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72	Vol-III Part-B Section-1 / Electrical Technical Specification	29.00.00 400KV GAS INSULATED SWITCHGEAR	588	29.02.01(ii)	FOTE system for two no. line feeders for other end to be supplied as loose to avoid mismatch. Technical parameters of FOTE system at other end of each line will be identical to FOTE at Ukai end and following items shall be supplied as loose: • CVTs • Line matching unit • HF cable as required • FOTE panels • FOTE mounting hardwares • Any other materials / item as per requirement	Bidder understand that:- 1. FOTE and PLCC to be supplied for two Line Feeder associated to 400kV GIS only. 2. Remote end of two line feeders is same, hence establishment of one FOTE link is required only from power plant(Ukai) to remote end S/S. 3. Outdoor EHV equipment CVT and wave trap to be supplied for both ends, both feeders only . 4. PLCC system and FOTE system remote end equipments loose supply to be handed over to GSECL only. 5. Local end PLCC system and FOTE system installation is in bidders scope only ,however commissioning of both systems is not in scope bidder, because the commissioning can be done only after installation at both ends. Kindly confirm the above.	Tender terms and condition prevails. It is clarified that, identical FOTE & PLCC shall be supplied loose for the GETCO end.
73	Vol-III Part-B Section-1 / Electrical Technical Specification	29.00.00 400KV GAS INSULATED SWITCHGEAR	604	29.05.08	Voltage Transformer shall be inductive type with graded insulation and shall be effectively shielded against high frequency electro-magnetic transient. Special care shall be taken to prevent risk of Ferro resonance, if any, resulting due to interaction of capacities of the switchgears and reactance of the voltage transformers. VT shall be SF6 insulated.	GIS VT Not Shown in SLD drawing ETg106-EPC-EE-GN-SLF-001, Bidder understand that AIS CVT is to be provided only as per SLD. Kindly confirm	The tender SLD is only indicative and tentative. Please refer tender cl.29.00.00 , GIS for CT,VT,LA, isolator etc. required for the complete system shall be considered by the bidder.
74	Vol-III Part-B Section-1 / Electrical Technical Specification	29.00.00 400KV GAS INSULATED SWITCHGEAR	605	29.05.09	Outdoor Gapless, zinc-oxide lightning arrestor of suitable rating shall be provided at the overhead line entry terminals and at able entry terminals to GIS.	Bidder understand that outdoor type Surge arrester has been envisaged instead of Sf6 type. Kindly confirm.	Tender terms & condition prevails. Clause is self explanatory
75	Vol-III Part-B Section-1 / Electrical Technical Specification	29.00.00 400KV GAS INSULATED SWITCHGEAR	606	29.05.12	GIS will be installed on the floor over structure. The under-ground mat below the substation with adequate number of risers shall be done by the contractor. The contractor shall supply the ground rods, risers, electrode etc.	There is no specific requirement of copper earthing for GIS. Kindly confirm.	Tender terms & condition prevails.

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76					General	Space available for 400kV bay extension is seems to be not sufficient for 2 bays, Owner is requested to check requirement. Alternatives may be explored if required.	As per the layout it is feasible to interconnect through overhead ACSR conductor. However, Bidder shall propose the option of GIS or AIS for interconnection between existing and proposed switchyard based on the availability of space as ascertained during site visit by the Bidder. In case of GIS, Two Main Bus system shall be considered provided submission of undertaking from OEM's regarding non availability of two main bus plus transfer bus system in GIS. For AIS, the same shall be with Two Main and Transfer bus system as per existing system.
77					General	New identified area for 400kV GIS as per Tender Plot plant seems to have 400kV Line crossing over and 400kV towers located inside the Plot. Dismantling and Shifting of same is not scope of Bidder. Kindly confirm.	Shifting of two nos. transmission tower is not in the scope of bidder. Location of GIS, PS building and Bop's in plot plan is indicative. However, Bidder may make their own arrangement for complete project layout as per their own study and experience. Corridor for transmission line will be finalised based on the approved plot plan submitted by the successful bidder and hence outgoing gantry shall be decided by the successful bidder. If extension required to accommodate 2 nos. tie line bays equipments and panels same shall be in the scope of successful bidder with no extra cost.

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78	Vol-III Part-B Section-1 / Electrical Technical Specification	16.00.00 ELECTRICAL CONTROL & RELAY PANEL / ELECTRICAL CONTROL PANEL (ECP)	367	16.09.00	ENERGY METER	Bidder understand that:- 1. There is no requirement of Separate CT, CVT for metering purpose even for GETCO/ POWERGRID transmission Line. If there is any requirement for separate CT, CVT, supply of same will not be in scope of Bidder due to their specific requirement. Kindly confirm.	Tender terms & condition prevails. Please refer Cl.29.00.00 & its annexures for metering of 400KV GIS and lines.
79	Vol-III Part-B Section-1 / Electrical Technical Specification	14.00.00 AC & DC MOTORS	341	14.49.02 LT Motors	i) Routine Test All equipment shall be completely assembled, wired, adjusted and routine tested as per relevant IS/IEC Standards at manufacturer's works in the presence of consultant /purchaser or his representative.	In line with bidder's standard practice, Routine test certificates shall be furnished for review to reduce project execution time.	Tender terms & conditions prevails
80	Vol-V Annexure-3 MANDATORY SPARES LIST	MANDATORY SPARES LIST	27	23.5.4	Rapper controller complete- 1 No	Bidder provides ESP controller with inbuilt rapping control. Hence separate rapping controller is not applicable. Hence , same may be excluded.	Noted. However, complete controller with inbuilt rapper control, rectifier controller, cpu card etc. complete 10% spares of installed quantity shall be supplied as mandatory spares.
81	Vol-V Annexure-3 MANDATORY SPARES LIST	MANDATORY SPARES LIST	27	23.5.4	For Transformer Rectifier Controller - 2 sets	Bidder provides ESP controller with inbuilt rapping control. Hence separate rapping controller cards is not applicable. Hence , same may be excluded.	
82	Vol-V Annexure-3 MANDATORY SPARES LIST	MANDATORY SPARES LIST	27	23.5.10	Hopper Heater - 100 Nos	The tender Specification calls for panel type heating elements, which is provided as one complete set for a hopper. Hence customer may specify how many sets(each set pertains to one hopper) is to be provided as mandatory spares	10% set of installed set shall be supplied as mandatory spares.
83	Vol-V Annexure-3 MANDATORY SPARES LIST	MANDATORY SPARES LIST	27	23.5.30	CPU Card- 5 Nos	As per the latest ESP controllers being offered by bidder, separate card wont be applicable. Hence, entire ESP controller required to meet the tender requirement shall be supplied. Owner may kindly review and note the same	Noted. However, complete controller with inbuilt rapper control, rectifier controller, cpu card etc. complete 10% spares of installed quantity shall be supplied as mandatory spares.
				23.5.31	I/O Card - 5 nos. each type		
				23.5.32	Power Supply Card - 2 nos. each type		
84	Vol-V Annexure-3 MANDATORY SPARES LIST	MANDATORY SPARES LIST	27	23.5.34	Synchronous Programmer for Rapping System - 2 Nos	Bidder provides ESP controller with inbuilt rapping control. Hence separate synchronous programmer and its motor gear is not applicable. Hence , same may be excluded.	
				23.5.35	Motor-Gear Unit of Synchronous Programmer - 5 Nos		

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85	Vol-V Annexure-3 MANDATORY SPARES LIST	MANDATORY SPARES LIST	195	4.16.00 (2)	Ash level indicator for ESP - 10 Nos of each type and rating Opacity monitor - 2 Nos	Some of the mandatory spare items are repeated. Bidder proposes that in case an item is repeated, bidder shall provide under only one clause where the requirement is maximum . Owner may kindly review and confirm. OPM already covered at 14 (x) (page-187), Hopper ALI already covered at 23.5.15(page-27),	a) Ash level indicator for ESP - Bidder shall consider the clause no 4.16.00 (2) b) Opacity monitor - 2 Nos for ESP system.
86	Vol-V Annexure-3 MANDATORY SPARES LIST	MANDATORY SPARES LIST	27	23.5.3	Transformer-rectifier set intermitted range controller complete - 4 Nos	Some of the mandatory spare items are repeated. Bidder proposes that in case an item is repeated, bidder shall provide under only one clause where the requirement is maximum . Owner may kindly review and confirm. ESP controllers already covered at 23.5.26 (PAge-27)	Noted.
87	Vol-V Annexure-3 MANDATORY SPARES LIST	Sub Section No. 3.00.00 / ELECTRICAL	159	Clause No: 14.0 ELECTRICAL ACTUATORS WITH NON-INTEGRAL STARTERS	14.0 ELECTRICAL ACTUATORS WITH NON-INTEGRAL STARTERS (along with its Sub-clauses: 14.1 to 14.1.17)	Please note that ELECTRICAL ACTUATOR mandatory spares are mentioned under 2 sub-sections, i.e. under 3.00.00 ELECTRICAL & 4.00.00 CONTROL & INSTRUMENTATION of Mandatory Spares List (Doc no: ETG106-EPC-MSL). The clauses are : 14.0 ELECTRICAL ACTUATORS WITH NON-INTEGRAL STARTERS in Page 159. & 4.12.00 ELECTRICAL ACTUATORS in Page 192. For Electrical Actuators for Gates & Dampers, please inform under which of the above Clauses (14.0 OR 4.12.00) mandatory spares have to be considered.	All the mandatory spares for Electrical Actuator with Non integral starter shall be considered.
88	Vol-V Annexure-3 MANDATORY SPARES LIST	MANDATORY SPARES LIST	18	14.21	Motor Bearing	Motor bearings for APH Drive motor will be offered	Noted for 2 sets of bearing DE-NDE for APH drive motor

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89	Vol-III Part-B Section-1 / Electrical Technical Specification	11.00.00 415 SWITCHGEARS AND DC BOARDS	306	Annexure-1 (IMC)	Contractor shall provide complete list of data items available for cyclic and acyclic data communication on Profibus DP for DDCMIS interface and diagnostics	Communication protocol for Intelligent Motor Controller (IMC) shall be finalized during detailed engineering. As per standard practice, Profibus-DP, Profinet, Modbus-TCP, Ethernet/IP protocols shall be available for selection as per the DCS/PLC manufacturers.	Noted. IMC Communication protocol shall be as per the DCS/PLC communication protocols for this project.
90	Vol-III Part-B Section-1 / Electrical Technical Specification	11.00.00 415 SWITCHGEARS AND DC BOARDS	307	Annexure-1 (IMC)	Communication to DDCMIS: The IMC shall be interfaced with DDCMIS on Profibus DP protocol for complete remote operation and control along with detailed diagnostics	Communication protocol for Intelligent Motor Controller (IMC) shall be finalized during detailed engineering. As per standard practice, Profibus-DP, Profinet, Modbus-TCP, Ethernet/IP protocols shall be available for selection as per the DCS/PLC manufacturers.	
91	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	46	1.42.00	Variable speed drive system shall be provided as per the mechanical/ electrical system as well as other technological requirement shall be supplied by Bidder. VFD panels for these applications shall be located in Main Control Room/concerned area Control Room under air conditioned atmosphere.	For CHP and AHP wherever mechanical equipments are far away from the MCC rooms, it is standard practice to keep the VFD panel in the junction tower in a closed air conditioned chamber. This is a standard practice so that the outgoing cable length from VFD to motor can be minimized as per the standard practice used in VFDs	Noted for CHP-AHP remote location drives..
92	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	46	1.42.00	All HT & LT VFD's shall have Auto/manual bypass DOL starter facility, so that in case of any problem in VFD, the system shall run through DOL starter. In case where bypass starter is not possible, then spare/standby VFD shall be provided.	This shall be decided on case to case basis. If the VFDs are inside a field machine (Stacker cum reclaimer etc.) DOL bypass is not permitted. In this case a spare VFD panel shall not be provided inside the machine E-house since the space inside E-house shall be minimized for proper mechanical balance of the machine. In such cases only a spare VFD module shall be considered as spare and not the whole panel.	Noted for stacker reclaimer VFD
93	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	53	1.49.00	These type test reports should be for the test conducted on the equipment similar (kVA,kW, kV, kA, application) to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.	Type test shall be applicable for same type of equipment, in case of transformer type test shall be applicable for same voltage ration, similar impedance (with minor variations) and type of transformer (Dry type/ Oil type). However for minor changes in the KVA rating, type test need not be conducted again. Type test conducted for a higher KVA rating transformer shall be accepted for a lower rating transformer.	Type test of various equipments shall be governed by the clauses specified for individual equipments in respective chapters.
94	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	37	1.30.08	The minimum cable sizes in control cables shall be 2.5 sqmm copper conductor unless otherwise specifically warranted. However for CT circuits the minimum size shall be 4 sqmm. However higher size may be selected based on the burden calculations.	Control cable of 1.5 Sq.mm also shall be allowed wherever applicable. This shall be selected as per the current requirement and distance of cable during detailed engineering.	Tender terms & condition prevails.

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95	Vol-III Part-B Section-1 / Electrical Technical Specification	14.00.00 AC & DC MOTORS	340	14.49.00	For each type & rating of HV & MV motors the Bidder shall conduct all the type test as per relevant IEC and IS standards for all the proposed motors to be supplied under this contract and the test(s) should be conducted at an NABL accredited independent laboratory.	Type test shall be applicable for same type of equipment. In case of motor similar IE class, Frame size, Voltage shall be considered for type test. Type test report of a higher rated motor with same frame size shall be accepted for lower rating motors.	Noted.
96	GENERAL					Request customer to allow cable routing inside conveyor gallery for LHP-GHP areas due to space constraint and non hazardous areas.	Will be discussed and decided during detailed engineering.
97	Vol-II Section-2 / Lead Technical Specification	LEAD TECHNICAL SPECIFICATION	56	xxxix	For whole plant buildings, all panels and switchgears should be kept at 1st floor, above cable floor which will be at the ground level.	For main plant building Switchgears shall be kept at first floor and Ground floor as cable vault. For BOP area switchgear shall be kept at ground floor with cable trench	Specification called for saving of space. However, the same will be decided during detailed engineering taking into consideration of various aspects and constraints..
98	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	12	1.09.05	Control & Instrumentation cables shall be laid in perforated trays.	1.1 KV LT PVC control cable shall be laid in ladder trays and Screen control cable (instrument and control cable) shall be laid in perforated trays.	Noted
99	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	37	1.30.08	However for CT circuits the minimum size shall be 4 sqmm. However higher size may be selected based on the burden calculations.	However for CT circuits the minimum size shall be 2.5 sqmm. However higher size may be selected based on the burden calculations.as there are many CT;s like 51N, REF for small rating transformer 4 sqmm size is not required.	Tender terms & condition prevails.
100	Vol-III Part-B Section-1 / Electrical Technical Specification	21.00.00 FIRE SEALING SYSTEM	463 & 474	21.02..01& 21.05.00	shall be sealed with fire stops. Fire barriers and fire stops shall have a fire rating not less than 3 hours….& Fire Seal shall provide 2 Hrs. Fire Resistance.	Both clauses are different for time. Customer is requested to clarify and specify the Hours.	3 hours shall be considered as per CL. 21.02.01.
101	Vol-III Part-B Section-1 / Electrical Technical Specification	5.00.00 AUXILIARY POWER & SERVICE TRANSFORMERS	166	5.05.05 i)	Bushings of rating below 52 kV shall be RIP type.	Bushing up to 1.1kV shall be Epoxy resin or porcelain type. Bushing =>3.3kV & up to 12kV shall be porcelain type.	For transformer bushings rated 52kV and above shall be RIP/RIS type. For transformer bushing rated below 52kV shall be RIP/Oil communication type porcelain bushing.

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102	Vol-III Part-B Section-1 / Electrical Technical Specification	5.00.00 AUXILIARY POWER & SERVICE TRANSFORMERS	172	5.15.03 i) b	In addition, the following tests shall be performed on each transformer:- Frequency response analysis test	Frequency response analysis test shall not be applicable for up to 11kV & 10MVA transformers.	This test shall be applicable for all transformers Except for LT Aux. distribution transformer.
103	Vol-III Part-B Section-1 / Electrical Technical Specification	5.00.00 AUXILIARY POWER & SERVICE TRANSFORMERS	173	5.15.03 ii) a	Recurrence surge oscillograph Measurement.	Recurrence surge oscillograph Measurement test shall not be applicable for up to 11kV & 10MVA transformers.	This test shall be applicable for all transformers Except for LT Aux. distribution transformer.
104	Vol-III Part-B Section-1 / Electrical Technical Specification	5.00.00 AUXILIARY POWER & SERVICE TRANSFORMERS	173	5.15.03 iii) a	Power taken by cooling equipment No load harmonic measurement Zero sequence impedance measurement	Mentioned special test shall not be applicable for up to 11kV & 10MVA transformers.	This test shall be applicable for voltage rating higher than 11KV and 10 MVA rating transformers.
105	Vol-III Part-B Section-1 / Electrical Technical Specification	6.00.00 NEUTRAL GROUNDING RESISTORS	180	6.03.08	One end of the resistor shall be connected to neutral side of the Transformer through suitable cable box (copper cables to be used) and the other end shall be connected to earth pit through bushing and Galvanized steel busbar.	a) Generally, copper busbar/single core power aluminium cable(specification) is used. Please clarify regarding this.	Tender terms & condition prevails.
106	Vol-III Part-B Section-1 / Electrical Technical Specification	28.00.00 CHIMNEY AND NDCT ELECTRICAL WORKS	583	28.02.07	Cable schedule shall be as under, a) 4CX10 Sq.mm Copper cable for Aviation warning lights. b) 4CX6 Sq.mm Copper cable for Power receptacles, stair case lighting and tail end aviation warning lights etc. c) 2CX2.5 Sq.mm Copper cable for local	All cable shall be of copper conductor, please clarify	Clause is self explanatory . All cable are of copper cable is already mentioned in the spec.
107	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	43	1.36.03 iii)	The minimum design vertical spacing for trays shall be 300 mm measured from the bottom of the upper tray to the top of the lower tray.	We understand that the minimum design vertical spacing for trays shall be 300 mm measured from the bottom of the upper tray to the **bottom** of the lower tray.	Tender terms & condition prevails.

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108	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	43	1.36.03 iii)	Tray covers shall be provided on the top most tray of each tier of cable trays.	With reference to clause No. 17.10.02 i) (page No. 398, SECTION - 1 TECHNICAL SPECIFICATION ELECTRICAL, VOLUME - III, PART - B), Cable trays in areas subject to excessive coal dust, oil spillage, mechanical damage or accessible to personal contact shall be provided with raised sheet metal tray covers, installed on upper tray in horizontal run and front in vertical run	17.10.02 (i) shall be applicable for provision of cable tray covers.
109	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	49	1.44.01 xix)	Minimum clearance from top of Busduct to nearest obstruction shall be at least 1000mm.	We understand that minimum clearance from inspection window of the Busduct to nearest obstruction shall be at least 1000mm, as 1000mm clearance from the top of complete Busduct will lead to increased elevation of SWGR room.	Tender terms & condition prevails.
110	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	42	1.36.01	Cable tray covers shall be fabricated from 16 gauge (1.7 mm thick) MS sheets.	With reference to clause No. 17.10.01 iii) (page No. 398, SECTION - 1 TECHNICAL SPECIFICATION ELECTRICAL, VOLUME - III, PART - B), Tray covers shall be minimum 1.6 mm.	17.10.01 (iii) shall be applicable for thickness of cable tray cover.
111	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	399	17.10.03 iii)	Duct banks shall be **high density PE pipes** encased in PCC (10% spare of each size, subject to minimum one) with suitable water-proof manholes.	With reference to clause No. 17.15.05 (page No. 405, SECTION - 1 TECHNICAL SPECIFICATION ELECTRICAL, VOLUME - III, PART - B), Where cables cross roads/rail tracks, the cables shall be laid in **Hume pipe/PVC pipe**.	High density PE Pipe shall be used in Duct Banks. Where cables road crossing/rail tracks, the cables shall be laid in Hume pipe or High density PE pipes.
112	Vol-III Part-B Section-1 / Electrical Technical Specification	27.00.00 ELECTRICAL INSTALLATION	577	27.04.06 viii)	Separate cable trays shall be used for the following - HT Power - LT Power - Control - Instrumentation/communication cables - **Fire survival cables**	Cable erection philosophy: We understand that separate cable trays shall be used for the following - HT Power - LT Power/**LT Fire survival cables** - Control/ **Control Fire survival cables** - Instrumentation/communication cables	Noted

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113	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	43	1.37.06	This mat shall be buried at 600 mm depth below the ground and provided with ground electrodes at 6m intervals at the periphery of the grid.	**For BTG Area:** Ground electrode are generally provided to reduce the Step & Touch potential values where apparent soil resistivity (Ohm-m) decreases with the depth. Therefore horizontal ground conductor spacing & Ground electrode spacing are calculated as per Single line to ground fault (As per cl.no. 15.3 "Types of ground faults" of IEEE-Std 80-2000) analysis to bring Step & Touch potential Voltage in tolerable limit. Therefore ground electrodes shall be provided at periphery of the grid with the distance calculated as per fault study and spacing of 6m may not be required.	Noted.
114	Vol-III Part-B Section-1 / Electrical Technical Specification	24.00.00 EARTHING & LIGHTNING PROTECTION	531	24.03.04 (xii)	Earth mat Grid spacing of the conductors shall be such that the touch and step potential are within the limits of permissible values and shall be maximum 15 Mtrs.		
115	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	43	1.37.06	The length of the ground conductors below earth shall be sufficient to ensure a ground resistance of less than one (1) ohm measured at the driest season.	Please note that ensuring a ground resistance less than 0.5 (point five)) ohm for offsite area/ building requires large number of Ground electrode as ring system shall be followed for offsite areas which are far from Main plant area. As Ring ground conductor is further connected to Main plant ground grid through 2 interconnection for further safety. Therefore length of the ground conductors below earth shall be sufficient to ensure a ground resistance of less than one (1) ohm.	Less than 0.5 ohm resistance shall be considered for all the Main Plant areas where the step and touch potential is considered. And for other areas where peripheral earthing is considered, the same shall be less than 1 ohm. And overall plant shall be less than 1 ohm. For switch yard the same shall be less than 0.5 ohms.
116	Vol-III Part-B Section-1 / Electrical Technical Specification	24.00.00 EARTHING & LIGHTNING PROTECTION	530	24.03.04 (ii)	The ground grid conductors shall be buried in earth at a depth of 600 mm. The length of ground conductors below earth shall be sufficient to ensure a ground resistance less than 0.5 (point five)) ohm for each area/building.		
117	Vol-III Part-B Section-1 / Electrical Technical Specification	24.00.00 EARTHING & LIGHTNING PROTECTION	530	24.03.04 (i)	The ground grid mesh for entire plant area is designed to keep the touch and step voltages within safe limits as per recommendation of IEEE 80	**For BTG Area:** Fault current for the earthing system shall be designed for 63 kA for duration of 1 sec. Step & Touch potential tolerable limit shall be calculated for Single line to ground fault (As per cl.no. 15.3 "Types of ground faults" of IEEE-Std 80-2000). Also as per cl.no. 5.3 & 6.0 "Tolerable Body current limit" of IEEE-Std 80-2000, Duration of body current shall be 0.5 sec as per research done by Biegelmeier and Lee.	Tender terms & condition prevails. Fault current of 63 kA for 1 sec shall be considered.
118	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	44	1.37.08	For grounding of electronic equipment, a separate earthing system consisting of a number of deep driven treated earthing rods interconnected with insulated cables and insulated risers are to be installed. This system shall be totally isolated from the power equipment earthing mesh risers described above and shall be located underground vertically below the electronic equipment room	For grounding of electronic equipment, a separate earthing system is not required however above ground connection of electronic equipment shall be totally isolated from the above ground connection of electrical equipment to avoid fault current running in electronic circuit. However earthing rod shall be connected to earth mat below ground. Location shall be near TG Hall/Transformer Yard area (i.e. At nearest possible location of Control room).	Tender terms & condition prevails.

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119	VOLUME - V	ANNEXURE V			GEOTECHNICAL SURVEY REPORT *	Soil resistivity report is required for Step & touch potential values & design of grounding system.	Already provided. However, same is uploaded as an amendment - Annexure-6
120	Vol-III Part-B Section-1 / Electrical Technical Specification	31.00.00 GENERATOR CIRCUIT BREAKER	782	31.01.02	27kV, ***A, 160kA Generator Circuit Breaker (GCB) Assembly with air natural design:	GCB shall be either Natural Cooled or Forced Cooled. As restricting GCB to Natural Cooled result in single bidder. Therefore same is not acceptable & firm deviation, Customer is requested to accept the same.	GCB shall be Naturally cooled design. Bidder to quote accordingly.
121	Vol-III Part-B Section-1 / Electrical Technical Specification	31.00.00 GENERATOR CIRCUIT BREAKER	783	31.03.07	Circuit Breaker shall be either naturally cooled as defined in the annexure. For forced cooled Generator Circuit Breaker, emergency current rating during loss of cooling shall be established according to the IEEE Standard and incorporated in the design.		
122	Vol-III Part-B Section-1 / Electrical Technical Specification	31.00.00 GENERATOR CIRCUIT BREAKER	795	Annexure- A	9.0 Cooling Natural / Forced : Natural		
123	Vol-III Part-B Section-1 / Electrical Technical Specification	31.00.00 GENERATOR CIRCUIT BREAKER	782	31.01.02	One (1) set of Portable SF6 gas evacuating & filling equipment	SF6 gas evacuating equipment is not required as once SF6 Gas is filled, there is no such requirement of SF6 gas evacuation Only SF6 Gas filling equipment shall be provided.	Noted for gas filling equipment. Evacuating equipment is not required.
124	Vol-III Part-B Section-1 / Electrical Technical Specification	31.00.00 GENERATOR CIRCUIT BREAKER	791	31.04.16	A Portable SF6 gas filling and evacuating system shall be supplied with necessary gas valves, safety devices, gas purity monitoring devices, regulators, vacuum pump, pressure gauges/switches, hose pipes etc.		

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125	Vol-III Part-B Section-1 / Electrical Technical Specification	31.00.00 GENERATOR CIRCUIT BREAKER	782	31.01.02	One (1) set of Circuit Breaker operation analyzer.	Circuit Breaker operation analyzer shall be either portable offline analyzer or online monitoring device mounted in the GCB Control panel for measuring parameters as per specification requirement.	GSECL shall prefer online operation analyzer. However, as per OEM supply the same shall be decided DDE.
126	Vol-III Part-B Section-1 / Electrical Technical Specification	31.00.00 GENERATOR CIRCUIT BREAKER	791	31.04.16	iii) An Operational Analyzer shall be supplied to record contact travel, speed and for making measurement of operating		
127	Vol-III Part-B Section-1 / Electrical Technical Specification	31.00.00 GENERATOR CIRCUIT BREAKER	783	31.03.03	Frequency variation : ± 5%	GCB shall be capable of frequency variation + 3% & -5%	Noted
128	Vol-III Part-B Section-1 / Electrical Technical Specification	31.00.00 GENERATOR CIRCUIT BREAKER	783	31.03.09	The three single phase enclosures along with the Control box housing the operating mechanism, supervisory and control equipment shall be factory assembled on a common frame.	The three single phase enclosures housing the operating mechanism shall be factory assembled on a common frame. However Control panel & Auxiliary components shall not be assembled on a common frame. As it is restricting GCB bidders, hence same shall be as per manufacturer standard for control panel.	Control panel mounting shall be as per manufacturer standards.
129	Vol-III Part-B Section-1 / Electrical Technical Specification	31.00.00 GENERATOR CIRCUIT BREAKER	784	31.04.02	Each Generator circuit-breaker shall comprise of three (3) identical poles complete with auxiliary components housed in single phase enclosures, all fully assembled on a common frame with mechanical gang operated mechanism.		
130	Vol-III Part-B Section-1 / Electrical Technical Specification	31.00.00 GENERATOR CIRCUIT BREAKER	788	31.04.09	The Control cubicle shall be mounted on the C.B system supporting frame work		
131	Vol-III Part-B Section-1 / Electrical Technical Specification	31.00.00 GENERATOR CIRCUIT BREAKER	795	Annexure- A	6.1 Construction : 3 single phase enclosures assembled on common frame with control cubicle		

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132	Vol-III Part-B Section-1 / Electrical Technical Specification	31.00.00 GENERATOR CIRCUIT BREAKER	786	31.04.06 (i)	Circuit Breaker operating mechanism shall be pneumatically or hydraulically	Circuit Breaker operating mechanism shall be pneumatically / hydraulically / Spring operated.	Circuit breaker operating mechanism shall be spring operated with a bare minimum hydraulic as per OEM design.
133	Vol-III Part-B Section-1 / Electrical Technical Specification	31.00.00 GENERATOR CIRCUIT BREAKER	795	Annexure- A	2.0 Operating Mechanism : Hydraulic / Pneumatic, Stored energy, Gang operated		
134	Vol-III Part-B Section-1 / Electrical Technical Specification	31.00.00 GENERATOR CIRCUIT BREAKER	786	31.04.06 (iii)	Pole discrepancy feature shall be provided to trip the breaker out if all the poles do not close simultaneously within the stipulated time.	Pole discrepancy feature not required if all three poles are gang operated.	Tender terms & condition prevails. However the same shall be as per manufacturers standards.
135	Vol-III Part-B Section-1 / Electrical Technical Specification	31.00.00 GENERATOR CIRCUIT BREAKER	788	31.04.09 (v)	Potential free contacts shall be provided in the cubicle for the following remote annunciations and indications as a minimum ALARMS : - Pole discrepancy		
136	Vol-III Part-B Section-1 / Electrical Technical Specification	31.00.00 GENERATOR CIRCUIT BREAKER	788	31.04.09 (v)	Potential free contacts shall be provided in the cubicle for the following remote annunciations and indications as a minimum ALARMS : - Oil/ Air pressure low		
137	Vol-III Part-B Section-1 / Electrical Technical Specification	31.00.00 GENERATOR CIRCUIT BREAKER	793	31.06.02	Out of phase current calculation for 900 out of phase condition, according to IEEE Std. C37.013, on the basis of the generator and system.	Out of phase current calculation for 90 degree out of phase condition, according to IEEE Std. C37.013, on the basis of the generator and system.	Noted
138	Vol-V Annexure-3 MANDATORY SPARES LIST	ANNEXURE III	138	1.40 & 1.41	Electrical Mandatory Spares - Generator Circuit Breaker	Mandatory Spare list shall be as per S.No. 1.40 & 1.41 only. However If manufacturer has different components or complete assembly equivalent to required component, then same shall be supplied as Mandatory spare.	Prior Approval shall be seeked in those special cases and the same shall be as per approved GCB documents.

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139	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	378	17.01.00 e)	Copper cables to be used for all NGR/NGT.	a) Copper cables in power applications is procured for small cable sizes e.g. 2.5 /6 sq mm. Procuring small quantity of various large sizes of copper cable for NGT NGR purpose is difficult from operational point of view. Customer may please accept Aluminium cond. XLPE insulated cable for NGT NGR. b) If a) above is not acceptable to customer. It is proposed that Cable for NGT NGR shall be provided in non-standard drum lengths as per requirement	Cable for NGT NGR shall be provided in non-standard drum lengths shall be accepted.
140	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	382	17.03.06 xxi)	Multicore control cables will generally have spare conductor (s) in accordance with the following chart : 1 or 2 : 1-3/C (b) 3 or 4 : 1-5/C (c) 5 or 6 : 1-7/C (d) 7 or 8 : 1-9/C (e) 9 or 10 : 1-12/C (f) Above 10 : Two or more of above Cables	Spcificication requirement is not clear. We shall consider 20% spare cores as per 17.03.06 xxiv) except 2C,3C control cable. No. of cores no. of spares 1. 2C, 3C Nil 2. 5C 1 3. 7C,10C,12C 2	Noted
141	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	383	17.03.06 xxv)	For practical purposes, the minimum size chosen is as below: (a) Aluminium : 16 mm² (b) Copper : 2.5 mm² (c) Recommended cable sizes for various motor ratings Motor rating Cable size (i) 0-5.5kW 3C-2.5/4/6/10 mm² Cu as per voltage drop (ii) 5.6-11kW 3C-16 mm² Al (iii) 11.1-22kW 3C-35 mm² Al (iv) 22.1-45kW 3C-95 mm² Al (v) 45.1-75kW 3C-185 mm² Al (vi) 75.1-below 90kW 2x3C-185 mm² Al	i) 10 mm2 size may please be accepted with Aluminium conductor as per Industry standard practice. ii) In place of 3C-35 sq mm, 3C-25 sqmm and 3C-50 sq mm sizes (final size as per cable sizing criteria specified by customer) may please be allowed.	Final cable size shall be as per the cable sizing criteria and laying conditions as per relevant standard. However, cable size as shown in the specification shall be considered as minimum.
142	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	383 & 395	17.04.01 iii) & 17.08.00	17.04.01 iii)- 1100 Volt grade, control cables with.....Armour shall be GS. Cl. No. 17.08.00 1100 V grade, PVC Control cable conforming to following requirement and in line with IS-1554, IS-8130, IS-5831 & IS-3975	In both clauses there is difference in type of insulation , inner sheath and outer sheath. Please specify the final requirements fore LT Control cables.	Control Cables shall be with HRPVC Insulation, Inner & outer sheaths shall be FRLS Extruded HR PVC Type ST-1. All other parameters/specifications shall be as per specifications.

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143	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	385	17.04.02 vi) a)	Armour a) For Single core cables to be used in A.C system, the armouring over inner sheath shall consist of single layer of round copper wire..	Aluminium round wire armour may please be accepted for single Core FS cables , aluminium round wire in single core FS cable is sufficient. It may please be noted that in thermal power projects of various customers single core FS cable is generally provided with Aluminium armour.	Noted.
144	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	387	17.04.03 x)	Cables for the following systems shall be fire survival type. .. .. X) Incomer cables for DG board , emergency board, DC lighting board etc. ...	It is proposed to use Aluminium sandwich Busduct from DG to DG Board and DG board to Emergency board because of following advantages of Busduct over FS cable- i) Busduct is more economical ii) Low O & M cost iii) Aesthetically better than multiple runs of FS cable iv) No voltage drop limitations in Busduct	Noted. However, for DG to DG board and DG to Emergency Board connection if connection is through cable then tender terms and conditions shall prevail.
145	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	388	17.05.03 i)	Cable identification shall be provided by embossing on every meter on the outer sheath the following: ..... ISI Mark	As per Cl. No. 17.04.02 i) FS cables shall be generally manufactured in conformity to IS- 9968 Part-1/1988. Please note that all the requirements of Fire survival cables (e.g. Fire survival test along with special tests (Oxygen index, temperature index, Acid gas generation, smoke density test etc.) are not specified in this IS. therefore, cable vendors do not provide ISI marking in case of FS cables. In view of same, it is requested to waive off ISI marking requirement for Fire survival cables	Noted. However, the same shall be discussed during DE.
146	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	390	17.06.05 i)	Acceptance test : One drum out of every 10 number of drums or less shall be selected at random sampling basis in each lot for every type & size of cable for the Acceptance Tests	Since the quantity of LT Power and control cables is very large, therefore sample size of " One drum out of every 10 number of drums or less" becomes very large for inspection purposes. Therefore, it is proposed to have sampling plan as per IS 7098 part-1 (LT power cable) and IS 1554 Part-1 (LT control cables) for Acceptance tests.	Noted. However, the same shall be discussed during DE.
147	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	38	1.30.10 iii)	For DC system only single core cables shall be used.	For DC system, 1C/2C cable shall be used. Same is in line with cl. No. 17.04.02 vi)(single/two core cables in D.C. System).	Clause 17.04.02 prevails.

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148	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	13,47 & 48	1.09.09, 1.43.05 & 1.43.06	**1.09.09** Unless otherwise specified, at least 10 % margin shall be considered in equipment sizing over and above the calculated load current/fault current/power requirements except DG set, Battery & charger, Aux transformer, Lighting transformer, UPS. The same shall have 20% design margin. **1.43.05** with additional margin of 10% overload **1.43.06** 20% margin shall be considered for DG sizing.	Design margin in both clauses is different. It is proposed to consider 10% design margin for DG sizing.	Tender terms and conditions prevails.
149	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL 9.00.00 LT SERVICE TRANSFORMERS	26 & 241	1.22.05 & 9.01.12 i)	1.22.05 10% spare margin shall be considered over & above the estimated total load on the L.T. board. 9.01.12 Each Transformer shall be rated to meet the loads connected on both the bus sections of switchgear with 20% design margin on total load of Transformer.	Different design margin for service transformers is specified in both the clauses. Please specify the final design margin for service transformers.	Each Transformer shall be rated to meet the loads connected on both the bus sections of switchgear with 20% design margin on total load of Transformer
150	Vol-III Part-B Section-1 / Electrical Technical Specification	9.00.00 LT SERVICE TRANSFORMERS & 11.00.00 DATA SHEET FOR 415V PCC/PMCC/MCC/ DBs	241 & 302	9.01.12 i) DATA SHEET FOR 415V PCC/PMCC/MCC/DBs	**9.01.12 i)-** 0.4 for intermittent loads like valve actuators, dampers, cranes, plug points, elevator etc., **DATA SHEET FOR 415V PCC/PMCC/MCC/DBs-** Intermittent class for Unidirectional motors (IS:2959) 0.1 Intermittent class for Bidirectional motors (IS:2959) 0.3	a) There is mismatch in intermittent loads, load factor requirement in mentioned clauses. b) Please note that for intermittent loads, load factor of 0.4 is very high. As a standard practice load factor of 0.05 is considered for valve actuators, dampers as they run for very small time. c) Therefore, it is proposed to consider 5% load factor for valve actuators, dampers. d) For remaining intermittent loads it is proposed to have 10% or 20% load factor.	Intermittent loads of 0.4 shall be considered.
151	Vol-III Part-B Section-1 / Electrical Technical Specification	11.00.00 DATA SHEET FOR 415V PCC/PMCC/MCC/ DBs	299	1 (d)	Material of bus bars: For rating up to 2000A, Al. or Al. alloy For rating above 2000A, Cu	Al. or Al. alloy for busbar rating above 2000A	Noted.
152	Vol-III Part-B Section-1 / Electrical Technical Specification	11.00.00 415 SWITCHGEARS AND DC BOARDS	272	11.06.01 i)	The PCC/PMCC/MCC shall be of Form 4B Type 7 construction as per IEC 61439..	it is requested to allow Cable alley design as per Form IVb Type 6 (as per IEC 60439) for safety purpose.	Tender terms & condition prevails.

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153	Vol-III Part-B Section-1 / Electrical Technical Specification	11.00.00 415 SWITCHGEARS AND DC BOARDS	271	11.05.13	Wireless temperature monitoring system to be provided and same shall be integrated to DDCMIS/ separate HMI. Temperature sensors shall be installed in all relevant joints, contact joints etc. as per the standard OEM Practice, however Position of such sensors shall be decided at the time of detailed engineering.	It is proposed that the temperature sensors to be provided for Boiler PMCC, Turbine PMCC & EMERGENCY MCC only. Wireless temperature monitoring system is not required for other PMCC/MCC Same is in line with practice followed by other customers.	Wireless temperature monitoring system for all PMCC and EMCC shall be provided. Rest of the conditions prevails.
154	Vol-III Part-B Section-1 / Electrical Technical Specification	19.00.00 COMMUNICATIO N SYSTEM	440	19.01.00	Public Address System	As Qty. , Block Diagram for PA System item is not mentioned. BHEL shall provide PA system as per BHEL standard practice in line with BHEL executed 800 MW Thermal Power Plant Project.	Noted. However, it will be decided during detailed engineering.
155	Vol-III Part-B Section-1 / Electrical Technical Specification	15.00.00 ELECTRICAL ACTUATORS - NON INTEGRAL STARTER	348	15.06.03;ii)	Each motor actuator shall also have two (2) torque limit switches with four (4) normally opened and four (4) normally closed contacts each.	As per current practice followed for various projects of similar rating, Bidder proposes to have two (2) torque limit switches with 2 NO + 2 NC contacts each..	Each motor actuator shall also have two (2) torque limit switches with two (2) normally opened and two (2) normally closed contacts each.
156	Vol-III Part-B Section-1 / Electrical Technical Specification	15.00.00 ELECTRICAL ACTUATORS - NON INTEGRAL STARTER	348	15.06.03; v)	The motor actuators shall have 2 nos. potentiometric type transmitters of 100 ohm rating.	Bidder understand that referred clause is applicable for inching motorised valves. One potentiometric type transmitter shall suffice the requirement. Kindly confirm.	Tender terms and conditions prevails.
157	Vol-III Part-B Section-1 / Electrical Technical Specification	15.00.00 ELECTRICAL ACTUATORS - NON INTEGRAL STARTER	348	15.06.04; i)	Motor actuators shall be provided with clearly visible local position indicators mounted on the operator assembly itself. Suitable transducers shall be provided for remote indication of the position.	Bidder understand that transducer for actuator position is applicable for inching motorised valves. Kindly confirm	Tender terms and conditions prevails.
158	Vol-III Part-B Section-1 / Electrical Technical Specification	8.00.00 11KV & 6.6/3.3 KV SWITCHGEAR	212	CL 8.04.04 (xv)	Inbuilt Motorised and Remote Rack in and Rack out facility for all MV & HV switchgear breakers shall be provided	We request customer to allow Trolley mounted (manually handled) breaker also against this clause.	Trolley mounted (manually handled) for breaker rack in rack out is also acceptable.

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159	Vol-III Part-B Section-1 / Electrical Technical Specification	8.00.00 11KV & 6.6/3.3 KV SWITCHGEAR	203	CL 8.04.04 (III)	Two nos of trip coil with individual trip circuit (dedicated CT, PT) for ll HT switchgear breakers.	We confirm that two nos. trip coils shall be provided as per specification. However, please note that the trip circuit is energised by DC Battery supply & it is switched by tripping relay contacts. Hence, the trip circuit has no direct connection with CT's & PT's (which are used in separate circuit involving protection relays) As such, specified requirement of "dedicated CT/PT" for both trip circuits is not technically required.	Noted for trip coil.
160	Vol-V Annexure-4 SUB-VENDOR LIST	2.00.00 ELECTRICAL	32	Cl 2.00.00 ELECTRICAL, Sl no 1	MAKE OF MAIN PROTECTIVE RELAY SHALL BE RESTRICATED TO AREVA/ ABB/ SIEMENS AS PER NIT.	We request customer to kindly accept Schneider Electric make relays also. Schneider Electric is one of the reputed manufacturer for protective relays & have supplied relays to many projects of NTPC, TSGENCO, NHPC, IOCL, etc. Required credentials for review & acceptance shall be furnished during detailed Engg.	Make of Main protective relay shall be of latest model as specified in the tender. However, latest model of Schneider and SEL will be considered after review and acceptance of credential during detailed engineer.
161	Vol-V Annexure-3 MANDATORY SPARES LIST	9.0 HV SWITCHGEAR (11 kV, 6.6 kV & 3.3 kV)	150	9.23	Carbon brushes for spring charging motor (if applicable)	Not applicable. Kindly delete the item from list of spares.	Clause is self explanatory.
162	Vol-V Annexure-3 MANDATORY SPARES LIST	9.0 HV SWITCHGEAR (11 kV, 6.6 kV & 3.3 kV)	151	9.26	Arc chute (if applicable for each rating)	Not applicable. Kindly delete the item from list of spares.	Clause is self explanatory.
163	Vol-V Annexure-3 MANDATORY SPARES LIST	9.0 HV SWITCHGEAR (11 kV, 6.6 kV & 3.3 kV)	151	9.27	SF6 cylinders with SF6 gas filled along with nozzle for filling the gas if applicable	Not applicable. Kindly delete the item from list of spares.	Clause is self explanatory.
164	Vol-V Annexure-3 MANDATORY SPARES LIST	9.0 HV SWITCHGEAR (11 kV, 6.6 kV & 3.3 kV)	151	9.28	Bearings for spring charging motor	Not applicable. Kindly delete the item from list of spares.	Noted.
165	Vol-V Annexure-3 MANDATORY SPARES LIST	9.0 HV SWITCHGEAR (11 kV, 6.6 kV & 3.3 kV)	151	9.30	Guide for moving contact set	Not applicable. Kindly delete the item from list of spares.	Noted.

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166	Vol-V Annexure-3 MANDATORY SPARES LIST	9.0 HV SWITCHGEAR (11 kV, 6.6 kV & 3.3 kV)	151	9.32	Pressure gauge (for SF6 breaker)	Not applicable. Kindly delete the item from list of spares.	Clause is self explanatory.
167	Vol-V Annexure-3 MANDATORY SPARES LIST	9.0 HV SWITCHGEAR (11 kV, 6.6 kV & 3.3 kV)	151	9.35	Control supply transformers (If applicable)	Not applicable. Kindly delete the item from list of spares.	Clause is self explanatory.
168	Vol-V Annexure-3 MANDATORY SPARES LIST	9.0 HV SWITCHGEAR (11 kV, 6.6 kV & 3.3 kV)	151	9.36	Breaker Trolley	Not applicable as in our design as each VCB has it's own trolley & hence separate trolley is not required.	Noted.
169	Vol-V Annexure-3 MANDATORY SPARES LIST	9.0 HV SWITCHGEAR (11 kV, 6.6 kV & 3.3 kV)	151	9.38	Complete pole of breaker	We understand Vacuum Interrupter (1no of each type & rating) is to be offered. Customer to please confirm.	2% of each type and rating of installed qty. shall be considered.
170	Vol-V Annexure-3 MANDATORY SPARES LIST	9.0 HV SWITCHGEAR (11 kV, 6.6 kV & 3.3 kV)	151	9.41	Bus bar flat pieces	We understand 24 Nos of each size. is to be offered. Customer to please confirm.	Clause is self explanatory.
171	Vol-V Annexure-3 MANDATORY SPARES LIST	9.0 HV SWITCHGEAR (11 kV, 6.6 kV & 3.3 kV)	151	9.42	Bus bar angles/formed pieces for breaker	Not applicable. Kindly delete the item from list of spares.	Clause is self explanatory.
172	Vol-V Annexure-3 MANDATORY SPARES LIST	9.0 HV SWITCHGEAR (11 kV, 6.6 kV & 3.3 kV)	152	9.46	Online temperature monitoring system	From 1 set, we understand 1 No. each of sensors, reader, antenna etc. Customer to please confirm.	Bidder understanding is correct. However, any etc. item required for complete monitoring shall be considered.
173					General	Bidder did not find the QR for 400kV GIS, Kindly confirm that there is no QR for GIS. New Vendor can be accepted by GSECL other than Vendor List	The QR for new Vendor for GIS is enclosed in the Amendment Electrical - Annexure 10
174					Bays to be provided: Eight bays (1GT+ 1ST + 2 Line Fdr. + 2 Tie Fdr. + 2 spare) + 2 Nos. Bus PT.	We didn't receive Project BOQ at tender stage , requesting you to kindly provide it. Also the bay quantities not matching in SLD and Technical specification document	Number of Bays shall be as per the tender SLD. Spare bays shall be fully equipped up to the air to SF6 bushing.

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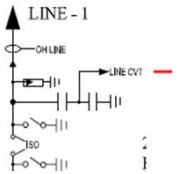
175				Dwaring NO. SLD ETG-106-EPC-EE-GN-SLD-001 page 1/2	CVT in Line ,Transformer & Bus VT bay 	As per received SLD CVT is mentioned if CVT is required, it is for AIS equipment from EPC side. We Hyosung will consider only GIS equipment, All AIS equipment shall be considered from EPC Kindly confirm	Tender specification prevails
176				Dwaring NO. SLD ETG-106-EPC-EE-GN-SLD-001 page 1/2	PIR requirement for 400kV Line bay Circuit Breaker	We would like to inform that in current scope Line bays are mentioned as per general practise PIR is required for Line bays where line goes over 200km Kindly clarify whether PIR required or not?	PIR shall be provided for Two outgoing lines plus Two spare bays including Tie Breakers.
177	Vol-III Part-B Section-1 / Electrical Technical Specification	29.00.00 400KV GAS INSULATED SWITCHGEAR	610	29.06.02	Type test certificate, dated not more than five years back, shall be furnished for the offered model of the GIS	We would like to inform you that, As per CEA guidelines . GIS type test validity should not be more than 15 years. We are complying the same. Kindly accept the same	Respective guidelines of CEA and it's amendment from time to time shall be followed for type test and it's validity.
178					<table><tr><td></td><td>Secondary-I</td><td>Secondary- II</td><td>Secondary– III</td></tr><tr><td>Voltage Ratio</td><td>400kV/110V √3 3</td><td>400kV/110V √3 √3</td><td>400kV/110V √3 √3</td></tr><tr><td>Application</td><td>Protection</td><td>Synchronization</td><td>Metering</td></tr><tr><td>Output burden VA</td><td>200</td><td>200</td><td>200</td></tr><tr><td>Accuracy Class*</td><td>3P</td><td>0.2S</td><td>0.2S</td></tr></table> (*within frequency variation range)	We would like to inform there is two possibilities as per given data of VT 1) Secondary-I is 110V/3, This winding is as residual winding. Total simultaneous burden is 200VA for 3P, 200VA for 0.2. That is, our proposal is : Ratio- 400kV/√3/:110V/3/:110V/√3/:110V/√3 Burden - 200VA/100VA/100VA Class - 3P/0.2/0.2 2) Secondary-I& -II& -III is 110V/√3 Total simultaneous burden is 200VA. That is our proposal is Ratio- 400kV/√3/:110V/√3/:110V/√3/:110V/√3 Burden - 100VA/50VA/50VA Class - 3P/0.2/0.2 Please note . For VT, there is no accuracy of 0.2s, only accuracy of 0.2	Noted. However, dedicated VT required for ABT metering.

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179				General	General	Transmission Line shifting work:- 1. During Site Visit it is observed multiple 400kV transmission Lines surrounds the proposed Site of 1X800MW unit and 2 Nos of 400kV Tower exists at Site. Kindly confirm that shifting of same Lines is not in Bidders scope of work. 2. As per Tender Layout Interconnection between GIS and GT& ST seems to be difficult, on the other Side 400KV line may cross over the existing 400kV Lines therefore creating a challenging arrangement to execute. Location of 400kV GIS Building may suitably placed to reduce the issues as discussed during Site Visit. 3. Corridor for new Transmission Lines is not yet finalised, Kindly inform the same to place Switchyard Gantries in layout. 4. Bidder Understands that 400kV control room building extension is not required and sufficient space is available to accommodate the 2 bays extension auxiliaries, panels etc. Kindly confirm the same.	Shifting of two nos. transmission tower is not in the scope of bidder. Location of GIS, PS building and Bop's in plot plan is indicative. However, Bidder may make their own arrangement for complete project layout as per their own study and experience. Corridor for transmission line will be finalised based on the approved plot plan submitted by the successful bidder and hence outgoing gantry shall be decided by the successful bidder. If extension required to accommodate 2 nos. tie line bays equipments and panels same shall be in the scope of successful bidder with no extra cost.
180	Vol-III Part-B Section-1 / Electrical Technical Specification	22.00.00 BATTERY & BATTERY CHARGER	472	22.01.01	This specification is intended to cover the design, manufacture, assembly, testing at manufacturer's works, supply and delivery, properly packed for transport to site of BATTERY AND BATTERY CHARGER complete with all accessories for efficient and trouble-free operation for the complete plant including 400kV GIS and AIS switchyards.	1. Bidder understand that Old Battery chargers and battery bank shall be retained at existing 400kV AIS control room and new battery bank and charger is to be installed for 2 bays extension portion only. Kindly confirm the same. 2. GSECL needs to provide space for accommodating the same in existing control room	1. Noted 2. Based on the site visit by bidder, if accommodation of all the panels and battery, battery charger is not possible, bidder to construct separate Equipment and control room adjacent to the existing control room.

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BID CLARIFICATION- ELECTRICAL

Sr. No.	Section No. / Section Title	Sub Section No. / Sub Section Title	Page No.	Clause No.	Bid Specification	Bidder's Query	Pre-bid Resolution
181	Vol-III Part-B Section-1 / Electrical Technical Specification	ANNEXURE-H SUBSTATION AUTOMATION SYSTEM (SAS)	666	1.01.14	All components required for Integration of protection relay and IEDs being proposed under this contract with the existing switchyard SAS system for control, protection and monitoring for 400kV tie lines at 400 kV AIS side shall be in the scope of bidder. Protection & Control system shall be provided with Numerical relays.	Kindly confirm the following: 1.As per site visit new SAS is required for complete 400kV switchyard AIS. 2. SAS requires BCUs which can be mounted in existing Panels or can be supplied with new panels. 3. 3. Bidder understand existing relay panels have sufficient space to mount LIUs, Ethernet switches.	1. No SAS integration of existing AIS with the extended tie bays shall be considered by the bidder. *" SAS shall be provided for 400kV GIS plus 2 Nos tie line and bays (AIS/GIS) to be constructed in existing 400kV AIS. However, provision for integration of all line, transformer, ICT and reactor bays shall be considered in the new SAS for two nos tie bays.* *If required, CVT or other equipment required for standalone operation of extended tie bays shall be considered in Bidder's scope. "* 2. As above. 3. As above. However, protection viz, Busbar, LBB, etc. and feedbacks of existing AIS with the proposed extension of 2 Nos Tie line bays shall be considered in the bidders scope.
182	Vol-V Annexure-3 MANDATORY SPARES LIST	23.0 400 kV SWITCHYARD	169	23.1.2	400 kV Capacitive Voltage Transformers (For the following items each type & rating to be repeated)	please specify that the item is for Sf6 Gas insulated or Air insulated.	Applicable for AIS
183	Vol-V Annexure-3 MANDATORY SPARES LIST	23.0 400 kV SWITCHYARD	169	23.1.2	SWITCHYARD EQUIPMENT ACCESSORIES (For the following items each type & rating to be repeated)- i) 400 kV Glazed Brown Insulator	Bidder understand that The Item is not applicable for GIS equipments, only applicable for AIS equipments Kindly confirm the same.	Applicable for AIS
184	Vol-V Annexure-3 MANDATORY SPARES LIST	23.0 400 kV SWITCHYARD	170	23.1.4	LA 400 kV side	Bidder understand that the item is applicable for AIS type equipment	Applicable for AIS and GIS as outdoor equipment
185	Vol-V Annexure-3 MANDATORY SPARES LIST	23.0 400 kV SWITCHYARD	170	23.1.5	Local Control Panel	Qty is shown like 100% spare for 1 panel, Bidder understand that one LCC panel as spare to be supplied only. Kindly confirm.	Bidder understanding is correct.
186	Vol-V Annexure-3 MANDATORY SPARES LIST	23.0 400 kV SWITCHYARD	170	23.1.7	Complete module for 400 kV LA (With Earth Switch)	Bidder understand that in 400kV GIS all LAs/SAs are AIS type only the Item shall not be applicable, with earth/ without earth switch does not hold any significance, kindly confirm.	Bidder understanding is correct.

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Sr. No.	Section No. / Section Title	Sub Section No. / Sub Section Title	Page No.	Clause No.	Bid Specification	Bidder's Query	Pre-bid Resolution
187	Vol-V Annexure-3 MANDATORY SPARES LIST	23.0 400 kV SWITCHYARD	170	23.1.8	23.1.8 Complete module for 400 kV LA (Without Earth Switch)	Bidder understand that in 400kV GIS all LAs/SAs are AIS type only the Item shall not be applicable, with earth/ without earth switch does not hold any significance, kindly confirm.	Bidder understanding is correct.
188	Vol-V Annexure-3 MANDATORY SPARES LIST	23.0 400 kV SWITCHYARD	170	23.1.15	CRM, DCRM kit with transducer of appropriate breaker fittings	Kindly provide broad specification as the item is a Testing instrument	Latest state of the art kit shall be consider along with the necessary transducers for measurement.
189	Vol-III Part-B Section-1 / Electrical Technical Specification	14.00.00 AC & DC MOTORS	327	14.10.6	Online Insulation Resistance monitoring system shall be provided in all HT motors.	Motors IR is always measured before start of any device from cold condition or after any fault. Hence it is always measured in static condition before start / maintenance. Online monitoring of IR is not warranted.	Online Motor IR monitoring is not required.
190	Vol-III Part-B Section-1 / Electrical Technical Specification	14.00.00 AC & DC MOTORS	327	14.10.10	For VFD controlled HT and LT motors, it shall be IE2 class as per IS 12615.	IS 12615 is not applicable for HT motors, as per standard's scope.	Noted for HT motors IS. Relevant IS shall be considered.
191	Vol-III Part-B Section-1 / Electrical Technical Specification	14.00.00 AC & DC MOTORS	328	14.12.02	Pump motor subject to reverse rotation shall be designed to withstand the stresses encountered when starting with non-energized shaft rotating at 125% rated speed in reverse direction.	Pump HT Motors are always started from rest in forward direction. Motors are not given start signal when shaft is rotating in opposite direction .	Noted. However, necessary provision like ratchet mechanism for preventing reverse rotation shall be considered.
192	Vol-III Part-B Section-1 / Electrical Technical Specification	14.00.00 AC & DC MOTORS	329	14.13.05.iii	iii) Motors above 3000 KW.....450%. Not subject to any positive tolerance.	Motors can be guided through Starting MVA limitation , instead of relating it through rating. It becomes very stringent and unnecessary increase in equipment size if starting current is very less. Methodology like KVA/KW ratio as followed in NTPC Projects can be followed for the same.	Noted. However, not subject to any positive tolerance.
193	Vol-III Part-B Section-1 / Electrical Technical Specification	14.00.00 AC & DC MOTORS	329	14.13.05.ii	Motors (above 1000 KW up to 3000 KW) . 600%. Not subject to any positive tolerance.	In case mill motor rating is greater than 1000 kW, the starting current shall be 600% subject to IS/IEC tolerance, considering very high torque requirement during starting.	Noted
194	Vol-III Part-B Section-1 / Electrical Technical Specification	14.00.00 AC & DC MOTORS	329	14.15.02		We understand that Full load torque requirement herein means full load torque demand of load. In view of stringent starting conditions of 450% inclusive , Excess torque to be as per IEC:60034-1 or with applicable tolerances as per IEC:60034-1	Tender terms & condition prevails.

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Sr. No.	Section No. / Section Title	Sub Section No. / Sub Section Title	Page No.	Clause No.	Bid Specification	Bidder's Query	Pre-bid Resolution
195	Vol-III Part-B Section-1 / Electrical Technical Specification	14.00.00 AC & DC MOTORS	330	14.17.04	The value of the polarization index for motors above 160kW should not be less than 2 when determined according to IS: 78114.0	In case where IR 1 minute is greater than 5 G Ohm, minimum value of PI is not applicable. PI value shall only be for reference as per IEC 60034-27-4.	Noted
196	Vol-III Part-B Section-1 / Electrical Technical Specification	14.00.00 AC & DC MOTORS	331	14.23.00	HV & MV motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads	For small IC411/511 motors pad size may be lesser than 80X80, but the pad shall be suitable for mounting the vibration probe for online vibration measurement.	Noted
197	Vol-III Part-B Section-1 / Electrical Technical Specification	14.00.00 AC & DC MOTORS	334	14.28.05	Unless otherwise approved, bearing lubricating system shall be such that no external forced oil or water is necessary to maintain required oil supply to keep bearing temperature within design limits.	For motors having sleeve bearings, either forced oil lubricated or self lubricated bearing arrangement shall be provided depending on motor rating and application requirements.	Noted
198	Vol-III Part-B Section-1 / Electrical Technical Specification	14.00.00 AC & DC MOTORS	334	14.28.07	Ring oiling system shall be adequate for starting and continuous operation of motor for at least half an hour, without pressure oiling system in operation.	For high speed applications like 1500 rpm and high capacity Motors , bearing shall be Sleeve type, forced oil cooled. Ring shall also be present to aid oil film formation. However, such system is not suitable for operation of Motor for half an hour. The same is suitable for coasting down period without Forced Oil supply.	Noted.
199	Vol-III Part-B Section-1 / Electrical Technical Specification	14.00.00 AC & DC MOTORS	336	14.37.02	Min. fault level for 415V Motors - 35 MVA	For LT motor main terminal box, fault level certificate shall not be applicable, owing to low fault energy requirement in these boxes during fault condition.	Tender terms & condition prevails.
200	Vol-III Part-B Section-1 / Electrical Technical Specification	14.00.00 AC & DC MOTORS	338	14.41.00	HV & MV motors shall be provided with dial type two (2) bearing temperature indicators and shall have two (2) sets of contacts, each set having 2 NO + 2 NC contacts rated for 5A at 240V AC and 0.5A at 220V DC. One set shall be set to operate at lower value to give alarm and other set at a higher value to trip the motor.	As per latest Industrial practise, 2 Nos. BTDs are employed for Alarm & Tripping of Motor. Additional DTT is utilized for Local temperature indication. We shall provide Gas filled DTTs in which 2 Change over contacts shall e provided with Contact rating of 30 VAC. Modern Relay system does not require 5 A Contact rating.	Noted.

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Sr. No.	Section No. / Section Title	Sub Section No. / Sub Section Title	Page No.	Clause No.	Bid Specification	Bidder's Query	Pre-bid Resolution
201	Vol-III Part-B Section-1 / Electrical Technical Specification	14.00.00 AC & DC MOTORS	340	14.49.01 ii) a	Tests conducted at an NABL accredited independent laboratory.	BHEL Manufactures Motor rating from 200 KW TO 22000 KW and performance test are conducted at works in presence of Client with state of the art testing facilities duly calibrated by NABL accredited Instruments. Testing cannot be conducted in NABL accredited labs as complete performance test facility for such wide range and orientation is not available in country. This methodology is practised by all motor manufacturer and is acceptable in GSECL Projects executed earlier. Some of the tests like Fault level, Degree of Protection are conducted in independent labs and existing valid certificates shall be submitted for your review .	Noted.
202	Vol-V Annexure-3 MANDATORY SPARES LIST	ANNEXURE-3	157	3.00.00/12.14 (a)	LT Motors of Main plant.: 1 Set	LT Motor for Condenser air evacuation pump (LRVP) has already covered under Cl.24.6 (Page. 40 of 206). Hence, This clause is not applicable for vacuum pump motor. GSECL to accept.	Noted.
203	Vol-V Annexure-3 MANDATORY SPARES LIST	ANNEXURE-3	157	3.00.00/12.18	Bearings(DE and NDE) for each type and rating of motor: 4 sets.	Bearings for Condenser air evacuation pump motor has already covered under Cl.24.3 (Page. 40 of 206). Hence, This clause is not applicable for vacuum pump motor. GSECL to accept.	Noted.
204	Vol-V Annexure-3 MANDATORY SPARES LIST	ANNEXURE-3	132	3.00.00/1.8	Stator winding bars and connections (one set comprising of two bars of each variant) Quantity - 4 set	GSECL to inform whether required quantity will be one ser or 4 set for winding bars of each variant.	4 set for winding bar of each variant.
205	Vol-V Annexure-3 MANDATORY SPARES LIST	ANNEXURE-3	135	3.00.00/1.33	Man-hole Cover	Gaskets for Man-hole cover shall be offered. GSECL to accept.	Man-hole cover with its gasket shall be provided by Bidder.
206	Vol-V Annexure-3 MANDATORY SPARES LIST	ANNEXURE-3	136	3.00.00/1.35.k	Thermometers	Thermometers are not envisaged in Gas system. GSECL to accept.	If any part/item is not applicable in the supplied equipment/systems, then the same shall not be considered.
207	Vol-V Annexure-3 MANDATORY SPARES LIST	General			Definition of "Set"	We understand that one set means total quantity required for operational requirement of one equipment or system (as applicable). GSECL to confirm.	Set means total quantity required for operational requirement of one equipment or system (as applicable).

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208	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	11	1.07.00	ISLANDING SCHEME	For 400KV GIS switchyard, new Islanding scheme shall be offered. However, for existing 400KV AIS switchyard, we understand that Islanding scheme is existing and only new Tie line bays are to be integrated by providing trip relays. Kindly confirm and provide existing Islanding scheme drawing for reference.	Islanding scheme is to be provided for new 400kV GIS switchyard as per tender specifications. It may be noted that existing 400 kV AIS does not have any islanding scheme and hence not to be considered for existing 400 kV AIS.
209	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	13	1.10.01	All the required modifications in existing 400KV switchyard system hardware and software for remote control, monitoring and protection system including busbar protection system.	Kindly provide existing Single line diagram and Busbar protection scheme for 400KV AIS.	Already shared by email. However, same is uploaded as an Amendment Electrical -Annexure 11
210	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	16	1.14.00	ELECTRICAL CONTROL & RELAY PANEL	BCU based control is envisaged for 400KV Switchyard bays, kindly confirm the requirement of hardwired backup control panels.	Backup electrical control panel is for main plant electrical system which shall be located in main Plant control room.
211	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	18	1.14.01	The following protection schemes shall be provided in the GRP and the protections shall be divided into two groups; each group being 100% redundant and on separate DC supply,	We understand that against the said clause Main and backup protection is envisaged inline with tender SLD.	Please note that tender SLD is only tentative. Bidder shall consider the redundant 100% protections as per tender NIT.
212	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	353	16.01.00	i) Relay panel for Generator transformer ii) Relay panel for Unit transformers iii) Relay panel for station transformer iv) Relay panel for Generator	As per standard practice combined Protection panel for Generator, Generator transformer and Unit transformer shall be offered leading to space saving in control room. Station transformer panel shall be provided as separate panel. Kindly confirm.	Noted
213	Vol-III Part-B Section-1 / Electrical Technical Specification	Section-1, ANNEXURE-C METERING, PROTECTION & CONTROL	635	3.14.00	Individual bay energy meters will summate (by a solid state summator)	Summator unit is obsolete now. The required summation shall be done in the metering software.	Noted
214	Vol-III Part-B Section-1 / Electrical Technical Specification	Section-1, ANNEXURE-H ; SUBSTATION AUTOMATION SYSTEM (SAS)	666	1.01.15	Bus bar protection integration in the existing Stage's bus bar protection for all 220 kV / 400 kV bays under present scope shall be in bidder's scope.	We understand busbar augmentation of only two new 400KV interconnecting bays at 400KV AIS is to be considered. Any bay augmentation in 220KV is not envisaged.	Integration shall be as per existing busbar protection of 400KV AIS.

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215	Vol-III Part-B Section-1 / Electrical Technical Specification	30.00.00 400KV AIS SWITCHYARD EQUIPMENT & ACCESSORIES	714	30.01.01	Existing 400 kV AIS SCADA is not in working condition. Hence complete new SCADA system shall be considered for existing 400 kV switchyard Bays & New AIS Tie line Bays. The design and technical specification shall be as per the existing system and the SCADA specification specified in GIS chapter of this specification. Make of SCADA system of both GIS switchyard and AIS switchyard shall be same.	We understand that the existing Numerical relays are on IEC 60870-5-103 protocol and SCADA system meeting the specification requirement against GIS chapter shall not be feasible as same is BCU based and Protection relays are IEC 61850. New SAS system, if required as per new 400KV GIS system, shall require replacement of existing Control and Protection panels. Kindly confirm the requirement.	SAS shall be provided for 400kV GIS plus 2 Nos tie line and bays(AIS/GIS) to be constructed in existing 400kV AIS. However, provision for integration of all line, transformer, ICT and reactor bays shall be considered in the new SAS for two nos tie bays. If required, CVT or other equipment required for standalone operation of extended tie bays shall be considered in Bidder's scope.
216	Vol-III Part-B Section-1 / Electrical Technical Specification	30.00.00 400KV AIS SWITCHYARD EQUIPMENT & ACCESSORIES	717	30.01.09	5) Bus Bar protection of all bays of 400kV AIS.	We understand that present scope includes augmentation of 02 nos. new Tie line bays with existing Busbar protection scheme. Kindly provide the existing 400KV Busbar protection scheme for reference.	Already shared by email. However, same is uploaded as an Amendment Electrical -Annexure 11
217	Vol-III Part-B Section-1 / Electrical Technical Specification	30.00.00 400KV AIS SWITCHYARD EQUIPMENT & ACCESSORIES	719	30.03.02	Control and monitoring of the 400kV switchyard will be through the Substation Automation System (SAS). The SAS operating station shall be located in the control room of the existing Switchyard Control Building.	BCU based control is envisaged for 400KV Switchyard bays, kindly confirm the requirement of hardwired backup control panels.	Backup electrical control panel is for main plant electrical system which shall be located in main Plant control room.
218	Vol-III Part-B Section-1 / Electrical Technical Specification	26.00.00 ELECTRICAL LABORATORY EQUIPMENTS	570	Clause 26.00.00, Serial No. 44	Reference meter for tariff meter Current : 0-20 A Accuracy class: 0.1% CL 0.2S	We understand that the Current rating for Reference meter for tariff meter shall be 1 A as all the secondary current of CT used in switchyard is 1 A. Please confirm.	The requirement is for testing and calibration of all energy meters for which reference meter shall have current range from 0-20 A which shall capable of testing meters ranging from 1 mA - 20 A.
219	Vol-V, Ann-4	SUB – VENDOR LIST			SUB – VENDOR LIST SL. NO. 42 - CONTROL PANELS SL. NO. 46- RELAY PANELS SL. NO. 80 - CONTROL/RELAY PANEL SL. NO. 91- GENERATOR PROTECTION/ PROTECTION PANELS	BHEL Bhopal has supplied Control and relay panels to customers like NTPC, PGCIL, KPCL, TANGEDCO, TSGENCO etc. We have also supplied panel to GSECL for Sikka and Ukai projects. Kindly accept BHEL Bhopal Control and relay panels & Generator Protection panels.	Noted. However, protection and auxiliary relays shall be of GSECL Approved make only.

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220	Vol-III Part-B Section-1 / Electrical Technical Specification	29.00.00 400KV GAS INSULATED SWITCHGEAR	620	ANNEXURE-B RATINGS & REQUIREMENTS	ANNEXURE-B RATINGS & REQUIREMENTS 2.27 Operating mechanism 2.28 Opening time (ms) 2.29 Closing time (ms)	As per the standard practices being adopted by major Power/Transmission utilities like NTPC & POWERGRID; Operating Mechanism, Opening and & Closing time requirements are stipulated as per below: 2.27 Operating mechanism: Spring charged mechanism or electro hydraulic mechanism or a combination of these. The mechanism shall be housed in a dust proof cabinet and shall have IP: 42 degree of protection. 2.28 Opening time (ms) : As per IEC 2.29 Closing time (ms) : As per IEC As such the utilities don't face any technical difficulties during Switchyard operations. Accordingly, we request GSECL to amend ANNEXURE-B RATINGS & REQUIREMENTS for Operating mechanism, Opening time (ms) and Closing time (ms) inline with the above.	For Clause No - 2.27 Circuit breaker operating mechanism shall be spring charge mechanism. However, complete spring charge mechanism as per OEM design shall be acceptable. 2.28 Tender terms and conditions prevail. 2.29 Tender terms and conditions prevail.
221	Vol-III Part-B Section-1 / Electrical Technical Specification	29.00.00 400KV GAS INSULATED SWITCHGEAR	592	29.04.02	Gas- proof compartments. The bus bars shall be sub-divided into compartments including the associated busbar disconnectors.	As per the standard industry practice, Bus bar compartment as per standard type test design of OEM and meeting the service continuity requirement are acceptable to the utilities. Accordingly, we request you to kindly amend the requirement as per below. **"Bus bar compartment shall be as per standard type test design of OEM and meeting the service continuity requirement as technical specification/IEC".**	Noted. Bus bar compartment shall be as per standard type test design of OEM and meeting the service continuity requirement as technical specification/IEC.
222	Vol-III Part-B Section-1 / Electrical Technical Specification	2.00.00 GENERATOR AND ACCESSORIES	59	2.05.00 iv) f)	Suitable slot couplers/coupling capacitors (as applicable) shall be provided for partial discharge monitoring (under running condition)through portable Partial Discharge Monitoring Kit. Bidder to supply two (2) Nos. of portable Discharge Mentoring Kit.	In Generator, no slot coupler / coupling capacitors is envisaged in BHEL's standard design. Therefore, supply of 2 nos.of portable Partial Discharge Monitoring Kits are also not applicable.	All necessary provisions shall be made for monitoring of PD through portable kit.
223	Vol-III Part-B Section-1 / Electrical Technical Specification	2.00.00 GENERATOR AND ACCESSORIES	64	64	vi) ON line partial discharge (PD) monitoring	Deviation- As the performance of systems available in the market and their noise cancellation effectiveness is not proven and no-verifiable against any reference. Accordingly same is not envisaged .	All necessary provisions shall be made for monitoring of PD through portable kit. Portable PD monitoring kit shall be in the scope of bidder.

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224	Vol-III Part-B Section-1 / Electrical Technical Specification	15.00.00 ELECTRICAL ACTUATORS - NON INTEGRAL STARTER	344	344	Electrical Actuators - Non Integral Starter	Electrical motor Actuators in BHEL HWR scope shall be provided with Integral Starter as per Technical Specification Volume-III, Part-C, Cl. 9.10.00. This is also as per standard practice of BHEL for all supercritical sets.	Tender terms and conditions prevail. However, for exceptional case where OEM is not providing non-integral type actuator for particular package/system the same shall be accepted as per Technical Specification Volume-III, Part-C, Cl. 9.10.00
225	Vol-III Part-A Section-1 / Mechanical Technical Specification 2.00.00 BOILER & AUXILIARIES	2.24.00 Headers	18	2.24.06	All valves that require operation during start up or shutdown of the steam generator shall be electric motor operated, except if specifically stated otherwise. .... All motor actuators shall be of same make only.	Actuator Makes shall be as per approved sub-vendor list. Same make for all motorized valves in all services is not considered.	Noted. However, maximum effort shall be put in to restrict the makes of actuators up to 02 to 03 makes.
226	Volume-II, Section-2	LEAD TECHNICAL SPECIFICATION	54	2.16.15, xii)	Segregated Bus Ducts – For rating above 2000A conductor shall be copper.	Bidder suggests to consider Aluminium conductor as an alternative to Copper conductor for SPBD. This is also inline with standard practice followed by NTPC/ other SEBs. Owner may please confirm.	Tender terms & condition prevails.
227	Volume-II, Section-2	LEAD TECHNICAL SPECIFICATION	54	2.16.15, xvii)	VVFD – HT & LT Variable Voltage Frequency drives as per the system requirement.	Owner may please specify name of drives for which VFD is required.	Tender terms & condition prevails.

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228	Volume-II, Section-2 Volume-III, Part-B, Section-1	LEAD TECHNICAL SPECIFICATION TECHNICAL SPECIFICATION ELECTRICAL	55 49	2.16.15, xxi) 1.37.09	**Advanced type charge Accumulation Device** (SERTEC) shall be applied for only buildings against lightning protection. **However, the advanced technology shall be discussed during detail Engineering** and shall be acceptable only if it is agreeable/approved from customer upon submission of credentials. Lightning protection system shall be provided as per latest IS /IEC 62305. Lightning protection system shall comprise vertical air terminations, horizontal air terminations, down conductors, test links and earth electrodes. Advanced type charge Accumulation Device (SERTEC) shall be applied for only buildings against lightning protection. However, the advanced technology shall be discussed during detail Engineering and shall be acceptable only if it is agreeable/approved from customer upon submission of credentials.	(1) Lightning protection shall be provided as per Clause no. 24.00.00, Section-1, Part-B, Vol.III. (2) Use of Advanced type charge Accumulation Device is not envisaged and hence excluded from bidder's scope. (3) The referred discussion for "advanced technology" during detail engineering is not envisaged as Lightning protection shall be provided as per Clause no. 24.00.00, Section-1, Part-B, Vol.III.	Bidder shall consider the conventional type of lightning protection. However, advanced lightning protection system shall be considered at minimum 2 locations over and above conventional lightning protection system.
229	Volume-II, Section-2	LEAD TECHNICAL SPECIFICATION	57	2.16.16, iv)	All electrical devices like switches/ transmitters/ controller/ analyzer/ solenoid valves which are located in the in hazardous areas like hydrogen gas area, seal oil area etc. shall be made intrinsically safe by providing suitable type of transformer isolated barrier / Zener barrier of standard make & shall be provided with explosion proof enclosure suitable for hazardous areas described in **National Electric Code (USA), Article 500, Class-I, Division-I or EN60079-14 or shall comply with the essential requirements of ATEX directives.**	Bidder proposes to consider applicable IS and IEC standard for referred electrical devices. Owner may please confirm.	Tender terms & condition prevails.
230	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	6	1.04.04	Any additional feeder requirement on HT & LT switchgears required for purchaser during detailed engineering shall be arranged by the bidder/Bidder without any price implication.	Owner may please clearly specify the list of feeders with rating required from HT and LT Switchgears before price bid submission. Any additional feeder requirement during detailed engineering shall be provided with price implication.	Noted

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231	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	7	1.04.14	For CHP system motors, 6.6kV voltage ratings shall be considered.	As per tender specification for medium voltage switchgear, only CHP switchgear is rated with 6.6kV and all other switchgears are rated with 3.3kV. Bidder suggests to consider 3.3kV voltage level for all MV Switchgear. This is also inline with standard practice followed by NTPC/ other SEBs.	Tender terms & condition prevails.
232	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	11	1.08.00	HT Switchgears 11kV , 6.6 kV & 3.3kV - 3 seconds	The duration for fault level for HT Switchgear shall be 1 second as per type test design of OEM. Owner may please confirm.	Noted for 11kV, 6.6kV & 3.3kV for time 1 sec.
233	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	10	1.05.00, S. No. 9	Fault Level 11 kV System - 50 kA for **3 seconds** 6.6/3.3 kV System - 50 kA , **3 secs** for 6.6kV and 40 kA, **3 secs** for 3.3kV	Bidder proposes that duration for fault level for 11kV and 3.3 kV system shall be 1 second as per standard industry practice. Owner may please confirm.	
234	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	12	1.09.04	The battery shall be Lead Acid Plante type only.	Bidder suggests to allow Ni-Cd battery as an alternative to Lead acid plante battery. Owner may please accept.	Tender terms & condition prevails.
235	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	17	1.14.00 (12)	Electrical Control Panel including complete station Auxiliary systems	The concept of hardwired Electrical Control Panel is obsolete now. Electrical system shall be controlled as per clause no. 25.04.00, Section-1, Part-B, Vol.III. Hence, Electrical Control Panel is not envisaged. Owner may please confirm.	Tender terms & condition prevails.
236	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	18	1.14.00 Note: 3)	Bidder shall provide software version update time to time at free of cost.	Bidder would like to inform that such support is not provided by OEMs and hence, Bidder requests Owner to delete this clause.	It shall be read as "The supplied relay shall be of latest version of installed software and shall be communicable and interface with the upgraded software in case of up gradation in future if any."

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237	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	18	1.14.00 Note: 4)	Bidder shall provide spares and technical support for minimum **15 years from date of commissioning**.	Bidder would like to inform that such support is not provided by OEMs and hence, Bidder requests Owner to delete this clause.	Undertaking letter for spare & support from OEM shall be provided by the Bidder.
238	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	20	1.15.00	Generator transformer 3 Nos. of **325 MVA** (3X325MVA) rating	As per CEA standard specification, the Generator Transformer rating shall be **315 MVA**. This is also inline with standard practice followed by NTPC/ other SEBs. Owner may please accept.	Tender terms & condition prevails.
239	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	20	1.15.00	Bushings up to 52 kV shall be Epoxy RIP type and above 52 kV shall be **Epoxy RIS type.** No oil cooled bushings shall be used.	Bushings below 52 kV shall with porcelain insulator and shall be of oil communicating / OIP (non-oil communicating type) / epoxy RIP type. All condenser bushings shall be non-communicating type. Bushings from 52kV up to 420 kV class (including 52 kV and 420 kV class), shall be RIP (Resin Impregnated Paper) Type with composite insulator. This is also inline with standard practice followed by NTPC/ other SEBs. Owner may please accept.	For Transformer bushing rated 52kV and above shall be RIP/RIS type. For transformer bushing rated below 52kV shall be RIP/Oil communication type Porcelain Bushing.
240	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	47	1.43.02	750kVA shall be supplied to feed essential auxiliaries of FGD systems in case of blackout/grid failure.	Bidder proposes to size DGs based on actual load requirement as per sizing criteria mentioned in the technical specification. Owner may please accept the same.	Capacity of DG set to feed essential auxiliaries of FGD systems in case of plant safe shut down shall be based on actual load requirement plus 20% design margin as per the approved sizing calculation during detail engineering.

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241	Vol-III Part-B Section-1 / Electrical Technical Specification	3.00.00 POWER TRANSFORMER	128	3.15.02(viii)	The following Type test will be carried out for at least one transformer for MVA rating equal and greater than 5MVA. (viii) Short circuit test	Transformer Manufacturers in India are not willing to perform short circuit test and are not quoting for projects where short circuit test is required. Hence, there is no such supplier available in India who can follow tender specification requirement. In view of the above, the GT and ST manufacturer will submit Annexure-J as per CEA specification for waiver of Short circuit test and prove its design is similar to referenced Short circuit tested transformer design, this procedure has been accepted by NTPC and other SEBs. Owner may please accept.	For GT and ST only, successful bidder shall submit Annexure-J as per CEA specification for waiver of Short circuit test and prove its design is similar to referenced Short circuit tested transformer design. The validity of the same shall be as per the latest CEA guideline and it's revision from time to time.
242	Vol-III Part-B Section-1 / Electrical Technical Specification	3.00.00 POWER TRANSFORMER	136	Annexure-1	Technical Specification for Nitrogen Injection Fire Protection System (NIFPS) for Transformers including Generator transformers,(Including Spare GT), Station transformers, Unit transformers and all transformers rated **10 MVA & above** Located Outside Main Plant Boundary, against the transformer explosion which shall use nitrogen as quenching medium.	Owner is requested to consider use of Nitrogen injection fire protection system (NIFPS) only for transformers rated 100 MVA and above, which is as per SEBs' tenders. Owner may please accept the same.	As per CEA Regulation 2023; 46. 2. (ix) i.e. every transformer of 10 MVA or reactor of 10 MVAR and above rating shall be provided with automatic fire fighting system as per relevant standards. Also, necessary provisions of IS 3034 shall be followed.
243	Vol-III Part-B Section-1 / Electrical Technical Specification	3.00.00 POWER TRANSFORMER	137	Annexure-1 2.00.00(k)	PERFORMANCE k. All outdoor panels shall have **IP 56** degree of protection.	Owner is requested to consider IP 55/55W degree of protection in case of Nitrogen injection fire protection system (NIFPS), which is inline with general requirements. Owner may please accept the same.	Tender terms & condition prevails.
244	Vol-III Part-B Section-1 / Electrical Technical Specification	4.00.00 IPBD, NGT, LASCPT	141	4.03.01	IPBD shall be rated for short circuit duration of **3 seconds**.	Owner is requested to consider short circuit duration of one second, which is as per NTPC and other SEBs standards. Owner may please accept the same.	Tender terms & conditions prevails for designing the short circuit withstand duration of 3 secs. However testing of Busduct short circuit withstand duration shall be as per standards/accredited NABL lab.
245	Vol-III Part-B Section-1 / Electrical Technical Specification	5.00.00 AUXILIARY POWER & SERVICE TRANSFORMERS	165	5.05.02	Core i) The core shall be constructed from high-grade non-aging, low loss, high permeability, cold rolled, super grain oriented, silicon steel laminations, known as **HI-B steel trade name.**	Owner is requested to consider steel laminations of M4 grade or better quality, which is as per NTPC and other SEBs standards. Owner may please accept the same.	Noted for Auxiliary & Service Transformers. However, for GT, ST & UT the clause number 3.04.04 shall be read as " the core shall be constructed from high-grade non-aging, low loss, high permeability, cold rolled, super grain oriented, silicon steel laminations, known as HI-B steel trade name."

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246	Vol-III Part-B Section-1 / Electrical Technical Specification	5.00.00 AUXILIARY POWER & SERVICE TRANSFORMERS	166	5.05.05	i) Bushings The electrical & mechanical characteristics of bushings shall be in accordance with IS: 2099, IS: 3347 & IS: 12676. Bushings of rating below 52 kV shall be **RIP type.**	Owner is requested to consider bushings of oil communicating / OIP (non-oil communicating type) / epoxy RIP type, which is as per NTPC and other SEBs standards. Owner may please accept the same.	For Transformer bushing rated 52kV and above shall be RIP/RIS type. For transformer bushing rated below 52kV shall be RIP/Oil communication type Porcelain Bushing.
247	Volume-II, Section-2 Volume-II, Section-2	LEAD TECHNICAL SPECIFICATION LEAD TECHNICAL SPECIFICATION	113 112	9.02.37 9.02.37	xi) As a safety requirement, fire wall shall be provided on 'A' row of PHB in front of power transformers. x) Transformers shall be separated from the adjacent building/structure and from each other by a minimum distance, as mentioned below or by a fire wall of minimum two hours fire resistance rating of minimum height 600mm above bushing / pressure relief valve vent, whichever is higher.	Please note that if transformers are placed with clear distance as mentioned in Clause no.:9.02.37, point no. (x) from A-row of TG building, then bidder shall not provide fire wall. Owner may please accept.	It shall be decided during detail engineering as per applicable IS and its latest amendment.
248	Volume-II, Section-2	9.00.00 LT SERVICE TRANSFORMERS	115	9.02.39	xv) Separate cable tray for optical fibre cable / UTP cable shall be provided.	Bidder proposes that the optical fibre cable/UTP cables shall be routed in Instrumentation cable trays, wherever it is available. Owner may please accept.	Noted
249	Volume-III, Part-B, Section-1	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	16	1.13.02	The isolated phase bus ducts shall run partly indoor and partly outdoor. The isolated phase bus ducts on generator neutral side shall be complete with generator neutral side current transformers, neutral point formation and neutral bushing of appropriate voltage class.	Bidder would like to clarify that as per Generator OEM proven practice, protections, metering and AVR CTs for generator shall be mounted within the generator turret only. Bidder would like to propose protections, metering and AVR CTs for generator as per OEM proven practice. Owner may please accept.	For Generator CT's mounting as per OEM design shall be allowed however, it shall not be confined and shall be easily approachable for maintenance/replacement.
250	Volume-III, Part-B, Section-1	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	21	1.13.03	The IPBD shall be based on following factors: i) Continuous current rating with 10 % design margin as per IS 8084	Bidder proposes to size IPBD for the maximum gross power output(VWO) with minimum voltage from generator without any margin in line with standard engineering practice considering worst case scenario. In no case, current through IPBD will exceed this calculated value. Owner may please accept.	Design margin of 2.5% shall be considered

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251	Volume-III, Part-B, Section-1	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	27	1.18.00	1.18.00 …….. 415V system shall limit the earth fault current to 400A (max.) for 10 secs.	LV system is solidly grounded and LV emergency system is ungrounded. Hence, this clause description is not applicable for this project. Owner may please confirm.	Tender conditions specified in 1.05.00 system particulars are self explanatory and shall be followed.
252	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	27	1.19.00	1.19.00 SEGREGATED PHASE BUS DUCTS Segregated phase bus duct shall be rated for secondary side current of transformer at minimum tap plus 10% margin rounded off to the next higher rating.	Bidder proposes to select the bus rating of segregated phase bus duct considering the selected rating of LV winding of the transformer without any margin as the margin would already be applied while selecting the transformer rating. Adding further margin over selected transformer rating would result in double margin. Owner may please accept.	Tender terms & condition prevails.
253	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	27	1.20.04	1.20.04 The incomers and bus bars of 11 kV switchgear shall be sized (continuous thermal rating) as per the LV winding current rating of UT or ST at minimum tap with 10% margin rounded off to the next higher rating.	Bidder proposes to select the bus rating of switchgear considering the selected rating of LV winding of the transformer without any margin as the margin would already be applied while selecting the transformer rating. Adding further margin over selected transformer rating would result in double margin. Owner may please accept.	Tender terms & condition prevails.
254	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	37	1.30.09	The minimum sizes of L.T power cable to be chosen are as below:- AL - 16 mm2 (3 core) & Cu - 2.5 mm2 (3 core)	Bidder request to allow AL cable from 6 sq mm selected after meeting the design criteria specified in the tender specification. Owner may please accept.	Final cable size shall be as per the cable sizing criteria and laying conditions as per relevant standard. However, cable size as shown in the specification shall be considered as minimum.
255	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	41	1.35.02	minimum nominal diameter/hume pipes of the plastic ducts shall be 125 mm. A 75 mm galvanized steel conduit shall also be installed where required for digital and analog low level circuits requiring noise immunity from adjacent power circuits.	Bidder proposes that 75mm and 100mm dia.of PVC conduits shall also be used in duct banks where ever requirement is lesser. Owner may please accept.	Tender terms & condition prevails.
256	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	43	1.36.03 Point no. (iii)	The minimum design vertical spacing for trays shall be 300 mm measured from the bottom of the upper tray to the top of the lower tray.	Bidder proposes to provide 300mm spacing between bottom of upper tray to bottom of lower tray in horizontal run of cable trays and 100mm spacing between bottom of upper tray to top of lower tray in vertical run of cable trays as per standard engineering practice. Owner may please accept.	Tender terms & condition prevails for both horizontal and vertical trays.

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257	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	35	1.25.09	1.25.09 LV Power Supply LV power supply feeders shall have moulded case circuit breaker (MCCB) with ECB for over current & short-circuit protection.	Bidder understands that only MCCB to be provided. Owner may please confirm.	Tender terms & condition prevails.
258	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	35	1.26.03	i) Control of incomers and bus-coupler breakers of LV Switchgear shall be possible from the ECP and DCS. Dedicated and separate Check synchronizing relay shall be housed in the respective switchboards. Relay based synchronisation relays shall not be used.	Bidder proposes the synchronisation check as part of numerical relays as per current industry practice. For EDG incomers, dedicated synchronizing scheme shall be provided as per specification. Owner may please accept.	Bidder's proposal is not correct, Bidder to comply the tender terms & conditions.
259	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	35	1.26.04	Online resistance (IR) monitoring in all HT motors of 3.3kV & above	Use of Online resistance (IR) monitoring is not envisaged in HT motors as per standard industry practice and hence Bidder requests Owner to exclude the same from bidder's scope.	Online resistance (IR) monitoring in all HT motors of 3.3kV & above is excluded from the scope
260	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	38	1.27.05	Locked rotor current of the LV motor shall not exceed 600% of full load current subject to 20% IS tolerance.	Bidder proposes to follow the locked rotor current for LV motor corresponding to IE3 efficiency class. Owner may please accept.	Noted IS: 12615 for LT energy efficient motors. For other motors kindly comply tender terms & conditions for LRC.
261	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	45	1.33.01	v) The termination kits shall be suitable for termination of the cables to indoor switchgear or to a weatherproof cable box of an indoor/outdoor mounted transformer/motor. The short circuit fault withstanding capacity of the termination kits shall be as per the system fault level. The termination kits shall preferably be as of the following types:- a) PUSH ON type for LV power cables	Bidder proposes to provide cable lugs for termination of LV power cables as per standard industry practice. Owner may please accept.	Tender terms & condition prevails.
262	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	46	1.34.03 1.35.00	1.34.03 Galvanized rigid steel conduit shall be used for all conduit encased in concrete and all exposed conduit except at cooling towers. 1.35.02 All underground duct banks shall consist of plastic conduit encased in reinforced concrete.	There is discrepancy between referred clauses. Bidder proposes to use HDPE for conduits encased in Duct bank/Concrete. Owner may please confirm.	Tender terms and conditions prevails. Different materials of conduits are specified for various areas as specified in Cl. 1.34.03 & 1.35.00.

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263	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	50	1.38.06	1.38.06 For yard illumination, flood lights would be installed at suitable locations to provide the requisite level of illumination. Pole-mounted high-pressure sodium vapor fixtures would be used for approach roads.	Bidder understands that all lights shall be LED type only. Owner may please confirm.	Noted. However, Flameproof enclosure/fixture shall be provided for lighting in Explosive gas zone/Fire hazardous area as per latest applicable standards and safety regulations.
264	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	51	1.42.01	1.42.01 Variable speed drive system shall be provided as per the mechanical/ electrical system as well as other technological requirement shall be supplied by Bidder. VFD panels for these applications shall be located in Main Control Room/concerned area Control Room under air conditioned atmosphere. All HT & LT VFD's shall have Auto/manual bypass DOL starter facility, so that in case of any problem in VFD, the system shall run through DOL starter. In case where bypass starter is not possible, then spare/standby VFD shall be provided. VFD for RAPH feeder shall be considered and this VFD shall be located in central control room.	Bidder understands that bypass DOL starter is not applicable for MV VFD as per standard industry practice. Owner may please confirm.	Tender terms & condition prevails.

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265	Vol-III Part-B Section-1 / Electrical Technical Specification	3.00.00 POWER TRANSFORMER	110	3.04.10	3.04.10 Cooling System i) Cooling equipment for Generator Transformer ii) Generator Transformer cooling shall be OFAF. The cooling system for each single-phase transformer shall be independent & complete in itself. iii) 2 nos. of 60% capacity radiators. Each radiator shall be provided with 2x100% capacity oil pump. One standby pump which would automatically come into operation, in case of failure of the running pump will be provided. Each bank will have one standby fan or 20% capacity standby fans (whichever is higher), which would automatically come into operation, in case of failure of any of the fan in the radiator bank. iv) In addition cooling equipment shall conform to the requirement stipulated below: a) Transformer cooling shall be affected by use of a No. of detachable type unit coolers. Capacity of each cooler shall be limited to maximum of 20% of the total cooling requirements. The coolers shall be tank mounted.	Bidder understands that the clause is specifying contradicting requirement. Bidder proposes to supply unit coolers for GT. Owner may please accept.	The referred claus 3.04.10 shall be either for provisioning of Radiators or alternatively for Unit coolers. It shall be noted that Total capacity of unit coolers furnished for each transformer shall be minimum 120% of actual requirements i.e. 6x20% unit coolers.
266	Vol-III Part-B Section-1 / Electrical Technical Specification	9.00.00 LT SERVICE TRANSFORMERS	114	9.02.39, Point no.: iii)	Trestle height in outlying area shall be 5.0m (BoS).	Bidder proposes that in the outlying areas the trestle height of 2 meter will be provided as per standard industry practice. Owner may please accept.	The referred clause is not related with trestle . Bidder to refer tender Volume III, Part B, Cl. 17.09.02 for trestle clearance.
267	Volume-III, Part-B, Section-1 _____ Volume-III, Part-B, Section-1	TECHNICAL SPECIFICATION ELECTRICAL _____ TECHNICAL SPECIFICATION ELECTRICAL	114 ____ 63	9.02.39, Point no.: ix) _____ 7.27.03	A walkway of 800mm width (minimum) with hand rails and toe guards shall be provided all along length of the trestle for maintenance of cables and pipes. Ladders for approach to these platforms shall be provided near roads, passage ways. Gratings shall be provided for all external walkways. _____ The width of the Gallery shall vary depending on the functional requirement. A walkway of minimum width 600mm shall be provided along the Cable Trays supporting floor of the gallery.	Bidder proposes that hand rails & toe guard for the same may be avoided all along the length of the gallery, where walkway is between the vertical cable trays. Bidder also proposes that minimum 600 mm width of walkway shall be provided for maintenance of cables as per referred clause no. 7.27.03. Owner may please confirm.	The referred cl. 7.27.03 under Part B, section-1 is not related with the walk way. Bidder to comply tender NIT , Volume II, section-2, Cl.09.02.39.

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268	Volume-III, Part-B, Section-1	4.00.00 IPBD, NGT, LASCPT	143	4.00.00	4.00.00 GENERAL INFORMATION TO BIDDER The bidder is advised to visit project site and get detail information/drawings and make comparative study of connections, orientation of marshalling box/cubicle & conservator, existing foundation plan and location of fire wall etc. The bidder shall offer the system for as a standalone one to existing transformer i.e. there will be no need to change the existing foundation, LV side bus duct connection and external cable connection etc.	Bidder understands that following paragraph of referred clause is not applicable for this project: "The bidder shall offer the system for as a standalone one to existing transformer i.e. there will be no need to change the existing foundation, LV side bus duct connection and external cable connection etc." Owner may please confirm.	Noted.
269	Volume-III, Part-B, Section-1 Volume-III, Part-B, Section-1	TECHNICAL SPECIFICATION ELECTRICAL TECHNICAL SPECIFICATION ELECTRICAL	166 240	5.01.03 9.00.00	5.01.03 LT Auxiliary service transformers shall be three phase, two winding, 11/0.433kV or 3.3/0.433kV , Dyn11, 50HZ, ONAN cooled with ±5% off circuit taps in steps of 2.5% on HV side. LV system shall be solidly earthed. Also refer section 9.00.00 (LT service Transformers) for design criteria and other technical details of LT Auxiliary service transformers. The scope of supply shall include Cast Resin Encapsulated dry type indoor transformers of ratings to be decided by the Bidder based on selection criteria given in this specification.	Bidder understands that these two clauses are contradicting the requirement. Bidder proposes to provide all LV service transformer with AN cooling as indicated in single line diagram. Owner may please confirm.	Bidder to follow both the clauses specified in tender terms & conditions. Dry type transformers shall be provided on all the main plant and indoor areas. However for any balance of plant - offshore outside areas, if oil type transformers are to be used, the same shall be ONAN.
270	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	381	17.03.06	ii) Power cables shall be generally laid on ladder type cable trays. For interplant connection cables shall be routed along overhead cable bridge. iii) Perforated type cable trays shall be used for Control cables. Even in cable risers perforated type cable trays shall be used for Control cables. iv) Cables shall be generally laid on overhead cable trays/cable trays in cable trenches.	Bidder would like to propose that Ladder type cable trays shall be used for Power & control cables and Perforated type cable trays shall be used for Instrumentation cables. However, In vertical cable tray risers, Ladder type cable trays shall be used for Power, control & Instrumentation cables. Bidder also proposes that for interplant raceway connection, Cable shall be routed through Aboveground & Underground raceway arrangement as per requirement. Owner may please confirm	Tender terms & condition prevails.

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271	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	397	17.09.02 Point no.: xi)	Bidder shall provide two independent routes for cables between Switchyard Control Room & Main Plant Control Room. Bidder shall provide the cable trays along with its supporting structure arrangement on the trestle.	Bidder would like to clarify that cables between Switchyard control room & Main plant control room shall be routed in separate cable trays in overhead trestle / Duct bank area. Please confirm.	Noted.
272	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	397	17.09.02 Point no.: xii)	a) Cable vault of not less than 3.5 metres clear height shall be provided.	Bidder understands that 3.5M height is between floor to floor for cable vault area. Owner may please confirm.	Tender terms & condition prevails.
273	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	404	17.14.02	Laying of cables directly buried in ground is not acceptable.	Bidder proposes Owner to allow for the directly buried cables in ground for outdoor/remote area. Owner may please accept.	Tender terms & condition prevails.
274	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	532	24.03.09 Point no.: ii)	vii) Structures, Bus Duct Control Panels, Cable Trays etc. 75x10 mm Flat Galvanised Steel xii) Cable trays - 40x6 mm Flat Galvanised Steel	Bidder would like to clarify that 40x6 mm GS flat shall be used for the cable trays earthing as per referred clause no.:24.03.09 point no (xii) . Owner may please confirm.	Noted.
275	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	536 ___ 538	24.03.13 Point no.: iv) _____ 24.03.18 point no.:(x)	All the vertical air terminal rods shall be electrically connected together by means of horizontal conductors of size 50 x 6 mm galvanized steel flats. _____ x) The sizes and materials of earthing conductors to be used in lightning protection system are listed below:- 1) Horizontal air termination and down conductors for buildings, boilers and other tall structures- 25 x 6 mm- GI Flat	Bidder would like to clarify that 25x6 mm GI flat shall be used for Horizontal air termination and down conductors for buildings & other structures as per referred clause no.:24.03.18 point no.:(x), Table-Point no.(1) . Owner may please confirm.	Bidder to follow tender Cl.24.03.13, (iv).

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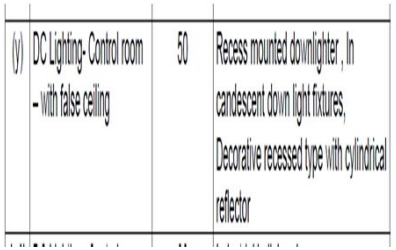
Sr. No.	Section No. / Section Title	Sub Section No. / Sub Section Title	Page No.	Clause No.	Bid Specification	Bidder's Query	Pre-bid Resolution
276	Vol-III Part-B Section-1 / Electrical Technical Specification	6.00.00 NEUTRAL GROUNDING RESISTORS	243	6.03.01	The transformer shall be capable of continuous operation at specified rating under the following conditions : i) Voltage variation -- +/- 10% ii) Frequency variation -- +/- 5% iii) Combined voltage and Frequency variation (absolute sum) -- 10%	Discrepancy is observed in selection of frequency variation. (as per Vol-III, General Technical Requirements - Electrical, Cl. No. 1.05.00, system particulars, which indicates frequency variation is +3% and -5% for 400kV, 11kV, 6.6/3.3kV and 415V systems. Owner is requested to clarify.	For Generator & GCB the frequency variation shall be +3% and -5% and for all other systems shall be +/- 5%
277	Volume-III, Part-B, Section-1 Volume-III, Part-B, Section-1	TECHNICAL SPECIFICATION ELECTRICAL TECHNICAL SPECIFICATION ELECTRICAL	524 524	Illumination Level Table Sl No.(y) DC emergency lighting table Sl No. 1.	 (y) DC Lighting- Control room - with false ceiling 50 Recess mounted downlighter, In candlescent down light fixtures, Decorative recessed type with cylindrical reflector DC Emergency Lighting Sl. No. Area Average Lux Level 1. Unit Control Room 100	There is discrepancy between referred clauses regarding illumination requirement in control room through DC lighting Owner is requested to clarify.	Bidder to follow tender CL. DC emergency lighting table Sl No. 1. as 100 lux for control room.
278	Vol-III Part-B Section-1 / Electrical Technical Specification	8.00.00 11KV & 6.6/3.3 KV SWITCHGEAR	207 208	8.03.10 '8.04.01	8.03.10 Continuous Current Ratings i) The continuous rating of the 11 and 6.6/3.3kV switchgear buses and incomer breaker shall be based on the rated LV winding current of the transformer at its lowest tap position with 20% margin rounded off to the next higher standard rating. 8.04.01 v) Forced cooling for HV breakers (11 kV & 6.6/3.3 kV) and HV switchgear is not acceptable.	Bidder proposes to select the bus rating of switchgear considering the selected rating of LV winding of the transformer without any margin as the margin would already be applied while selecting the transformer rating. Adding further margin over selected transformer rating would result in double margin. Addition of both margin is resulting the LV incomer breaker size to go beyond available rating with naturally cooled. Forced cooling is not allowed as per tender specification and not recommended by bidder too. Owner may accept the proposal of not applying any margin over selected transformer rating for selecting breaker and bus rating for switchgears	Tender terms and conditions prevails

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Sr. No.	Section No. / Section Title	Sub Section No. / Sub Section Title	Page No.	Clause No.	Bid Specification	Bidder's Query	Pre-bid Resolution
279	Vol-III Part-B Section-1 / Electrical Technical Specification	8.00.00 11KV & 6.6/3.3 KV SWITCHGEAR	209	8.04.02	8.04.02 Bus and Bus Taps i) The main buses and connections shall be of high conductivity copper for current rating above 2000Amps and aluminium alloy for lesser rating, sized for specified current rating with maximum temperature limited to:- a) 90°C (i.e. 40°C rise over 50°C ambient)- For bolted joints (Plain or tinned) b) 105°C (i.e. 55°C rise over ambient 50°C)- For bolted joints (Silver Plated) c) 85°C (35°C rise over ambient 50°C)-For busbar	Based on manufacturer's feedback, bidder would like to clarify that the bus bars are designed for individual panels & runs through the complete panel line-up and needs to be bolted at all the panels individually phase wise. The temperature rise observed at the bus bar joining is usually higher compared to locations other than non-joining parts. As per tender specifications, the temp. rise allowed at bus bar joints is 55 deg. C (above ambient of 50deg. C) with silver plated joints. But the rise allowed on Bus bar surface is only 35 deg. C. During temperature rise test, the temperature recorded at joints were highest and at bus bar near to joints were near to the temperature of joints. Due to thermal conductivity characteristics of bus bar, the temperature at bus bar near to joints usually is similar to the temperature which gets recorded at joints. Practically the distance between joint is less hence the part of bus bars where joints are not present will have almost the same temperature as that of nearby joint. In view of above, Bidder requests Owner to accept the temperature rise of Bus bar as 105°C (i.e. 55°C rise over ambient 50°C). Further, Bidder confirms that considering high conductivity aluminium/aluminium alloy main buses, the temperature shall be limited to 105°C for joints (Silver plated) and Bidder will meet temperature rise requirement as per IEC for all other areas. Owner may please confirm.	8.04.02 (c) to be deleted.
280	Vol-III Part-B Section-1 / Electrical Technical Specification	8.00.00 11KV & 6.6/3.3 KV SWITCHGEAR	224	8.04.12	viii) Motor feeders. m) Winding temperature n) Bearing temperature	Bidder understands that winding and bearing temperature will be monitored in DCS. Hence, Wiring and bearing RTD input will not be wired to numerical relay. Owner may please confirm.	Noted

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281	Vol-III Part-B Section-1 / Electrical Technical Specification	9.00.00 LT SERVICE TRANSFORMERS	245	9.01.12	switchgear, 2X100% rated transformer shall be considered. Each Transformer shall be rated to meet the loads connected on both the bus sections of switchgear with 20% design margin on total load of 9.01.12 MVA Rating i) The Quantity and rating of the 11/0.433 kV service Transformers shall be based on the actual load figures and 100% redundancy. For each Transformer. Standby motors will be considered for Transformer sizing, maximum 70% loading of standby motors shall be considered	Bidder proposes not to consider any loading for standby motors while sizing the transformer as a general practice. Owner may please accept.	Tender terms and conditions prevails
282	Vol-III Part-B Section-1 / Electrical Technical Specification	9.00.00 LT SERVICE TRANSFORMERS	248	9.03.11	9.03.11 Current density for H.V and L.V windings of all transformers should not exceed 2.08 A/Sq.mm.	Bidder proposes to consider 2.8 A/Sq. mm. as standard design. Owner may please accept.	Noted.
283	Vol-III Part-B Section-1 / Electrical Technical Specification	11.00.00 415 SWITCHGEARS AND DC BOARDS	276	11.05.08	11.05.08 Busbar for PCC/PMCCs being fed from service transformers shall be sized based on the rated continuous LV winding current of the transformer with 20% margin and rounded off to the next higher standard rating.	Bidder proposes to select the bus rating of switchgear considering the selected rating of LV winding of the transformer without any margin as the margin would already be applied while selecting the transformer rating. Adding further margin over selected transformer rating would result in double margin. Owner may please accept.	Tender terms and conditions prevails

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284	Vol-III Part-B Section-1 / Electrical Technical Specification	TECHNICAL SPECIFICATION ELECTRICAL	43 286 392	1.30.11 11.06.15 17.04.03	1.30.11 The fire survival power & control cables suitable for withstanding 750°C temperature for three (3) hours shall be used for the following important auxiliaries/areas: …… '11.06.15 iii) All cable for DC system shall be F.S. copper cable 17.04.03 Cables for the following systems shall be fire survival type Fire Survival Cables shall be used for important auxiliaries / area as recommended by Standard Technical Specification and CEA as below for the following: Fire Survival Power & Control Cables shall be used for important auxiliaries/areas like:	Bidder understands that fire survival cable will be provided as per clause number 1.30.11 only as per CEA guidelines. Other clauses will not be applicable. All power cables of 220V DC, 24V DC & UPS will not provided as fire survival cable. Owner may please confirm.	Noted. However, latest CEA guidelines and it's amendments from time to time shall be followed during detailed engineering.
285	Vol-III Part-B Section-1 / Electrical Technical Specification	TECHNICAL SPECIFICATION ELECTRICAL	306	15	1.05.00 SYSTEM PARTICULARS System particulars are as follows: 220 V DC System : 25 kA $$ for 1 second Note: $$ denotes fault level at DCDB level shall be 25kA while at DLDB level fault level shall be 9kA. DATA SHEET FOR 415V PCC/PMCC/MCC/DBs 8 Short circuit level : 50 kA (rms) at 415 V	For DCDB short circuit rating shall be 25kA as per clause no. 1.05.00. Owner may please confirm.	Clauses are self explanatory
286	Vol-III Part-B Section-1 / Electrical Technical Specification	14.00.00 AC & DC MOTORS	335	14.17.03	14.17.03 However temperature rise shall be restricted to limits corresponding to Class 'B' insulation for both MV, HV & LT motors. The temperature under abnormal running conditions shall be limited to 5oC above class 'B' limits.	Bidder understands that the temperature under abnormal running conditions shall be limited to 5 Deg C above class 'B' limits. Owner may please confirm.	Bidder's understanding is correct.

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Sr. No.	Section No. / Section Title	Sub Section No. / Sub Section Title	Page No.	Clause No.	Bid Specification	Bidder's Query	Pre-bid Resolution
287	Vol-III Part-B Section-1 / Electrical Technical Specification	15.00.00 ELECTRICAL ACTUATORS - NON INTEGRAL STARTER	350	15.03.01	15.03.01 The actuator shall be Non integral type and suitable for operation in a hot, humid and tropical atmosphere, highly polluted at places with coal dust & fly ash and shall be suitable for an ambient temperature ranging from (-) 20 deg C to (+) 70 deg C.	Bidder proposes to provide integral type actuator as per current industry practice. Owner may please accept.	Tender terms & condition prevails.
288	Vol-III Part-B Section-1 / Electrical Technical Specification	15.00.00 ELECTRICAL ACTUATORS - NON INTEGRAL STARTER	351	15.06.01	ix) Actuators shall be non-integral type with starters located in separate MCCs/ separate Gate Valve damper control room in switchgear room/ control room.	Bidder proposes to provide integral type actuator as per current industry practice. Owner may please accept.	Tender terms & condition prevails.

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289	Volume-III, Part-B, Section-1 Volume-III, Part-B, Section-1 Volume-III, Part-B, Section-1 Volume-III, Part-B, Section-1	TECHNICAL SPECIFICATION ELECTRICAL TECHNICAL SPECIFICATION ELECTRICAL TECHNICAL SPECIFICATION ELECTRICAL TECHNICAL SPECIFICATION ELECTRICAL	16 42 385 387	1.08.00 1.30.02 '17.03.02 '17.03.06	1.08.00 FAULT LEVEL vii. Cables to the feeders protected by breakers - Main protection fault clearing time with 0.16 second minimum 1.30.02 The fault current & interrupting time shall be as under:- i) For 11kV & 6.6KV– 50kA - 0.2 sec for outgoing motor feeders and transformer feeders and 1sec-for tie and incomer feeders. ii) For 3.3kV -40kA - 0.2 sec for outgoing motor feeders and transformer feeders and 40kA-1 sec-for incomers & tie feeders. iii) For 415V - 50kA - 0.25 sec for motor feeders and 50kA-1sec-for incomer & tie feeders. 17.03.02 Power cables shall be sized to withstand the system fault current for the fault clearing time indicated below: i) Breaker operated Motor feeders and transformer feeders: 0.16 second. ii) Breaker operated outgoing feeders: 0.5 second. iii) Tie between two switchgear: 0.5 second. iv) Incomers: 1 second. 17.03.06 xvii) For breaker protected circuits minimum size of the cable shall be as follows:	Bidder proposes to consider 0.16 sec as fault clearing time for breaker operated feeders for selecting minimum cable size. Owner may please accept.	Bidder to follow tender specification Cl.1.30.02 for sizing.

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290	Vol-III Part-B Section-1 / Electrical Technical Specification	TECHNICAL SPECIFICATION ELECTRICAL	278 ____ 420	11.06.02 _____ 18.04.03	11.06.02 Emergency MCC v) All service like essential motors for safe shutdown of the unit, UPS incomers, battery charger AC supply, lighting, etc. shall be connected to this MCC. DG supply shall be extended to emergency MCC in less than 15 sec from loss of power. _____ 18.04.03 Diesel Generator Sets capable of starting and picking up the load within 30 seconds	Bidder proposes that the starting time for EDG shall be as per OEM's standard design. Owner may please accept.	The Clause 11.06.02 v) shall be read as *"All service like essential motors for safe shutdown of the unit, UPS incomers, battery charger AC supply, lighting, etc. shall be connected to this MCC ."* The Clause 18.04.03 shall be read as *"Diesel Generator Sets capable of starting and picking up the load within 30 seconds."*
291	Vol-III Part-B Section-1 / Electrical Technical Specification	29.00.00 400KV GAS INSULATED SWITCHGEAR	600	29.05.01	xvii) Controlled Switching Device (CSD) of proven make shall be provided for 400 kV GIS GT and ST bays.	Bidder understands that along with the GT and ST bay Circuit breakers, associated tie breakers shall also be equipped with CSD. Owner may please confirm.	Noted & confirmed.
292	Vol-III Part-B Section-1 / Electrical Technical Specification	29.00.00 400KV GAS INSULATED SWITCHGEAR	602	29.05.02	Grounding switches located at the entrance of the transmission lines, EHV Cables and at busbar shall be of high speed, make proof type and shall be used to discharge the respective charging currents in addition to their safety grounding function.	Bidder understands that grounding switches located only at the entrance of the transmission lines, EHV Cables and at busbar shall be of high speed while all other grounding switches shall not normal maintenance type. Owner may please confirm.	Noted
293	Vol-III Part-B Section-1 / Electrical Technical Specification	29.00.00 400KV GAS INSULATED SWITCHGEAR	623	Annexure-B	-	Owner may please clarify the requirement of PIR for the circuit breakers.	PIR shall be provided for Two outgoing lines plus two Spare Bays including TIE breakers.
294	Vol-III Part-B Section-1 / Electrical Technical Specification	29.00.00 400KV GAS INSULATED SWITCHGEAR	625	Annexure-B	-	Owner may please provide endurance class of disconnecting switch, maintenance grounding switch and fast acting grounding switch.	M2 & E2 endurance class shall be considered for all disconnecting switches and grounding switches.

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295	Vol-III Part-B Section-1 / Electrical Technical Specification	29.00.00 400KV GAS INSULATED SWITCHGEAR	626	Annexure-B Cl No- 3.8	Rated Short time current for 3 secs: 63kA (for disconnecting switch)	Bidder would like to clarify that In line with Vol-III, part B, section-1, Cl No- 1.05.00, 400kV GIS system shall be designed for short circuit level of 63kA for 1 sec. However, all the 400kV equipment (Circuit breaker, disconnector, earth switches, CT and CVT) shall be designed at 63kA for 3 sec fault level as per datasheets given for respective equipment under annexure. Owner may please reconfirm. Further, Bidder propose to keep **63kA for 1 sec** short circuit level for GIS and outside GIS equipment. Owner may please accept and issue amendment.	Noted 63 kA for 1 sec shall be followed for GIS.
296	Vol-III Part-B Section-1 / Electrical Technical Specification	29.00.00 400KV GAS INSULATED SWITCHGEAR	629	Cl No-6.6 of Annexure-B _____ Cl No- 1.02.00 of Annexure-C	Cl No- 1.02.00: "Both Main 1 and Main 2 relays shall have both Distance Protection 21M1 & 21M2) as well as line Differential Protection (87L1 & 87L2) elements.". _____ Cl No- 6.6: Core-1 : Main-I Distance Protection Core-2 : Main-II Distance Protection, Bkr. Failure * Directional O/C & E/F Core-3 : Tariff metering.	In Cl No- 1.02.00, it is mentioned that distance and differential both protection required in both relays (main 1 & main 2). However, in Cl No- 6.6 only distance protection is mentioned. Bidder understands that clause number 1.02.00 to be followed. Owner may please confirm.	Confirmed for CL. 1.02.00
297	Vol-III Part-B Section-1 / Electrical Technical Specification	30.00.00 400KV AIS SWITCHYARD EQUIPMENT & ACCESSORIES	719	Cl No- 30.01.01, point No- (a)	400 kV switchyard structures and bus work for Two (2) line feeders as indicated in the SLD Switchyard.	Please provide following documents of existing 400kV switchyard. 1. Single Line Diagram 2. Overall Layout 3. Earthmat layout 4. Structure layout 5. Existing bus bar protection scheme	Email already sent on dtd. 12.03.2024. However, if further details are required, bidder shall collect the same from site.

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298	Vol-III Part-B Section-1 / Electrical Technical Specification	30.00.00 400KV AIS SWITCHYARD EQUIPMENT & ACCESSORIES	719	Cl No- 30.01.01, point No- (a)	400 kV switchyard structures and bus work for Two (2) line feeders as indicated in the SLD Switchyard.	Bidder understands that the existing Bus Gantries are designed for main bus and transfer bus extension for the tie bays. Owner may please confirm.	Bidder shall propose the option of AIS/GIS/Hybrid GIS for extension of existing 400kV AIS including interconnection with the proposed 400kV GIS based on the availability of space as ascertained during site visit by the Bidder and finalized plot plan by the bidder. In case of GIS, Two Main Bus system shall be considered provided submission of undertaking from OEM's regarding non availability of two main bus plus transfer bus system in GIS. For AIS/Hybrid GIS, the same shall be with Two Main and Transfer bus system as per existing system.
299	Vol-III Part-B Section-1 / Electrical Technical Specification	30.00.00 400KV AIS SWITCHYARD EQUIPMENT & ACCESSORIES	719	Cl No- 30.01.01, point no - (d)	FOTE communication & associated equipment for both ends of line feeders to avoid mismatch with other end. Proper coordination shall be made with 400kV GIS Switchgear end and 400kV Air Insulated Switchyard end.	Owner may please mention type of FOTE equipment and communication protocol of existing 400kV AIS switchyard.	Comply with tender. Existing details shall be obtained from site. Identical FOTE & PLCC shall be supplied loose for the GETCO end.
300	Vol-III Part-B Section-1 / Electrical Technical Specification	30.00.00 400KV AIS SWITCHYARD EQUIPMENT & ACCESSORIES	720	Cl No- 30.01.01, point no - (f)	Existing 400 kV AIS SCADA is not in working condition. Hence complete new SCADA system shall be considered for existing 400 kV switchyard Bays & New AIS Tie line Bays. The design and technical specification shall be as per the existing system and the SCADA specification specified in GIS chapter of this specification.	1. Bidder understands that a new Substation Automation System to be provided for existing 400kV by replacing the existing control system. Owner may please confirm. 2. Bidder also understands that a standalone Substation Automation System to be provided for new 400kV GIS. Owner may please confirm. 3. Owner is requested to please share following details to understand the complete requirement : - Architecture of existing control system of 400kV - Relay make and model number of all the IEDs of existing system	1.New SAS is not required for existing 400kV AIS Switchyard. SAS shall be provided for 400kV GIS plus 2 Nos tie line and bays(AIS/GIS) to be constructed in existing 400kV AIS. For new 400kV GIS provision for integration of all line, transformer, ICT and reactor bays shall be considered in the new SAS for two nos tie bays. If required, CVT or other equipment required for standalone operation of extended tie bays shall be considered in Bidder's scope. 2. Bidder understanding is correct. 3. Refer reply to above point no 1.
301	Vol-III Part-B Section-1 / Electrical Technical Specification	30.00.00 400KV AIS SWITCHYARD EQUIPMENT & ACCESSORIES	720	Cl No- 30.01.01, point no - (g)	Bus bar protection integration in the existing Stage's bus bar protection for all 220 kV / 400 kV bays under present scope shall be in bidder's scope.	Bidder understands that 220kV bays are not applicable for this tender. Owner may please confirm.	Noted.

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302	Vol-III Part-B Section-1 / Electrical Technical Specification	30.00.00 400KV AIS SWITCHYARD EQUIPMENT & ACCESSORIES	723	Cl No- 30.03.01, point no - (e)	Rated Short time withstand current capacity: 40kA for 3 sec (for 400KV AIS switchyard)	Short circuit level of 400kV AIS switchyard is 40kA for 3 sec and short circuit level of 400kV GIS is 63kA for 1 sec. In view of the same, the gantries for overhead tie connection from 400kV GIS to 400kV AIS shall be designed for 63KA for 1 sec. Owner may please confirm. Further, Bidder propose to keep **63kA for 1 sec** short circuit level for GIS and outside GIS equipment. Owner may please accept and issue amendment.	Noted 63kA for 1 sec shall be followed for GIS.
303	Vol-III Part-B Section-1 / Electrical Technical Specification	30.00.00 400KV AIS SWITCHYARD EQUIPMENT & ACCESSORIES	757	Cl No- 30.04.16	iv) Earth mat within the switchyard has to be extended by 1 metre beyond the fence, so as to ensure that the area in the vicinity of the substation fence is safe.	Bidder understands that earthing system design and installation shall be done only for new extended tie bays. Owner may please confirm.	Noted.
304	Vol-III Part-B Section-1 / Electrical Technical Specification	30.00.00 400KV AIS SWITCHYARD EQUIPMENT & ACCESSORIES	758	Cl No- 30.04.17	i) The lightning protection system shall be comprised of shielding mast, down conductor, riser and other accessories required for complete protection of the switchyard.	Bidder understands that lightning protection system design and installation need to be done only for new extended tie bays. Please confirm.	Noted.
305	Vol-III Part-B Section-1 / Electrical Technical Specification	30.00.00 400KV AIS SWITCHYARD EQUIPMENT & ACCESSORIES	767	Annexure-A, Cl No-2.0	Datasheet of disconnecting switch	Please provide endurance class of disconnecting switch.	Shall be M2 & E2
306	Vol-IV Bid drawings	Main single line diagram	31 of 39		-	The reference of Note for Line-3 and Line-4 which are connecting to the existing AIS seems to be incorrect. The correct reference shall be Note-17. Owner to reconcile the discrepancy and issue amendment.	Noted,. Refer Sr.no.17 under Note.
307	Vol-IV Bid drawings	Main single line diagram	31 of 39		-	Please differentiate the legend of fast acting grounding switch and maintenance grounding switch in "Main single line diagram".	Bidder shall propose in compliance with tender requirement as per cl. 29.05.02.
308	Vol-IV Bid drawings	Main single line diagram	31 of 39		-	As per Main single line diagram, only one number of CT is shown in line feeder, GT feeder and ST feeder. Bidder understand that CT shall be provided as per Cl No-6.6 of Annexure-B). Owner may please confirm.	SLD is only indicative. Bidder shall consider the CT's (minimum requirement) as per tender specification Cl No-6.6 of Annexure-B and as per system requirements .

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309	Vol-IV Bid drawings	Main single line diagram	31 of 39		-	Bidder understands that LA and CVT shown in main single line diagram shall be of outdoor type AIS equipment. Owner may please confirm.	Outdoor Gapless, zinc-oxide lightning arrestor of suitable rating shall be provided at the overhead line entry terminals and at cable entry terminals to GIS as per CL.29.05.09. All other shall be a part of GIS.
310	Vol-IV Bid drawings	Main single line diagram	31		-	Both the main buses are assigned as Main Bus - 2. Owner may please clarify which bus is Main Bus - 1. Owner to reconcile the discrepancy and issue amendment.	Noted, one of the bus shall be designated as Main Bus-1.
311	Vol-IV Bid drawings	Metering & protection SLD for generator, GT, UT and ST	33		-	Owner to please share typical protection and metering SLD for line feeders, spare feeders and tie feeders for proposed switchyard.	Bidder shall consider the same in compliance with the tender terms & conditions.
312	Vol-IV Bid drawings	Metering & protection SLD for generator, GT, UT and ST	33		-	In SLD only two number of secondary winding are shown in CVT. However, in Vol-III, part B, section-1, Annexure-B (Ratings & requirements), Cl No- 6.9 (pg no- 659), requirement of three CVT secondary winding are mentioned. Bidder understand that details mentioned under annexure-B shall be followed. Owner may please confirm.	Noted.
313	Volume V	Annexure 1		Plot Plan		Bidder understands that the GIS building location shown in plot plan is tentative and bidder may propose new location of GIS building as per suitability and feasibility within the available space. Owner may please confirm.	Plot plan is indicative and Bidder shall check the location proposed and suitably change the same as per site condition and their own experience and ease of design.
314	Volume-III, Part-B, Section-1 _____ VOL-IV ,Bid drawing _____ Volume-III, Part-B, Section-1	TECHNICAL SPECIFICATION ELECTRICAL _____ ETG106-EPC-EE-GN-SLD-001 Main Single Line Diagram_Rev-0 _____ TECHNICAL SPECIFICATION ELECTRICAL	240 _____ '2 of 2 _____ 26	9.01.04 _____ - _____ '1.22.02	**Service Transformers shall be indoor, three-phase, two winding 11/0.433 KV** _____ 6.6/0.433 KV LT Service transformer shown for CHP area in SLD _____ Power at 11000 level shall be transformed to 415V level through 11.0.433 KV transformers at various load centre to cater to the LT loads of plants and systems at and near the respective load centre	There is a discrepancy between the referred clauses. Owner may please clarify the applicability of 6.6KV/0.433V LT service transformer for CHP area. Clause number 9.01.04 can be reframed to read as below: "**Service Transformers shall be indoor, three-phase, two winding 11/0.433 KV or 6.6/0.433kV**"	Shall be as per SLD in case of CHP.

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Sr. No.	Section No. / Section Title	Sub Section No. / Sub Section Title	Page No.	Clause No.	Bid Specification	Bidder's Query	Pre-bid Resolution
315	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS - ELECTRICAL	37	1.30.09	Minimum size of LT power cable chosen as below AL - 16 mm2 (3 core) & Cu - 2.5 mm2 (3 core)	As per standard industrial practice kindly accept minimum size of LT power cable for aluminium as 6sqmm for 1C, 2C, 3C, 3.5C, 4C.Owner may please confirm.	Final cable size shall be as per the cable sizing criteria and laying conditions as per relevant standard. However, cable size as shown in the specification shall be considered as minimum.
316	Volume-III, Part-B, Section-1 _____ VOL-IV ,Bid drawing	TECHNICAL SPECIFICATION ELECTRICAL _____ 'ETG106-EPC-EE-GN-SLD-001 Main Single Line Diagram_Rev-0	207 _____ '2 of 2	8.04.04 xiv) _____ -	Vacuum contactor as an alternative to breaker is not acceptable _____ In single Line diagram of 6.6KV Switch gear for CHP Motor vacuum contactor with fuse is indicated	As there is a discrepancy between SLD and referred clause, Owner to please confirm whether vacuum contactor with Fuse is acceptable for CHP conveyor and crusher motor. Further due to frequent start stop for CHP Conveyor and Crusher motor, it is a general industrial practice to use vacuum contactor with Fuse. Owner may please accept and confirm	Vacuum contactor as an alternative to breaker is not acceptable. Please refer revised Main SLD enclosed in Amendment Electrical -Annexure 8.1 & 8.2
317	Volume-III, Part-B, Section-1 _____ Volume-III, Part-B, Section-1	TECHNICAL SPECIFICATION ELECTRICAL _____ 'TECHNICAL SPECIFICATION ELECTRICAL	33 _____ 29	1.27.06 _____ '1.25.07	Motors rated 18.5 KW and below shall be contactor controlled having MPCB incomer with contactor & EOCR-Electronic over current relay. Motor rated 18.5KW and above but below 90KW shall be vacuum contactor controlled having MCCB incomer with intelligent Motor controller. _____ MCCB with Contactor controlled LV Motor feeders (Motors rated above 18.5KW and below 50 KW) with intelligent Motor controller (IMC) and vacuum contactors for LV motor feeders rating 50 KW to below 90 KW with Intelligent motor controller (IMC)	1) There is a discrepancy in referred clause. Bidder understand that it is require to consider MPCB with contactor and EOCR-Electronic over current relay for motors up to and including 18.5KW. Owner to please confirm. 2) It is a standard industrial practice to use normal air contactor instead of vacuum contactor for all LT 415V motors excluding Air circuit breaker controlled motor. Owner to confirm the use of air break contactor for 415V LT loads below 90 KW.	Bidder to refer CL. 11.01.25, 11.01.27 & 11.01.28
318	Vol-III Part-B Section-1 / Electrical Technical Specification	22.00.00 BATTERY & BATTERY CHARGER	477	22.07.02	DC battery shall be stationary Lead acid plante positive plate type conforming to IS:1652	As per standard industrial practice, Bidder requests Owner to allow the option of providing either lead acid or Nickel cadmium type battery both for 220V DC supply.	Tender terms & condition prevails.
319	Volume-III, Part-B, Section-1 _____ VOL-IV ,Bid drawing	TECHNICAL SPECIFICATION ELECTRICAL _____ 'ETG106-EPC-EE-GN-SLD-001 Main Single Line Diagram_Rev-0	110 _____ '2 of 2	6.03.27 i) _____ -	The details of AC Distribution Board i.e. exact rating and no of feeders etc. of the 2x100% ACDB shall be as approved by owner during detail engineering _____ In single Line diagram one common ACDB is shown with Bus coupler	There is a discrepancy between the referred clauses. Owner may please confirm regarding requirement of single common ACDB with Bus coupler or two separate ACDB without bus coupler.	ACDB shall be with two incomer and buscoupler as per tender. The quantity and rating shall be decided during DE.

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320	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS - ELECTRICAL	27	1.24.02	All PCC/MCC/PMCC shall be of draw out type compatible with IEC-61850 communication protocol	1) As per Bidder's understanding IEC-61850 is applicable only for ACB module in PCC/MCC/PMCC with numerical relay. Owner to please confirm 2) Due to space constraint for panels, mounted on moving machines, such as stacker reclaimer, travelling trippers etc., same shall be non draw out, fixed type, single front and non intelligent type without spare feeders, inline with philosophy followed for on going projects. Owner may please accept.	1. Tender terms & conditions prevails. IEC 61850 is applicable for all numerical relays and Numerical/electronic meters. 2. Noted
321	Vol-III Part-B Section-1 / Electrical Technical Specification	11.00.00 415 SWITCHGEARS AND DC BOARDS	267	11.01.29	All PCC & PMCC shall be of single front construction	As per Bidder's understanding, only 415V Air circuit breaker switchgear panels in PCC and PMCC shall be of single front type whereas rest all panels of PCC & PMCC shall be of double front type. Owner may please confirm	Tender terms & conditions prevails.
322	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	397	17.09.02 viii)	No subzero level cable vault/trenches shall be provided below control building/Switch gear room s in main plant area.	As per Bidder's understanding subzero level cable trenches can be provided for CHP/FGD area substation buildings. Owner to please confirm.	Tender terms & conditions prevails.
323	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	383	17.03.06 xxv)	Motor rating cable size (i) 0-5.5kW 3C-2.5/4/6/10 mm² Cu as per voltage drop (ii) 5.6-11kW 3C-16 mm² Al (iii) 11.1-22kW 3C-35 mm² Al (iv) 22.1-45kW 3C-95 mm² Al (v) 45.1-75kW 3C-185 mm² Al (vi) 75.1-below 90kW 2x3C-185 mm² Al	As per bidder's understanding, cable size shall be as per actual cable sizing calculation based on voltage drop and ampacity. Owner may please confirm.	Final cable size shall be as per the cable sizing criteria and laying conditions as per relevant standard. However, cable size as shown in the specification shall be considered as minimum.
324	Volume-III, Part-B, Section-1 VOL-IV ,Bid drawing	TECHNICAL SPECIFICATION ELECTRICAL 'ETG106-EPC-EE-DC-SCH-003 DC System scheme	35 1 of 1	1.29.01	In addition, separate 2 x 100% rated 220 V Battery charger (Float and Float cum Boost) for each battery and 2 x 100% rated battery for catering DC loads of each Bop areas such as CHP, AHP,CW, Water system, FGD, switchyard etc. In DC SLD only one float cum boost charger is shown for each battery	As there is a discrepancy between referred clauses and DC system scheme, Owner may please clarify whether to consider one number float charger and one number float cum boost charger for each battery set or to consider one number float cum boost charger for each battery set. Owner may please confirm.	Same shall be as per SLD. 2X100% charger (Float & Float Cum Boost)with 2X100% battery system for all the areas/packages as specified.

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325	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	53	1.50.02	20% spare feeders on each HV/MV switchboards or one on each type and rating on each bus section whichever is higher	Spare philosophy as per mentioned clause will lead to the increase in HT SWGR length and will impact building sizes. As per previous / on going projects and standard industrial practice, "HT Switchboards shall have 2 nos. of spare modules (i.e. 2 no's motor feeder/2 no's of transformer feeder/1 motor and 1 transformer feeder to be provided). Highest rating of each motor and transformer feeder shall be included as spare." Owner may please accept.	Tender terms & condition prevails.
326	Vol-III Part-B Section-1 / Electrical Technical Specification	1.00.00 GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL	38	1.30.10 iii)	For DC system only single core cables shall be used	Owner may accept the use of 2 Core cable for DC system. Owner may please confirm.	Noted.
327	Volume-III, Part-B, Section-1 VOL-IV ,Bid drawing	TECHNICAL SPECIFICATION ELECTRICAL 'ETG106-EPC-EE-GN-SLD-001 Main Single Line Diagram_Rev-0	184 2 of 2	Data sheet Neutral grounding Resistor	For 415V systems, NGR shall be designed to limit the fault current to 400A for 10 secs In main Single Line diagram for LT service transformer solid grounding is shown without NGR.	As per standard industrial practice and past project references, solid grounding without NGR is applicable for all LT service transformer and there is a discrepancy between data sheet and main single line diagram. Bidder understands that solid grounding shall be applicable without NGR for all LT service transformer and NGR description in datasheet is not applicable for this project. Owner may please confirm.	tender conditions specified in 1.05.00 system particulars are self explanatory and shall followed.
328	Volume-III, Part-B, Section-1 Volume-III, Part-B, Section-1	TECHNICAL SPECIFICATION ELECTRICAL TECHNICAL SPECIFICATION ELECTRICAL	6 380	1.04.06 17.03.01 ii)	For higher voltage systems it shall be limited to 50kA, 3 Secs for 11 kV and 6.6KV systems and 40 kA , 3 secs for 3.3 kV systems 6.6/3.3 kV unearthed system having phase fault current of 40 kA and earth fault current of 300 A.	There is a discrepancy between referred clauses, Owner may please clarify fault current for 6.6KV system.	Fault Current shall be 50KA 1 sec. for 11 & 6.6kV and 40KA 1 sec. for 3.3kV rest of the spec prevails.

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329	Volume-III, Part-B, Section-1 Volume-III, Part-B, Section-1	TECHNICAL SPECIFICATION ELECTRICAL TECHNICAL SPECIFICATION ELECTRICAL	37 380	1.30.02 i) ii) and iii) 17.03.02 i) and iii)	i) For 11kV & 6.6KV– 50kA - 0.2 sec for outgoing motor feeders and transformer feeders and 1sec-for tie and incomer feeders ii) For 3.3kV -40kA - 0.2 sec for outgoing motor feeders and transformer feeders and 40kA-1 sec-for incomers & tie feeders iii) For 415V - 50kA - 0.25 sec for motor feeders and 50kA-1sec-for incomer & tie feeders. i) Breaker operated Motor feeders and transformer feeders: 0.16 second. iii) Tie between two switchgear: 0.5 second	1) There is a discrepancy between these clauses. Owner may please clarify whether fault clearance time shall be 0.20 sec or 0.16 sec for outgoing motor and transformer feeder for 11KV ,3.3KV and 6.6KV system. 2) For 415V motor feeder, Owner may please clarify fault clearance time shall be 0.25 sec or 0.16 sec. 3) For Tie feeders, Owner may please clarify fault clearance time shall be 0.5 sec or 1 sec.	Bidder shall follow tender CL. 1.30.02, I,ii,iii.
330	Vol-III Part-B Section-1 / Electrical Technical Specification	17.00.00 HV/LV POWER & CONTROL CABLES, CABLING SYSTEM	381	17.03.05	For HT motors the voltage drop in the cable, during motor starting condition, shall be limited to 10% and during full load running condition, shall be limited to 2.5% of the rated voltage.	As per standard industrial practice, Bidder proposes Owner to accept 15% drop for all HT motors during starting condition and 3% drop during running condition for all HT motors. Owner may please confirm.	Tender terms & condition prevails.
331	VOL-IV ,Bid drawing	–	–	–	Typical section of cable tray arrangement in trestle	Bidder requests Owner to submit typical section of cable tray arrangement in trestle.	Bidder shall furnish the typical section in compliance with the tender terms & conditions.
332	Vol-III Part-B Section-1 / Electrical Technical Specification	GENERATOR AND ACCESSORIES 2.05.00 DESIGN AND CONSTRUCTIONAL FEATURES. i) General	63	2.05.00 i)	Generator shall be provided with automatic CO2 fire extinguishing system as per manufacturer standard.	This is not applicable as per bidders standard and proven practice. Owner may please accept.	Tender terms & condition prevails. However the same shall be finalized during detail engineering.
333	Vol-III Part-B Section-1 / Electrical Technical Specification	GENERATOR AND ACCESSORIES 2.05.00 DESIGN AND CONSTRUCTIONAL FEATURES iv) Stator Winding f)	64	2.05.00 iv)	Suitable slot couplers/coupling capacitors (as applicable) shall be provided for partial discharge monitoring (under running condition) through portable Partial Discharge Monitoring Kit. Bidder to supply two (2) Nos. of portable Discharge Mentoring Kit.	This is not applicable as per bidders standard and proven practice. Owner may please accept.	All necessary provisions shall be made for monitoring of PD through portable kit.

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334	Vol-III Part-B Section-1 / Electrical Technical Specification	GENERATOR AND ACCESSORIES 2.05.00 DESIGN AND CONSTRUCTIONAL FEATURES ix) Bearings	66	2.05.00 ix)	Arrangements shall be provided to measure the insulation of the generator bearing while the machine is in operation	This is not applicable as per bidders standard and proven practice. Owner may please accept.	All necessary provisions shall be made for monitoring of PD through portable kit.
335	Vol-III Part-B Section-1 / Electrical Technical Specification	GENERATOR AND ACCESSORIES 2.05.00 DESIGN AND CONSTRUCTIONAL FEATURES xiii) Generator Instrumentation vi) ON line partial discharge (PD) monitoring	69	2.05.00 Xiii)	The system offered shall be applicable to the turbo Generator of large rating confirming to IEEE-1129, 1434 / IEC60034-27-2. Sensors for to be provided for on-line partial discharge (PD) monitoring complete with all software and hardware.	This is not applicable as per bidders standard and proven practice. Owner may please accept.	All necessary provisions shall be made for monitoring of PD through portable kit.

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336	Vol-III Part-B Section-1 / Electrical Technical Specification	GENERATOR AND ACCESSORIES 2.05.00 DESIGN AND CONSTRUCTIONAL FEATURES xiii) Generator Instrumentation vii) Rotor Flux Monitoring	69	2.05.00 Xiii)	Permanently connected independent sensing unit for each generator shall be provided along with necessary terminal equipment. However, evaluation unit for all generators in each station shall be common and portable. Latest software shall be provided to interpret the PD result. It shall also be suitably connected to TG MMI. A minimum of two Nos. per phase, sensors (e.g. combination of slot coupler and coupling capacitors etc.) shall be located as per the recommendation of supplier of PD Analyser. Sensors to be provided complete with all software and hardware to detect turn to turn shorting in field winding. Also a standalone system for the Rotor flux monitoring system is also acceptable. Alternatively, Supplier shall consider Continuous ON line condition based monitoring system shall comply with IEEE 1129 , IEEE 1434 , IEC 60034-27-2 and take care of the Online monitoring system of Partial Discharges, Rotor magnetic Flux monitoring , End winding vibration and shaft voltage & current. Optical fibre based Turbovisory for Generator End winding shall be provided. The CBM system shall be of latest model with complete sensors/ instruments, signal cables, JB's, installation kit with hardware and software which shall be interfaced with DCS/SCADA.	This is not applicable as per bidders standard and proven practice. Owner may please accept.	All necessary provisions shall be made for monitoring of PD through portable kit.
337	Vol-III Part-B Section-1 / Electrical Technical Specification	GENERATOR AND ACCESSORIES 2.09.00 GENERATOR EXCITATION SYSTEM 2.09.04 Equipment design & sizing criteria vi)	80	2.09.04 vi)	Excitation system ceiling voltage: 2.0 times rated load excitation voltage.	Excitation system ceiling voltage shall be >1.5 times rated load excitation voltage. This is as per bidders standard and proven practice Owner may please accept.	Noted.

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338	Vol-III Part-B Section-1 / Electrical Technical Specification	GENERATOR AND ACCESSORIES 2.09.00 GENERATOR EXCITATION SYSTEM 2.09.06 vii) Features of Static Excitation System 2. Excitation Transformer	82	2.09.06 vii)	70 deg.C over an ambient temperature of 50 Deg.C.	Bidder proposes as follows for Excitation Transformer: 90 deg.C over an ambient temperature of 50 Deg.C Owner may please accept.	Terms & condition prevails.
339	Vol-III Part-B Section-1 / Electrical Technical Specification	GENERATOR AND ACCESSORIES 2.09.00 GENERATOR EXCITATION SYSTEM 2.09.06 vii) Features of Static Excitation System 7.Field Application & Suppression Arrangement: a) Field breaker	84	2.09.06 vii), 7, a)	The generator field breaker shall be of DC, multipole air break type, suitable for operation from local panel as well as from UCR.	Bidder requested to consider the generator field breaker shall be of AC or DC (multipole or single pole) air break type, suitable for operation from local panel as well as from Unit Control Room (UCR). This is as per bidders standard and proven practice. Owner may please accept.	Noted.
340	Vol-III Part-B Section-1 / Electrical Technical Specification	GENERATOR AND ACCESSORIES 2.11.00 TYPE TESTS, 2.11.04 Electrical Tests on AVR, (ii) Static excitation system a)	92	2.11.04 ii) a)	a) All type and special tests on excitation transformer as per IEC-60076-11	Bidder requested to consider it as "All type ~~and Special~~ tests on excitation transformer as per IEC- 60076-11". Owner may please accept.	Noted.
341	Vol-III Part-B Section-1 / Electrical Technical Specification	IPBD, NGT, LASCPT 4.04.13) Current Transformer	156	4.04.13 i)	The current transformers shall be epoxy cast-resin, single core ring type, mounted within the bus duct enclosure	The current transformers shall be epoxy cast-resin, single core ring type, mounted within the bus duct enclosure or on Generator as per Bidders standard and proven practice. Owner may please accept.	For Generator CT's mounting as per OEM design shall be allowed however, it shall not be confined and shall be easily approachable for maintenance/replacement.

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342	Vol-IV Bid drawings	Main single line diagram	31	-	The 11kV SPBD connecting UT & ST with their corresponding 11kV Switchgears are shown to be rated for 5000A	The highest standard rating for HT circuit breaker is 3150A (3500A with forced cooling). Hence Bidder proposes to split the 11kV SPBD and 11kV switchgear corresponding to UT & ST so that incomer breaker rating can be limited to 3150A. Owner may please accept.	Noted. Please refer revised Main SLD enclosed in Amendment Electrical -Annexure 8.1 & 8.2.
343	VOLUME - I/ PART-C	COMMERCIAL SPECIFICATION SCHEDULE- 7A Break up of Type Test Charges for Equipment Priced in Schedule-1	280	2.0	(A) The following type tests on typical 765 kV Circuit Breaker (As Applicable) (B) The following type tests on typical 132kV Circuit Breaker (As Applicable) (C) 132 KV cable type tests as per IEC 60840	Bidder understands that referred equipment and their type tests are not applicable for this project. Hence, Bidder requests Owner to delete the same from the price schedule.	Noted.
344	Vol-III Part-B Section-1 / Electrical Technical Specification	2.00.00 GENERATOR AND ACCESSORIES	62	2.04.00 7)	Short Circuit withstanding capacity- However generator to be type tested for sudden short circuit test as per cl. 4.16 of IEC 60034-3.	Generator Sudden short circuit test shall be carried out as per cl. 4.16 of IEC 60034-3. It says, "For a generator that will be connected to the system through its own transformer or reactor, usually by an isolated phase bus, the test at the terminals shall be carried out at reduced voltage, agreed upon between the purchaser and the manufacturer". Alternatively, Generator Sudden short circuit test certificate on similar rating Generator as per IEC 60034-3 shall also be acceptable. Owner may please accept.	Tender terms & condition prevails.
345	VOLUME - III/ PART B/ SECTION - 1 VOLUME - III/ PART B/ SECTION - 1	2.00.00 GENERATOR AND ACCESSORIES TECHNICAL SPECIFICATION ELECTRICAL	63 70	2.05.00 i) 2.06.00	Generator shall be provided with automatic CO2 fire extinguishing system as per manufacturer standard. GAS SYSTEM	Bidder understands this is in regards with Charging and discharging of Hydrogen gas in Generator. Same shall be part of the system supplied as per Clause no. 2.06.00 GAS SYSTEM of this tender. Owner may please confirm.	This is for safety of generator with automatic CO2 fire extinguisher.

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346	VOLUME - III/ PART B/ SECTION - 1 VOLUME - III/ PART B/ SECTION - 1	2.00.00 GENERATOR AND ACCESSORIES 2.00.00 GENERATOR AND ACCESSORIES	64 69	2.05.00 iv) 2.05.00 Xiii)	Suitable slot couplers/coupling capacitors (as applicable) shall be provided for partial discharge monitoring (under running condition) through portable Partial Discharge Monitoring Kit. Bidder to supply two (2) Nos. of portable Discharge Mentoring Kit. The system offered shall be applicable to the turbo Generator of large rating confirming to IEEE-1129, 1434 / IEC60034-27-2. Sensors for to be provided for on-line partial discharge (PD) monitoring complete with all software and hardware.	Bidder requests Owner to delete this requirement as this is not required and same has been agreed by project under execution by central utilities.	All necessary provisions shall be made for monitoring of PD through portable kit.
347	Vol-III Part-B Section-1 / Electrical Technical Specification	2.00.00 GENERATOR AND ACCESSORIES	66	2.05.00 ix)	Bearings- Arrangements shall be provided to measure the insulation of the generator bearing while the machine is in operation.	Bidder requests Owner to modify the referred clause as below: Arrangements shall be provided to measure the insulation of the generator bearing ~~while the machine is in operation.~~	Terms and condition prevails.
348	Vol-III Part-B Section-1 / Electrical Technical Specification	2.00.00 GENERATOR AND ACCESSORIES	69	2.05.00 Xiii)	At least six (6) numbers of dual axis optical sensor type vibration picksups at each end of over hang portion of the winding shall be provided, symmetrically located around the periphery with connection to Turbine Supervisory system for vibration monitoring and analysis. The connection between the pickups and Turbine Supervisory system for vibration monitoring shall be provided. ~~**Also a standalone station for the vibration monitoring system shall be provided.**~~	Bidder requests Owner to modify the referred clause as below: At least six (6) numbers of dual axis optical sensor type vibration picksups at each end of over hang portion of the winding shall be provided, symmetrically located around the periphery with connection to Turbine Supervisory system for vibration monitoring and analysis. The connection between the pickups and Turbine Supervisory system for vibration monitoring shall be provided. **Alternatively a standalone station for the vibration monitoring system shall be acceptable**	Terms and condition prevails.
349	Vol-III Part-B Section-1 / Electrical Technical Specification	2.00.00 GENERATOR AND ACCESSORIES	71	2.06.00 ix)	Alarms in TGM MI and annunciation contacts for use in station DDCMIS shall be provided for these conditions	Bidder proposes that List of Alarms in TG MMI and annunciation contacts for use in station DDCMIS shall be finalised during Detail Engineering. Owner may please accept.	Tender terms & condition prevails as a minimum requirement. However the same shall be decided during DE , subject to approval of Owner/consultant.
350	Vol-III Part-B Section-1 / Electrical Technical Specification	2.00.00 GENERATOR AND ACCESSORIES	92	2.11.04 ii) b)	2.11.04 Electrical Tests on AVR, (ii) Static excitation system b) Type tests on field breaker as per IEEE/ANSI C-37-18.	Bidder proposes to modify the referred clause: b) Type tests on field breaker as per IEEE/ANSI C-37-18, Alternatively, Type Test Certificate /report on similar rating Field breaker shall also be acceptable.	Tender terms & condition prevails.

Pre-bid resolution for the tender for "Design, Engineering, Manufacture, Supply, Construction, Erection, Testing & Commissioning works for the EPC Package of Coal Fired Tender No. GSECL/P&P/EPC/800MW/

BID CLARIFICATION- ELECTRICAL

Sr. No.	Section No. / Section Title	Sub Section No. / Sub Section Title	Page No.	Clause No.	Bid Specification	Bidder's Query	Pre-bid Resolution
351	Vol-III Part-B Section-1 / Electrical Technical Specification	4.00.00 IPBD, NGT, LASCPT	156	4.04.13 iv)	In addition to above the marshalling box having termination of line side CT's, the transducers as required shall be provided to facilitate interface of generator Busduct CT's/PT's with ECP/DDCMIS. Accordingly the interconnection from VT panels to this marshalling box shall also be provided. This marshalling box housing transducers shall be located near PT & SP Cubicle.	As per bidder's standard and proven practice, CT/VT secondary signals from BCTJB & VTSP cubicle respectively will be connected directly to the respective panel. If any transducer is reqd. same shall be mounted in the that panel. Owner may please accept.	Tender terms & condition prevails. However the exact requirements shall be decided during DE and subject to approval of owner/consultant.
352	Vol-III Part-B Section-1 / Electrical Technical Specification	4.00.00 IPBD, NGT, LASCPT	162	4.09.00 Annexure	C.T. RATINGS; The ratings indicated here under are tentative.	Bidder proposes that the ratings & quantity of Current Transformers indicated in referred clause are tentative and Bidder's standard and proven practice shall also be acceptable. Owner may please accept.	As specified in the tender, it is tentative and minimum requirement. However the same shall be decided during DE, and subject to approval of Owner/Consultant.
353	Vol-III Part-B Section-1 / Electrical Technical Specification						All switchgear panels shall be provided with pad lock and key arrangement with key rack located in Unit control room/ respective offsite area control room. All Electrical MV & LV Switchgear/MCC/Panel/ Modules /MCB/MCCB/CB etc. of complete Power plant shall be LOTO ready. Refer Amendment Electrical for indicative requirement - Annexure 9.

29.00.00 400KV GAS INSULATED SWITCHGEAR

29.01.00 INTENT OF SPECIFICATION

29.01.01 This specification is intended to cover the design, manufacture, assembly, testing at Contractor's works, supply & delivery, properly packed for transportation to site of EHV Gas Insulated Switchgear (GIS), complete with all materials and accessories along with latest version SCADA system for efficient and trouble-free operation.

29.01.02 The scope of work shall also include complete erection, testing and commissioning and putting into successful commercial operation of EHV Gas Insulated Switchgear (GIS) inclusive of the supply of all labour, supervision, tools, implements and supplies.

29.02.00 SCOPE OF WORK

29.02.01 Scope of supply

Type and rating of the equipment listed below are detailed in the attached annexure and associated single line diagram. The equipment shall be offered in strict compliance with the same.

i) One (1) set Gas Insulated Switchgear assembly consisting of following bays and termination.

Details	400 kV GIS
Busbar Rating as per IEC	400 kV, 63 kA / 1 Sec, 2000 A
Bus Configuration	Two bus with One and Half Breaker scheme
Bays to be provided:	Eight bays (1GT+ 1ST + 2 Line Fdr. + 2 Tie Fdr. + 2 spare) + 2 Nos. Bus PT.
Over Head Line Feeders	Two nos, 2000.A
60 MVA 400.kV/11.5kV /11.5kV Transformer feeders	One no, 2000A
945 *MVA 420kV/27kV Generator Transformer feeders	One no, 2000A
GIS to Existing AIS Interconnection	Two nos, 2000A
Future Space Provision	One feeder each on both sides with fully equipped up to SF6 to Air bushing.

* Minimum indicative rating. EPC Contractor will finalise the rating.

The inter-connecting 400kV transmission lines between 400kV GIS & 400kV extension bays of existing Air insulated Switchgear (AIS)

(including bus bar extension) shall also be considered under this EPC specification Scope.

ii) The supply of equipment with each set shall include, but not limited to:-

a) Gas-insulated switchgear with associated circuit breakers, disconnect and ground switches, voltage & current transformers and surge arrestors etc. as shown in the attached Single Line Diagram.

b) All metal enclosed gas insulated buses for interconnecting various switchgear assemblies, including flexible joints to ensure service continuity during thermal cycling and vibration.

c) SF6 duct connection to power transformers and incoming lines

d) SF6 duct connection from GIS to SF6 –Air bushing outdoor at power transformer side and incoming lines with all accessories or SF6 duct directly to the HV side SF6 to oil transformer bushing.

e) O/H line/Al tube connection to power transformer end including all structures.

f) SF6 duct connection from GIS to SF6 –Air bushing at outgoing line feeder end and spare feder end.

g) O/H line /Al tube connection from SF6-Air bushing upto gantry structure with all accessories for connecting the outside line feeder conductor.

h) EHV cable connections at GIS end (if required), including SF6 enclosures, terminating support structures, mounting insulators.

i) Transformer bushing SF6 enclosures complete with vibration dampers and /or alignment bellows.

j) Base frames & supports, wall through bushing plate, platforms, steps and walkways including fasteners to foundation.

k) Auxiliary equipment, for emergency control and local supervision, including interlocks; operating mechanisms; and control, monitoring and protective devices, installed in suitable cabinets.

l) Control cabinets with respective mimic buses, internal wiring, and terminations.

m) Provision shall be made to transmit the required power plant and switchyard salient & real time data to State Load Dispatch Centre, Regional Load Dispatch Centre , GSECL Corporate/Head Office, and necessary equipment for the same shall be provided.

n) Dedicated Battery and Battery charger as required for the auxiliary DC power.

o) 220 V Nickel – Cadmium (Ni-Cd)/Lead Acid plante Battery and Battery chargers for 400kV GIS. [2 x 100% Battery & 2 x 100% Float cum Boost Battery Charger for each set of Battery]

p) 48V Nickel – Cadmium (Ni-Cd) Battery (dedicated) and battery charger for 400kV Gas Insulated Switchgear FOTE Panel. [1 x 100% Battery & 2 x 100% Float cum Boost Battery Charger for Battery]

For technical details of the battery and battery systems, please refer specification in the respective chapter.

a) 400kV Capacitive Voltage transformers; Fibre optics Rein forced ADSS Fibre Optic Cables; 360kV Lightning Arrester, Disconnector switches and all other hardware Wiring of devices and terminations internal to the switchgear and all shielded control cables and associated raceways above foundation, between the equipment and the GIS bay control cabinets.

b) FOTE system for two no. line feeders for other end to be supplied as loose to avoid mismatch. Technical parameters of FOTE system at other end of each line will be identical to FOTE at Ukai end and following items shall be supplied as loose:

- CVTs
- Line matching unit
- HF cable as required
- FOTE panels
- FOTE mounting hardwares
- Any other materials / item as per requirement.

c) Fibre reinforced ADSS optical fiber cables along with associated termination & clamping accessories shall be supplied in accordance with the requirement of this project.

The fibre optic cables will be used for communication between SCADA located in the Central Control Room of power house and the Substation Automation System (SAS) of the 400KV GIS Substation. The detail specification on Fibre optic cables is enclosed in **Section-2, Technical Specification of Communication Equipment and OPGW (24F &48F DWSM)**.

d) Integrated Substation Automation System (SAS) as per Annexure-H

e) Metering, Protection & Control as per Annexure-C

f) Wiring of devices and terminations internal to the switchgear and all shielded control cables and associated raceways above foundation, between the equipment and the GIS bay control cabinets.

g) Underground earthing mat and risers, Earth pits, lightning spikes/ sheild wires, lighting, cabling, marshalling kiosks, fencing, rail-tracks etc..

h) Ground buses and ground connection pads for connection to underground earthing mat.

i) Electrically operated (EOT) craned in GIS building. Adequate capacity EOT crane /Motorized chain pulley block and their rails inside GIS building for O&M of GIS bays, etc.

j) All concrete foundation works including GIS building.

k) Gas density monitors, pressure relief devices, and gas-filling connections.

l) Gaskets, sealant, and desiccant for permanent sealing of field assembled joints and access covers removed during assembly.

m) Initial filling of SF6 gas, and hydraulic fluid, if required. SF6 gas quantity shall be sufficient for first filling plus expected gas loss during 20 years of operation.

n) SF6 gas filling equipment portable type.

o) Over-headlines, power and control cables for external connection (Outside GIS building).

p) Fibre reinforced ADSS optical fiber cables along with associated termination & clamping accessories shall be supplied in accordance with the requirement of this project.

q) Any other equipment that is not specifically mentioned herein but that is necessary for trouble-free operation, installation, and maintenance of the GIS.

iii) Communication Equipments including Fibre Optics Terminal Equipment and STM-1 - STM-4 equipment with integrated Access Multiplexer. The detailed specification of the communication equipments is enclosed in **Section -2, Technical Specification of Communication Equipment and OPGW (24F &48F DWSM)**.

iv) Supply & Erection of OPGW (24F DWSM) & OPGW (48F DWSM) and Associated Hardwares. The detailed specification of the OPGW 24F & 48F is enclosed in **Section-2, Technical Specification of Communication Equipment and OPGW (24F &48F DWSM)**.

v) LINE PROTECTION RELAY PANEL (main-1 and main-2 relays shall be of different make and working on different principles/algorithm/characteristics.

vi) One set of special tools and tackles

vii) Mandatory Spare parts

viii) Recommended spare parts for three(3) years operation in addition to mandatory spares

ix) All relevant drawings, data and instruction manuals.

x) The Bidder shall carry-out insulation co-ordination study to ascertain requirement of additional surge arrestor at any other location like Primary & secondary terminals of Step-down transformer, outgoing cable termination, over the Bus within GIS installation.

xi) Online Partial Discharge measurement system shall be provided for 400 kV GIS.

29.03.00 GENERAL REQUIREMENTS

29.03.01 Codes and Standards

i) All equipment and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) and IEC except where modified and/or supplemented by this specification.

ii) Equipment and material conforming to any other standard, which ensures equal or better quality, may be accepted. In such case, copies of the English version of the standard adopted shall be submitted along with the bid.

iii) The electrical installation shall meet the requirements of Indian Electricity Rules as amended upto date and relevant IS Code of Practice. In addition, other rules and regulations including CEA & CBIP guidelines applicable to the work shall be followed.

29.04.00 DESIGN CRITERIA

29.04.01 General layout

i) The bidder shall work out an optimum layout and building size based on the specific features of his product and submit the dimensional general arrangement layout drawing along with his bid.

ii) The equipment will be installed primarily in a hot, humid and tropical

atmosphere.

iii) All equipment, accessories and wiring shall have tropical protection, involving special treatment of metal and insulation against fungus, insects and corrosion.

29.04.02 Switchgear assembly

i) The switchgear shall be of compact and modular design, fully metal-clad and of the sulphur-hexafluoride (SF6) insulated type , sectionalized with gas tight barriers between sections or compartments. It shall be constructed for the specified busbar system and shall include all necessary switches and current and voltage transformers, as detailed in the enclosed single line diagram. The switchgear shall be supplied complete with all auxiliary equipment necessary for operation, routine maintenance, repairs or extensions.

ii) Each line up of switchgear shall be suitable, and prepared for future extension on either end without any drilling, cutting or welding on the existing equipment. To add equipment, it shall not be necessary to move or dislocate the existing switchgear bays.

iii) The switchgear shall be of the freestanding, self-supporting dead-front design, with all high-voltage equipment installed inside gas-insulated, metallic grounded enclosures, and suitably sub-divided into individual arc and gas- proof compartments.

The bus bars shall be sub-divided into compartments including the associated busbar disconnectors.

iv) The arrangement of the switchgear shall be such as to enable dismantling a bay without affecting the adjacent bay. However, to remove the busbar disconnector, a shutdown of the relevant section of the busbar is envisaged.

v) For routine inspections and possible repairs, all elements shall be accessible without removing support structures. The removal of individual enclosure parts, or entire breaker bays, shall be possible without disturbing the enclosure of neighboring bays.

vi) All similar materials and removable parts shall be uniform and interchangeable with one another

29.04.03 Construction

i) Materials used in the manufacture of the switchgear equipment shall be of the type, composition and physical properties best suited to their particular purposes and in accordance with the latest engineering practices.

ii) All joint surfaces shall be machined, and all castings shall be spot faced

for all bolt heads or nuts and washers.

iii) Bracing shall be provided for all mechanical components against the effects of short circuit currents specified under system parameter. The design of the equipment shall be such that the agreed permitted movement of foundations or thermal effects do not impair the assigned performance of the equipment.

iv) Each pressure filled enclosure shall be designed and fabricated to comply with the requirements of the applicable pressure vessel codes of the country of origin, and based on the design temperature and design pressures as defined in IEC.

v) The enclosure and seals shall be designed to withstand the gas pressure encountered under normal and short circuit conditions. The thickness of the enclosures shall be in compliance with IEC.

vi) Each gas filled compartment shall be equipped with static filters. These filters shall be capable of absorbing any water vapour, which may penetrate into the enclosures.

vii) Pressure relief devices shall be provided with a shield and be vented to provide a safe environment for field personnel and for equipment during operation. The bursting pressure of relief device should be effectively coordinated with the rated gas pressure and the pressure rise due to arcing.

viii) Furthermore, no part of the enclosure, or any loose parts, may fly off the switchgear in such an event, and no holes may burn through the enclosure until the nearest protective relay has tripped. All grounding connections must remain operational during and after an arc fault.

ix) The circuit breaker gas zone shall be independent from all other gas compartments and shall meet the requirement of relevant IEC.

x) Proper grounding for mitigating over voltages during disconnector operation shall be included.

xi) The GIS equipment shall be furnished with specially designed stainless steel compensators/bellows to preserve the mechanical strength of the equipment at the connection portions to deal with the following problems:

a) To absorb the expansion and Contraction of outer enclosure and conductor due to temperature variations.

b) Mismatch in various components of GIS

c) To absorb the vibration of the transformer and switching equipment

d) To absorb the dimensional variations due to uneven settling of foundation

e) To withstand seismic forces as mentioned in climatic condition.

xii) Viewing windows shall be provided at the disconnectors and earthing switches to ensure that each contact position can be inspected. Each section shall have plug-in or easily removable connection pieces to allow for easy replacement of any component with the minimum of disturbance to the remainder of the equipment.

xiii) All interlocks that prevent potentially dangerous mal-operations, shall be so constructed such that they cannot be defeated easily, i.e. the operator must use tools or brute force to over-ride them.

xiv) The safety clearances of all live parts of the equipment shall be as per relevant standards.

xv) The bus enclosure should be sectionalized with dia wise in a manner that maintenance work on any bus disconnector of particular dia can be carried out by isolating and evacuating only the the small effected dia/section and not the entire bus. All the necessary devices/components required for dia wise compartment isolation shall be considered for proper isolation and maintenance purpose. The enclosure sub-divided into individual arc and gas proof compartments for Busbar section with associated busbar disconnector. • Circuit breaker • Line disconnectors

29.04.04 Duty requirement

i) The switchgear shall be designed for continuous operation under all system operating conditions including sudden change of load and voltage within its ratings. The equipment shall be designed to withstand normal operating voltage even if the inside gas pressure decreases to atmospheric pressure and shall be suitable for breaking the load current.

ii) The switchgear shall be constructed of suitable material and thickness to withstand the mechanical and thermal stresses due to short circuits and internal arc faults.

iii) Arc faults caused by external reasons shall be positively confined to the originating compartment and shall not spread to other parts of the switchgear.

iv) The maximum temperature in any part of the equipment at specified rating shall not exceed the permissible limits as stipulated in the relevant standards.

v) The disconnect switches shall be capable of interrupting the charging

current of the connected GIS bus & associated components.

vi) There shall be no radio interference when the equipment is operated at maximum service voltage.

vii) The inspection of breaker contact in service shall be carried out after 3000 to 4000 operating cycles and after a cumulative interruption of 20 nos. at rated short circuit current.

29.05.00 SPECIFIC REQUIREMENTS

29.05.01 Circuit Breakers

i) Circuit breaker shall be the SF6 gas-insulated type having ratings as indicated in Annexure – B. The breaker shall be capable of performing the specific duty cycle without derating.

ii) Each circuit breaker shall be factory assembled, adjusted, and tested, and shall be shipped as a complete single-phase or three-phase unit.

iii) The breaker shall include a suitable fully spring charged operating mechanism to assure proper opening and closing and should permit checking the adjustments and operating characteristics. The mechanism should be capable of reclosing, when specified, within the time range specified.

iv) The circuit breaker shall have trip free, anti-pumping feature and pole discrepancy protection.

v) The circuit breaker shall have independent pole operation if auto-reclosing duty is specified. Pole discrepancy tripping is to be provided in case of single- phase operation.

vi) Each circuit breaker shall be equipped with one closing coil and two tripping coils. It shall also be provided with an operation counter locally to count the number of breaker operation. The preferred arrangement for this device is to operate only during the opening cycle.

Mechanical indicator shall be provided to show the position of the breaker status.

All gauges, counters, and position indicators shall be readable by an operator standing near the equipment.

vii) Necessary valves and connections should be provided to ensure ease in handling the SF6 gas.

viii) Breaker shall be suitable for following switching duties:

- Terminal faults
- Short line faults

- Out of phase switching
- Interruption of small inductive current including transformer magnetising inrush currents.
- Interruption of line and cable charging currents.

The breaker switching under above switching operations shall not result in excessive over voltages and/or re-strike of arc.

ix) Breaker components shall meet Partial Discharge requirement as per relevant IEC.

x) The circuit breaker shall meet all the double Circuit transmission line characteristics for any type of fault or fault location, and also for line charging and dropping when used on an effectively grounded system. Effect of second circuit in parallel shall also be considered.

xi) The circuit breakers shall be capable of being operated locally or from remote. Local operation shall be by means of an open/close control switch located in the bay control cabinet. In addition, manually operated tripping device shall be provided for emergency use as well as for maintenance purpose. Manually operated closing device shall also be furnished for use during maintenance.

xii) The accessories and auxiliary equipment to be supplied with the circuit breaker and other components of the same bay module shall include all parts necessary for correct functioning of the circuit breaker, and also the following items to be installed in the breaker control box:

a) Operation counter, electrically operated
b) One set of adequately rated, thermostatically controlled, anti-condensation heaters with provision for monitoring of heater failure, wired to terminal blocks
c) One copper ground busbar to be located near the control cable entrance
d) Operating mechanism, pressuring unit, gauges and switches
e) All motor driven auxiliaries shall have individual phase or pole thermal over-current protection
f) Circuit breaker SF6 gas pressure monitoring unit
g) Auxiliary switches 6NO + 6NC for Owner/Purchaser use besides its own interlocking
h) One vermin-proof, sheet steel cabinet of adequate size shall be provided for housing the operating mechanism, aux relays, control and auxiliary equipment and for terminating all control, alarm and auxiliary circuits in suitable terminal boxes. The control cabinet shall be provided with hinged doors with provision for locking and removable cable gland plates for bottom cable entry. Viewing windows shall be provided for observation of the instruments without opening the cabinet. Suitably engraved nameplates shall be provided to identify all equipment in the control cabinet.

xiii) Contractor shall provide all control wiring and terminations internal to

the switchgear, and connecting the switchgear to the bay control cabinets.

xiv) All control cables shall be shielded. Cable shields shall be grounded at both ends. Grounding connections shall be as short and direct as possible and shall terminate at the point of entry to cabinets or terminal boxes.

xv) Co-axial type cable glands suitable for use with shielded cables shall be used at each termination.

xvi) All control cables shall be installed and terminated in such a manner as to limit the effects of transient electromagnetic voltages on the control conductors to an acceptable level.

xvii) Controlled Switching Device (CSD) of proven make shall be provided for 400 kV GIS GT and ST bays.

29.05.02 Disconnecting Switches and Grounding (Maintenance & Fast acting) Switches

i) Operating Mechanism

a) Disconnecting switches should be three-pole, group-operated, no-load break, with one motor operated operating mechanism per three-pole. Operating mechanisms are to be provided with position indication that may be color- coded, or the position may be spelled out.

b) Two types of Grounding switches, namely, Maintenance Grounding switch and Fast acting Grounding switch, shall be used as shown in the Single Line Diagram. Maintenance Grounding switches shall be electrically interlocked. Grounding switches should be three-pole, group-operated, no-load break, with motor operating mechanisms. Grounding switches located at the entrance of the transmission lines, EHV Cables and at busbar shall be of high speed, make proof type and shall be used to discharge the respective charging currents in addition to their safety grounding function.

c) For motor-operated disconnecting and grounding switches, the control should be electrically and/or mechanically uncoupled from the drive shaft when the switch is operated manually to prevent coincident power operation of the switch and the drive mechanism(s).

d) Each disconnecting and grounding switch should open or close only due to manual or motor-driven operation. The switchblade should not move due to gravity or other means, even if a part fails. Once initiated, the motor mechanism

should complete an open or close operation without requiring the initiating contact to be held closed.

e) Each disconnecting switch and grounding switch should be furnished with electrically independent auxiliary switches. The auxiliary switches should indicate the position of the switchblades and should be provided to that the contacts can be adjusted to be fully engaged and in proper alignment when in the closed position. At least 6NO + 6NC contacts should be furnished for interlocking. 20% spare contacts shall be kept and wired upto bay control cabinet.

ii) Visual verification

Visual verification shall be provided for each pole of each disconnecting switch and grounding switch to permit visual inspection of each switchblade position. External position indicators should also be provided. Inspection view ports should have removable covers to prevent damage of the actual view port due to the elements or from abrasive action while cleaning the port for viewing.

iii) Duty

a) The disconnecting switches shall have breaking capabilities as per IEC requirements. Contact shielding shall be designed to prevent restrikes and high local stresses caused by the transient recovery voltages when currents are interrupted.

b) The bus disconnecting switches shall reliably handle capacitive currents due to the making and breaking of switchgear components as well as commutation currents due to busbar reconfiguration.

c) The fast-acting ground switches, used for overhead double circuit lines and underground cable feeders shall be capable of switching induced current as per IEC requirement.

iv) Access

Suitable means of access should be provided in each disconnecting switch and grounding switch housing and mechanism for repair and/or maintenance of contacts.

v) Low-voltage test provision

A low-voltage test provision shall be supplied with a grounding switch to permit test voltages of up to 10kV (optional 2.5kV) and upto 200 A to be applied to the conductor without removing SF_6 gas or other components, except for ground shunt leads.

vi) Operation & Control

Opening and closing of disconnecting switches shall be either by local or remote control. Local operation shall be by means of a two-position control

devices located in the bay control cabinet. Grounding switches shall be operated from local only from bay control cabinet.

vii) Interlock

a) The disconnecting switch operation shall be interlocked electrically with the associated circuit breakers such that its control is inoperative if the circuit breaker is closed. Interlocks with other bays for bus transfer switching scheme shall be done through bay control cabinets. Actuation of the emergency manual operating device shall also disable the electrical control. Disconnecting switch in open condition shall be secured against reclosure.

b) Disconnecting switches and their adjacent grounding switch/es shall have electrical interlocks to prevent closure of the grounding switches when the disconnecting switches are in the closed position and to prevent closure of the disconnecting switches when the respective grounding switches are in the closed position. The disconnecting switches shall be pad lockable in the close & open position.

c) Disconnecting switches having adjacent fast acting grounding switches shall be interlocked such that the ground switches close first to discharge the line charging currents before the respective disconnecting switches opened.

d) When the lines are taken out of service for maintenance, etc., the disconnecting switches and fast acting grounding switches located in the transmission line feeder modules of the GIS switchgear are required to operate as follows:

e) After tripping of circuit breaker, operation of the respective disconnecting control switch ‘to open’ will first initiate rapid closure of the associated fast acting-grounding switch. When this grounding switch is signaled ‘closed’ by its auxiliary switches, an adjustable time delay relay will start to allow time for any trapped charges to dissipate into the grounding network. After the set time delay, the disconnecting switch motor operating mechanism will be energized to open it.

f) Operation of the disconnecting control switch ‘to close’ will close it, which, when proved ‘closed’, will signal the fast acting grounding switch ‘to open’.

g) Local control of the disconnecting switches and fast acting grounding switches from the bay control cabinet shall be by individual control devices with the Remote/Local transfer switch set to Local.

29.05.03 Gas system

i) Furnishing the GIS

The GIS shall be furnished, with sufficient SF6 gas to pressurize the complete system in a sequential approach, one zone or compartment at a time, to the rated nominal density. The SF6 gas should conform to relevant IEC. The initial gas filling of the switchgear and sufficient extra SF6 gas for compensation of possible losses during installation and service for 20 years shall be supplied.

ii) Reuse or recycling of removed gas

The Contractor should provide guidelines or recommended practices for the reuse or recycling of SF6 gas removed from the equipment. These guidelines should be consistent with current industry practices, as they pertain to the effect of SF6 on global warming; i.e. SF6 gas should be reused and recycled whenever possible and never be unnecessarily released into the atmosphere.

iii) GIS enclosure

The GIS enclosure should be divided into several sections separated by gas- tight barrier insulators. Each section should be provided with the necessary piping and valves to allow isolation, evacuation, and refill of gas without evacuation of the any other section. Location of gas barrier insulators is to be clearly discernable outside the enclosure by a band of distinct colour normally used for safety purposes.

iv) Gas schematic diagram

A gas schematic diagram should be submitted for approval. It should include the necessary valves, connections, density monitors, gas monitor system and controls, indication, orifices, and isolation to prevent current circulation. Means of calibrating density monitors without de-energizing the equipment should be specified by the Contractor.

v) External fixtures

The external fixtures should be made of corrosion-resistant material and should be capped where required.

vi) Monitoring and maintenance

For the purpose of gas monitoring and maintenance, the GIS should be divided into the following individually monitored zones:

a) Each power circuit breaker

b) Additional zones as mutually agreed upon by the Owner/ Purchaser and the Contractor

vii) Single-phase bus construction

For single-phase bus construction, single-phase gas pressure and density monitoring shall be provided.

viii) Leakage rate

The leakage rate of SF6 gas from any single compartment to atmosphere and between compartments shall not exceed 0.5% per year for the service life of the equipment.

ix) Alarms

Each gas zone should be furnished with a temperature compensated gas-monitoring device capable of signaling two adjustable, independent alarms. The signaling is to be done by two sets of adjustable, electrically independent contracts that operate at the alarm levels as follows:

First alarm – refill gas density normally 5-10% below the nominal fill density Second alarm – minimum gas density to achieve-equipment ratings

In special cases determined by the Contractor, a third stage with a set of contacts may be necessary in certain areas.

x) Connections

Provisions should be made for connecting density relay, the service cart, and moisture instrumentation to each one of the gas sections.

xi) SF6 Gas Processing Unit

a) An SF6 gas-processing unit suitable for evacuating, liquefying, evaporating, filling, drying and purifying SF6 gas during the initial installation, subsequent maintenance and future extension of GIS shall be provided. The cart shall be equipped with rubber wheels and shall be easily maneuverable within the GIS building.

b) A wheeled maintenance unit shall be supplied which shall be self- contained (except for additional gas storage bottles and external power supply at 415 V AC, 3-phase, 50 Hz) and fully equipped with an electric vacuum pump, gas compressor, gas drier, gas filter, refrigeration unit, evaporator, gas storage tank, full instrumentation for measuring vacuum, compressor inlet temperature, tank pressure and temperature, valving and piping to perform the following operations as a minimum requirement:

- Evacuation from a gas filled compartment using the vacuum pump,
- Transfer of SF6 gas from a system at some positive or negative pressure to the storage tank via the gas drier and filter;
- Recirculation of SF6 gas in the storage tank through the drier,

- Recirculation of SF6 gas in any switchgear or bus duct compartment through the drier and filter;
- Evaporating and filling SF6 gas, Drawing off and liquefying SF6 gas,
- A combination operation of filling SF6 gas into a gas system and evacuating a second, gas system using the vacuum pump.

c) Adequate length of hoses shall be provided for filling of SF6 gas in any of the gas compartment with the help of gas cart.

29.05.04 SF6 – to –Air bushings

i) SF6-to-air bushings shall be used for connections between air insulated overhead transmission lines and GIS.

ii) Each bushing should be constructed of commercial-grade porcelain or an acceptable substitute, with all surfaces free from imperfections.

iii) Bushing connections to an overhead line shall be by standard four-hole aluminum pad with connector suitable for ACSR conductor and terminals are suitable specified conductor size.

iv) Each porcelain component or ceramic bushing that has an internal pressure shall comply with relevant IEC

v) Creepage distance of the bushing surface shall be based on specified creep length

29.05.05 Transformer Connections

i) Enclosure adapters is to be provided to connect the SF6 bus directly to the HV side SF6-to-oil transformer busing, bolting directly to a flange on the bushing, and totally enclosing the insulator and live parts in the SF6 environment.

The adapter should have a removable cover and removable bus link to permit disconnecting the transformer from the bus, testing of the bus or transformer separately, and removal of the transformer, if required.

ii) The bus enclosure is to be insulated from the transformer tank to minimize circulating currents through the transformer tank.

The bus connecting the transformer to the GIS shall also contain bellows assembly and flexible conductor connection to minimize vibration transfer from the transformer.

iii) GIS Contractor shall coordinate the designs of the interface to permit alignment of the bus and the bushing; Necessary drawings from Contractor will be handed over to the successful Contractor

29.05.06 Bus bars And Bus Ducts

i) The SF6 single-phase/three phase encapsulated bus bars & bus ducts shall be mounted in horizontal/vertical configuration to suit the switchgear layout.

ii) The conductors of the bus bars shall be fabricated of Aluminum/ copper Alloy tubular sections of cross-sectional area suitable to meet the current rating requirements.

The tubular bus sections shall be housed in a properly designed aluminum / steel enclosure, filled with pressurized SF6 gas.

iii) The conductors shall be supported from the enclosures by homogeneous epoxy resin insulators shaped to ensure uniform electrical field distribution at rated voltage.

iv) Adequate provision shall be made for absorption of thermal expansion of the conductors and of differential thermal expansion between the conductors and the enclosures. Metal bellow type compensators with adjustable tensions shall be provided, where required.

v) The enclosures shall be designed to eliminate as much as possible all external effects of the flux created by normal and fault currents.

The power losses in the system shall be kept to a min. and induced voltages on the enclosures shall not be allowed to exceed reasonable limits of safety for operating personnel. The Contractor shall furnish supporting calculations in respect of induced voltage & losses guaranteed for the enclosure.

vi) Bus end connections shall be made with multi-contact connectors to allow for axial thermal expansion of the bus. Enclosure end connections shall be flanged and shall be fitted with gaskets or O-ring seals to provide an effective gastight joint between sections.

vii) The common point of the two busbars should be in a separate enclosure with an earthing switch in order to ensure availability of one busbar in service at all times.

viii) Each end of the busbars shall be designed for convenient future extension of the switchgear. Bus conductor end connectors and enclosure flanges shall be designed accordingly.

ix) All necessary steel supporting structures required shall be provided for proper erection. The Contractor shall provide leveling and alignment of the busbars and bus ducts.

29.05.07 Current Transformers (CT)

i) Current transformer shall be ring type and shall be so arranged that the enclosure current does not affect the desired technical parameters. The CTs shall have multi cores with multi ratio, which shall be changeable by means of taps on the secondary side. All Current Transformers shall have effective electromagnetic shields to protect against high frequency trangents.

ii) The secondary leads of the Current Transformer shall be brought out into the secondary terminal box outside the enclosure. The terminal box shall have sufficient number of terminals with sorting arrangements.

iii) It should be possible to test each current transformer without the removal of gas.

iv) Tariff Metering core secondary shall be wired to a separate sealable compartment.

29.05.08 Voltage Transformers (VT)

i) Voltage Transformer shall be inductive type with graded insulation and shall be effectively shielded against high frequency electro-magnetic transient. Special care shall be taken to prevent risk of ferro-resonance, if any, resulting due to interaction of capacities of the switchgears and reactance of the voltage transformers. VT shall be SF6 insulated.

ii) Voltage transformers shall be of either plug-in construction or the disconnect- link type and be attached to the gas-insulated system in such a manner that they can be easily disconnected while the system is being dielectrically tested.

Alternately, a voltage transformer may be designed so that it does not have to be disconnected during dielectric testing. The metal housing of the transformer should be connected to the metal enclosure of the GIS with a flanged, bolted, and gasketed joint so that the transformer housing is grounded to the GIS enclosure.

iii) Special covers and any necessary corona shields shall be supplied so that the system can be pressurized and dielectrically tested after removal of the transformer.

iv) Primary and secondary terminals shall have permanent markings for identification of polarity, in accordance with relevant standard.

v) Secondary terminals of the voltage transformer shall be brought out into a terminal box with adequate number of terminals, external to the enclosure.

vi) Tariff Metering core secondary shall be wired to a separate sealable terminal box.

29.05.09 Metal-enclosed surge arresters

i) Outdoor Gapless, zinc-oxide lightning arrestor of suitable rating shall be provided at the overhead line entry terminals and at able entry terminals to GIS.

ii) The contractor shall carry-out insulation co-ordination study to ascertain requirement of additional surge arrestor at any other location like Primary & secondary terminals of Step-down transformer, outgoing cable termination, over the Bus within GIS installation.

iii) If it is found from the study that additional lightning arresters are required, same shall be provided by the contractor. These shall be of either the “plug- in” construction or the disconnect-link type and be attached to the gas- insulated system in such a manner that they can be readily disconnected from the system while the system is being dielectrically tested. The metal housing of the arrester shall be connected to the metal enclosure of the GIS with a flanged, bolted joint.

iv) The ground connection shall be sized for the fault level of the GIS. It shall be insulated from the GIS-enclosure and grounded externally to permit periodic maintenance and monitoring of the leakage current.

v) If the arresters are not equipped with removable links, special covers and any necessary corona shields should be supplied so that the system can be pressurized and dielectrically tested after removal of the arrester.

vi) Access to the arrester ground connection, when it is provided with means for leakage current monitoring should not be obstructed.

29.05.10 Capacitor Voltage Couplers

i) Suitable capacitive voltage couplers (UHF Coupler) shall be furnished to provide for specialized measurements, such as ultra-high-frequency partial discharge and diagnostic monitoring.

ii) Capacitive voltage couplers designed for partial discharge measurements do not normally have to be disconnected from the equipment during high potential testing.

29.05.11 Steel Structures

i) Contractor shall supply all GIS equipment supporting structures, access ladders / stairway / walkways, transverse and longitudinal beams and supporting members, complete with all necessary

hardware. Any temporary scaffolding or a movable platform, required for maintenance, shall also be supplied.

ii) All steel structure members shall be hot-dip galvanized after fabrication. Minimum quantity of Galvanising shall be 640 grams per square meter. All field assembly joints shall be bolted. Field welding shall not be acceptable.

iii) Non-corrosive metal or plated steel shall be used for bolts and nuts throughout the work. Contractor shall provide suitable foundation channels and anchor bolts to support the switchgear assemblies. All mounting bolts, nuts and washers shall be provided to fasten the switchgear base frames to the foundation channels.

iv) Foundation channels and anchor bolts shall be installed in the civil works by others in accordance with instructions provided by the Contractor.

29.05.12 Grounding of GIS

i) GIS will be installed on the floor over structure. The under-ground mat below the substation with adequate number of risers shall be done by the contractor. The contractor shall supply the ground rods, risers, electrode etc.

ii) The Contractor shall supply entire material for ground bus of GIS such as. conductor, clamps, joints, operating and safety platforms etc. to be laid/ embedded in GIS floors. The Contractor Is also required to supply all grounding connectors and associated hardware material for:

a) Connecting all GIS equipment, Bus duct, enclosures, control cabinets, supporting structures etc. to the ground bus of GIS

b) Connecting ground bus of GIS to the ground mat risers.

iii) The grounding arrangement of GIS shall ensure safety of the personnel. The enclosures of the GIS shall be grounded at several points such that there shall be a grounded cage around all live parts. The ground continuity between each enclosure shall be affected over flanges, with or without links or straps to bridge the flanges. Copper/Aluminum straps shall however bridge the metallic expansion bellows.

iv) Where operating mechanism cabinets are mounted on the switchgear, the grounding shall be made by separate conductor. Bay control cabinets shall be grounded through a separate conductor.

v) All conduits and control cable sheaths shall be connected to the control cabinet grounding bus. All steel structures shall be grounded.

vi) Each removable section of catwalk shall be bolted to the support structure for ground continuity.

vii) The enclosure grounding system shall be designed to minimize circulating currents and to ensure that the potential rise during an external or internal fault is kept to an acceptable level. The guidelines of IEEE Std. 80-1986 on GIS grounding, especially the transient ground potential rise caused by high frequency phenomena, shall be taken into consideration while designing the grounding system for GIS.

viii) The Contractor shall furnish readily accessible connectors of sufficient mechanical strength to withstand electromagnetic forces as well as capable of carrying the anticipated maximum fault current without overheating by at least from two paths to ground from the main ground bus.

ix) Provisions of IEC regarding safeguards in grounding of connected cables, testing during maintenance and other safety measures shall be ensured.

29.05.13 Bay Control Cabinet

i) Control cabinet
The Contractor shall furnish one local control cabinet for each bay. Each cabinet shall be completely fabricated, wired, assembled, and tested at the factory. Each cabinet furnished shall be fully equipped and completely wired to the terminal blocks for termination of circuit breaker and switch control instrument transformer leads, indication and gas alarm cables.

ii) Cabinet guidelines
The EPC Contractor shall install a suitable data Acquisition and control system, Relaying & Protection. GIS's local control system shall be compatible with that system.

iii) The local control cubicle shall be based on the bay control solutions (BCS). The BCS shall include all required functions for control and supervision of a complete GIS as well as the marshalling of all connections to and from the GIS bays.

iv) Safe station operation is ensured through following base functions.
Feeder & station interlocking, depending on the position of all high voltage components with their blocking functionality.

Blocking of commands when crank handle of disconnectors or earthing switches is introduced.

Extensive circuit breaker supervision through "Anti-Pumping", pole discrepancy, Gas density and position supervision of circuit breaker,

v) The bay control mimic shall be the main component of the control cubicle. The features to be included are:

Representation of Single Line diagram / Gas schematic diagram including position indication of all primary components such as circuit breakers, disconnectors, and earthing switches with reliable LEDs

Monitoring & Control of all high voltage switching devices in a bay Integrated Local/Remote key switch.

Digital Display of Current, Voltage, Active & Reactive power, frequency. Alarm unit for feeder alarms e.g. gas alarms, DC & AC supervision.

vi) The bay control cubicle shall be fitted with pre-wired interface terminal blocks for connection to feeder & station Protection. The interface includes CT & VT inputs for protection & Measuring system, Protection trip 1 & 2 signals, Aux switch contacts etc.

vii) Signals for Alarm, control command, status of different components will be interfaced with Data acquisition through Fiber optic cable in IEC 61850 protocol. Necessary provision shall be considered for the same.

29.05.14 Wiring

i) Wiring shall be complete in all respects to ensure proper functioning of the control, protection, and monitoring and interlocking schemes.

ii) DC circuit for trip coil 1 & 2 shall be wired separately so as to connect with duplicate DC supply.

iii) Wiring shall be done with flexible 1100V grade, fire resistance (FR) PVC insulated, switchboard wires with 2.5 mm2 stranded copper conductor. Wiring between individual poles, terminal boxes and control cabinet shall be routed through G.I. rigid conduits.

iv) Each wire shall identified at both ends with permanent markers bearing wire numbers as per Contractor's wiring diagram.

v) Wire termination shall be done with crimping type connectors with insulating sleeves. Wires shall not be spliced between terminals.

vi) All spare contacts of relays, push buttons, auxiliary switches etc. shall be wired upto terminal blocks in the control cubicle.

vii) Terminal blocks shall be 1100V grade, enclosed clamp type with engraved numbers suitable for termination of at least two numbers of 2.5 mm2 stranded copper conductor.

viii) Not more than two wires shall be connected to any terminal. Spare terminals equal in number to 20% active terminals shall be furnished.

ix) Terminal blocks shall be located to allow easy access. Wiring shall be so arranged that individual wires of an external cable can be connected to consecutive terminals.

x) Terminal connectors that carry power supply should be shrouded from adjoining connectors.

29.05.15 Name Plate

i) Each equipment shall be provided with name plate clearly marked the particulars.

ii) The name plate shall be provided in visible portion of normal service and installation.

29.05.16 Finish

i) Supporting steel structures shall be hot dip galvanized.

ii) All equipment shall be finished with a undercoat of high quality primer followed by two coats of synthetic enamel paints unless otherwise indicated.

iii) The interior surface finish shall be as per Contractor's standard. The shade of exterior surface finish shall be in accordance with the coloured shade specified in the Annexure. The contractor shall take care of derating if any due to painting and its shade during design.

iv) Pretreatment consisting of degreasing, derusting etc. shall be done on all fabricated parts before painting or galvanising.

v) Paints shall be carefully selected to withstand heat and weather conditions. The paint shall not scale-off or crinkles or gets removed by abrasion due to normal handling.

vi) Sufficient quantities of all paints and preservatives required for touching up at sites shall be furnished.

29.05.17 Not Used.

29.05.18 Installation Work

The installation work shall be carried out in accordance with the requirement given in attached Annexure–J.

29.06.00 TESTS

29.06.01 Routine Tests

During manufacture and on completion, all equipment shall be subjected to the Routine tests as laid down in IEC 62271-203. Test shall include the following:

i) Dielectric test on the main circuit.

ii) Tests on auxiliary and control circuits.

iii) Measurement of the resistance of the main circuit

iv) Tightness test.

v) Design and visual checks.

vi) Pressure tests of enclosures.

vii) Mechanical operation tests

viii) Tests on auxiliary circuits, equipment and interlocks in the control mechanism.

ix) Pressure test on partitions.

29.06.02 Type Tests

i) Type test certificate, dated not more than five years back, shall be furnished for the offered model of the GIS.

ii) The type tests shall be as per IEC 62271-203 and the report shall include following tests

a) Tests To verify the insulation level of the equipment and dielectric tests on auxiliary circuits.

b) Tests to prove the radio interference voltage (RIV) level (if applicable).

c) Tests to prove the temperature rise of any part of the equipment and measurement of the resistance of the main circuit.

d) Tests to prove the ability of the main and earthing circuits to carry the rated peak and the rated short time withstand current.

e) Tests to verify the making and breaking capacity of the included switching devices.

f) Tests to prove the satisfactory operation of the included switching devices.

g) Tests to prove the strength of enclosures.

h) Verification of the degree of protection of the enclosure.

i) Gas tightness tests

j) Electromagnetic compatibility tests (EMC).

k) Additional tests on auxiliary and control circuits.

l) Tests on partitions.

m) Tests to prove the satisfactory operation at limit temperatures.

n) Tests to prove performance under thermal cycling and gas tightness tests on insulators.

o) Corrosion test on earthing connections (if applicable).

p) Tests to assess the effects of arcing due to an internal fault.

29.06.03 Test Witness

Routine Tests shall be performed in presence of Owner/Purchaser's representative if so desired by the Owner/Purchaser. The Contractor shall give at least fifteen (15) days' advance notice of the date when the tests are to be carried out.

29.06.04 Test Certificates

i) Certified reports of all the tests carried out at the works shall be furnished in required number copies for approval of the Owner/Purchaser.

ii) The equipment shall be dispatched from works only after receipt of Owner/ Purchaser's written dispatch clearance & approval of the test reports.

iii) Routine test certificates of bought out components shall be furnished.

iv) Type test certificate on any equipment or component if so desired by the Owner/Purchaser shall be furnished. Type test certificates shall not be older than five (5) years from the date of inspection, otherwise the equipment shall have to be type tested, free of charge, to prove the design.

29.06.05 Tests after installation on Site

i) After installation and before being put into service, the GIS shall be tested in order to ensure correct installation and dielectric integrity of the equipment as laid down in IEC60517 & 62271-203.The Contractor

shall furnish a pre- commissioning test plan and a method statement for the tests on site. Test values and test procedures shall be subject to agreement between the Owner/Purchaser and the contractor. Testing equipment shall be provided by the Contractor in addition to testing personnel. Tests shall include the following:

a) Site installation verification

b) Measurement of the resistance of the main circuit.

c) Gas tightness tests.

d) Gas quality verifications.

e) Dielectric tests on auxiliary circuits

f) Short duration power frequency withstand test on the main circuits.

g) Partial discharge measurement

29.07.00 SPECIAL TOOLS & TACKLES

29.07.01 A set of special tools & tackle, gas manifold, special lifting devices (other than permanently installed EOT crane provided the Owner/Purchaser), which are necessary or convenient for erection, commissioning, maintenance and overhauling of the equipment shall be supplied. In addition, the list shall include following:

i) One (1) number portable gas leak detector

ii) One (1) number hygrometer

iii) One (1) number portable dust counter

iv) Five (5) sets of special gas mask for GIS maintenance

v) One (1) number vacuum meter

vi) One (1) number digital contact resistance meter

vii) One (1) set partial discharge measurement set

viii) One mobile platform

29.07.02 These shall be shipped in separate containers, clearly marked with the name of the equipment for which they are intended.

29.08.00 DRAWINGS, DATA & MANUALS

29.08.01 Drawings, Data and Manuals shall be submitted in triplicate with the bid

and in quantities and procedures as specified in General Conditions on Contract and/or elsewhere in this specification for approval and subsequent distribution after the issue of Letter of Intent.

29.08.02 To be submitted with the Bid

i) Typical general arrangement drawings of the equipment indicating space requirement, room dimensions, crane capacity etc.

ii) Proposal Technical Particulars, leaflets on equipment and special tools explaining construction features, principle of operation, special features etc.

iii) Type test certificate of the offered model of the GIS for the specified type tests.

29.08.03 To be submitted for Owner/Purchaser's Approval and Distribution

(A) : 'Approval Category'

(R) : 'Reference Category'

i) Guaranteed Technical Particulars (A) & Quality assurance plan.(R)

ii) Dimensional general arrangement drawing showing disposition of various fittings, (A)

iii) Calculation on GIS enclosure Voltage rise (A)

iv) Calculation for Surge Protection (A)

v) Structure Plan with details and loading. (R)

vi) Foundation loadings for all GIS equipment and supporting structure (R)

vii) Assembly drawing for erection at site with part numbers and schedule of materials Transport/shipping dimensions with weights (R)

viii) Control schematic (A) and wiring diagrams (R).

ix) Gas schematic Diagram (A)

x) Grounding arrangement and ground bus details (A) including Contractor's recommendation on Grounding of reinforcement bars of Column foundation.

xi) Any other relevant drawing or data necessary for satisfactory installation, operation and maintenance.

xii) Instruction manuals on GIS and its accessories (R)

The manual shall clearly indicate method of installation, check ups and tests to be carried out before commissioning of the equipment.

29.08.04 The drawings and documents marked with (A) above are of 'Approval' category and are subject to review by Owner/Purchaser. Those marked (R) are for 'reference' category.

The Owner/Purchaser may review the documents marked (R) if thought necessary. The contractor shall note that the approval of drawings & documents by the Owner/Purchaser does not relieve him of his contractual obligation.

29.08.05 The bidder may note that the drawings, data and manuals listed herein are minimum requirement only. The bidder shall ensure that all other necessary write-up, curves, etc require to fully describe the equipment are to be submitted with the bid.

29.08.06 All drawings shall be prepared by using Auto CAD and documents shall be generated using Electronic version. The paper copy of the drawings & document shall be submitted for approval & reference. All final drawings and documents shall be submitted in CD in AutoCAD 2005 and MS office format as applicable for Owner/Purchasers future reference. Also AutoCAD version of Main GA drawings is to be submitted for Owner/Purchasers layout finalization.

ANNEXURE-A SYSTEM DETAILS

1.0	EHV System		
1.1	Rated Voltage	:	400kV
1.2	Frequency	:	50 Hz ± 5%
1.3	Phase	:	3
1.4	System Neutral	:	Effectively Earthed Earthing
1.5	Fault Level (Sym.)	:	63 kA rms
2.0	Auxiliary Power Supply		
2.1	A.C. Supply	:	415V ± 10%,3 phase, 50 Hz ± 5%, 4 wire, effectively earthed system. Fault level 50 kA r.m.s symm.
2.2	D.C. Supply	:	220V+10%,-15%, 2wire, ungrounded system. Fault level 25 kA.

3.0 Supply Point

3.1 Auxiliary power supplies listed above will be made available to each circuit breaker as below: -

A.C. Supply	:	Single feeder
D.C. Supply	:	Duplicate feeder

3.2 MCCB shall be provided at the circuit breaker for receiving each incoming supply.

ANNEXURE-B RATINGS & REQUIREMENTS

1.0	GIS SW ITCHGEAR		
1.1	Reference standard	:	IEC62271-203, IEC62271-1
1.2	Type of design		
	Construction	:	Metal enclosed, 3-1 Phase SF6 gas filled, isolated design
	Enclosure	:	Aluminum alloy, grade 63401
	Conductor	:	Aluminum alloy, grade 19501
1.3	Service	:	Indoor / Outdoor
1.4	Rated Voltage	:	400 kV rms
1.5	Phase	:	Three
1.6	Rated Frequency	:	50 Hz
1.7	System grounding	:	Effectively Earthed
1.8	Design ambient temperature	:	50°C
1.9	Rated continuous Current at design ambient temperature		
	Bus bar	:	2000A
	Line/transformer/bus coupler feeders	:	2000 /2000 /2000 A
1.10	Temperature Limit		
	Conductor	:	105°C
	Enclosure	:	80°C (70°C for accessible portion)
1.11	Short Circuit Rating		
	Rated short time withstand current	:	63kArms
	Duration	:	1 Sec.
1.12	Rated peak withstand current	:	2.5 x rated short time current

1.13 Insulation level

a) Rated one minute power Frequency withstand voltage :

Phase- Phase 650kV (r.m.s)

Phase- Earth 650kV (r.m.s)

b) Rated Lightning impulse withstand voltage :

Phase- Phase 1425kV (peak)

Phase- Earth 1425kV (peak)

Rated switching impulse : withstand voltage

Phase- Phase 1575kV (peak)

Phase- Earth 1050kV (peak)

1.14 SF6 gas

Characteristic : As per IEC62271-100

Leakage rate : less than 0.5% per year

1.15 AC/DC Power Supply

Rated Control voltage : 220V DC (190V - 242 V)

Service voltage : 240V, 1 Ph, 50 Hz

1.16 Termination details

Line feeder : Gas to air bushing

Transformer feeder : Gas to oil bushing/ Gas to air bushing (as applicable)

1.17 Painting

Internal surface : as per manufacturer's practice

External surface

a) Base Epoxy / enameled : as per manufacturer's practice

b) Paint shade No. as per IS :

Indoor portion & Outdoor

portion :

1.18	Support structure	:	Galvanized steel
2.0	CIRCUIT BREAKER		
2.1	Reference Standard	:	IEC 62271-100, IEC62271-203, IEC60694
2.2	Type	:	SF6 gas-insulated type.
2.3	Pole	:	3
2.4	Rated Voltage	:	420 kV rms
2.5	Rated Frequency	:	50 Hz
2.6	Mechanical Endurance Class	:	M1
2.7	Electrical Endurance Class	:	E1
2.8	Re-strike Probability Class	:	C1
2.9	Electromagnetic Compatibility (EMC)	:	Normal EMC Severity lass as per IS 12729/ IEC62271-1
2.10	Rated Insulation Level		

a) Rated one minute power frequency withstand voltage

- between phase to earth	:	650kV rms
- between phase to Phase	:	650kV rms
- Across open contacts	:	815kV rms

b) Rated Lightning Impulse withstand voltage

- between phase to earth	:	1425kV peak
- between phase to Phase	:	1425kV peak
- Across open contacts	:	1425+(240)kV peak

The value in brackets are the peak value of the power frequency voltage 0.7 √ Ur x 2/√3 applied to the opposite terminal (combined Voltage)

c) Rated Switching Withstand Voltage

	- between phase to earth	:	1050kV peak
	- between phase to phases	:	1575kV peak
	- Across open contacts	:	1050kV peak
	- Across isolating distance	:	900+(345)kV peak

The value in brackets are the peak value of the power frequency voltage Ur x √2/√3 applied to the opposite terminal (combined Voltage)

2.11	Max. radio interference voltage at 1.1 U_{rated} /√3	:	<1000.Micro-Volts
2.12	Rated continuous current at design ambient temperature	:	2000 Arms
	Line/Trafo/ /Bus coupler	:	2000./2000/2000.Arms
2.13	Temperature rise over Design Ambient Temperature	:	As per IS/IEC duly adjusted for site condition.
2.14	Rated Short-circuit breaking current		
	- Symmetrical	:	63kArms
	- Percentage D.C. component	:	As per IEC62271-100
2.15	Rated short-circuit making current	:	2.5 X Symmetrical Current kA peak
2.16	Rated short time withstand current	:	63kArms
2.17	Rated duration of rated short time withstand current.	:	1 Sec.
2.18	Rated line charging breaking current	:	400Arms
2.19	Rated cable charging breaking current	:	400Arms
2.20	Rated Out of phase breaking current In % of rated Short Ckt. Breaking current	:	25%
2.21	Rated Out of phase making		

	current In % of rated out of phase breaking current	:	Crest value of the rated out of phase breaking current. (As per IEC -62271-100)
2.22	Characteristic for short-line fault related to rated short-circuit breaking current	:	As per IEC-62271-100
2.23	Rated capacitive switching breaking (Arms) / in rush making current (kA peak)	:	400Arms/20kA peak
2.24	TRV Characteristics	:	As per IEC-62271-100
2.25	Inductive current breaking capability without exceeding over-voltage by 2.0p.u	:	Interruption of steady and transient magnetizing currentsof connected transformers and reactors
2.26	First pole to clear factor	:	As per IEC-62271-100
2.27	Operating mechanism	:	Spring Charged
2.28	Opening time (ms)	:	Not more than 40
2.29	Closing time (ms)	:	Not more than 100
2.30	Rated Operating Sequence	:	0 - 0.3s-CO-3m-CO (for line breakers) CO-15s-CO (for transformer breakers)
2.31	Rated Supply Voltage and frequency for		
	- Closing & Tripping	:	220 V D.C
	- Heater/Lamp/Socket	:	240V, 1 Ph, 2W, 50Hz
2.32	Nos. of trip coil per pole	:	2
2.33	Minimum Creepage distance	:	31mm/kV
2.34	Noise level Db at the base of CB	:	less than 85db
3.0	DISCONNECTING SWITCH		
3.1	Reference standard	:	IEC62271-102, IEC62271-203
3.2	Type	:	

3.3	Pole	:	3
3.4	Rated voltage	:	420kV rms
3.5	Rated Frequency	:	50Hz
3.6	Rated Insulation Level		
	a) Rated one minute power frequency withstand voltage		
	- between phase to earth	:	650kV rms
	- between phase to Phase	:	650kV rms
	- Across open contacts	:	815kV rms
	b) Rated Lightning Impulse withstand voltage		
	- between phase to earth	:	1425kV peak
	- between phase to Phase	:	1425kV peak
	- Across open contacts	:	1425+(240)kV peak

The value in brackets are the peak value of the power frequency voltage 0.7 Ur x √ 2/√3 applied to the opposite terminal (combined Voltage)

	c) Rated Switching Withstand Voltage		
	- between phase to earth	:	1050kV peak
	- between phase to phases	:	1575kV peak
	- Across open contacts	:	1050kV peak
	- Across isolating distance	:	900+(345)kV peak

The value in brackets are the peak value of the power frequency voltage Ur x √2/√3 applied to the opposite terminal (combined Voltage)

3.7	Rated Continuous current at design ambient temperature	:	2000A rms
3.8	Rated Short time current for 3secs	:	63kA rms

3.9	Rated peak Withstand current time current kA peak	:	2.5 X Rated short
3.10	Magnetising & capacitive current Make & brake ability	:	Bidder to finalized
3.11	Operating Mechanism	:	Motor Operated and Manual.
3.12	Operating voltage	:	220V DC
4.0	MAINTENANCE GROUNDING SWITCH		
4.1	Reference standard	:	IEC62271-102
4.2	Type	:	
4.3	Pole	:	3
4.4	Rated Insulation Level		
	a) One Minute Power Frequency Withstand Voltage	:	650 kV rms
	b) Rated Lightning Impulse Withstand Voltage	:	1425 V peak
	c) Rated Switching Impulse Withstand Voltage	:	1050 kV peak
4.5	Rated Short time current for 3 secs	:	63 kA rms
4.6	Rated Peak Withstand current time current kA peak	:	2.5 X Rated short
4.7	Inductive & Capacitive current switching ability	:	Bidder to decided
4.8	Operating Mechanism	:	Motor Operated and Manual.
4.9	Operating voltage	:	220V DC
5.0	FAST ACTING GROUNDING SWITCH		
5.1	Reference standard	:	IEC62271-102
5.2	Type	:	Electrically/mechanically gang operated
5.3	Pole	:	3

5.4	Rated Insulation Level		
	a) One Minute Power Frequency Withstand Voltage	:	650 kV rms
	b) Rated Lightning Impulse Withstand Voltage	:	1425 kV peak
	c) Rated Switching Impulse Withstand Voltage	:	1050 kV peak
5.5	Rated Short time current for 3 secs	:	63 kA rms
5.6	Rated Peak Withstand current time	:	2.5 X Rated short current kA peak
5.7	Inductive & Capacitive current switching ability	:	Bidder to finalized
5.8	Operating Mechanism	:	Motor Operated and Manual.
5.9	Operating voltage	:	220V DC
6.0	CURRENT TRANSFORMER		
6.1	Reference Standard	:	IEC60044-1
6.2	Type	:	Ring type
6.3	Rated continuous thermal Current	:	120% of rated primary current
6.4	Rated Insulation Level		
	a. 1 minute 50 Hz withstand voltage		
	○ HV terminal & earth	:	630 kV rms
	○ Secondary winding	:	3 kV rms
	b. Impulse withstand voltage	:	1425 kV peak
	c. Switching impulse withstand voltage	:	1050 kV peak
6.5	Short time current		
	a) Short-time current for 3 sec	:	63 kA rms

b) Dynamic current : 2.5 times rated short time thermal current kA peak

6.6 C.T. Ratios & Parameters :

Core No	Description	Current Ratio A/A	Output Burden VA	Acc. Class	ISF	Min. Knee-point voltage V_K (volt) at highest ratio KPV	Max Excitation Current I_e (m A) at KPV	Max CT Sec. Resistance R_{CT} (ohm) at highest ratio
Feeder type: Line Feeder								
CT-1								
Core-1	Main-I Distance Protection	To be decided the bidder with back up calculation.						
Core-2	Main-II Distance Protection, Bkr. Failure * Directional O/C & E/F							
Core-3	Tariff metering.							
CT-2								
Core-1	Metering.							
Core-2	Bus Differential/ Check Bus differential							
Core-3	Misc. Relaying							
Feeder type: Generator Transformer Bay								
CT-1								
Core-1	Bus Differential/ Check Bus Differential	To be decided the bidder with back up calculation.						
Core-2	Spare							
Core-3	Spare							
CT-2								
Core-1	Overall Differential (Gen, GT & UT)							
Core-2	Bkr. Failure. Failure Back Up O/C & E/F							
Core-3	Metering							
Feeder type: Station transformer Bay								
CT-1								
Core-1	ST Differential	To be decided the bidder with back up calculation.						
Core-2	Bkr. Failure. Failure Back Up O/C & E/F							

Core No	Description	Current Ratio A/A	Output Burden VA	Acc. Class	ISF	Min. Knee-point voltage V_K (volt) at highest ratio KPV	Max Excitation Current I_e (m A) at KPV	Max CT Sec. Resistance R_{CT} (ohm) at highest ratio
Core-3	Metering							
CT-2								
Core-1	Bus Differential/ Check Bus Differential							
Core-2	Spare							
Core-3	Spare							

7.0 VOLTAGE TRANSFORMER

7.1 Reference standard : IEC60044-2

7.2 Type : Inductive type with graded insulation

7.3 Insulation Level

a. 1 minute 50 Hz withstand voltage

- Main circuit : 630 kV rms
- Secondary circuit : 3 kV rms

b. Impulse withstand voltage : 1425kKV peak

c. Switching impulse withstand voltage : 1050kKV peak

7.4 Voltage ratio & other parameters :

	Secondary-I	Secondary- II	Secondary– III
Voltage Ratio	400kV/110V √3 3	400kV/110V √3 √3	400kV/110V √3 √3
Application	Protection	Synchronization	Metering
Output burden VA	200	200	200
Accuracy Class*	3P	0.2S	0.2S

(*within frequency variation range)

7.5 Voltage factor : 1.5 times rated primary voltage for 30 sec.

8.0 GAS TO AIR BUSHING

8.1 Reference standard :

8.2 Type : composite (polymer0

8.3	Rated continuous current at Site condition	:	2000 A rms
8.4	Insulation Level		
	a. 1- minute 50 Hz withstand voltage	:	650 kV rms
	b. Impulse withstand voltage	:	1425 kV peak
	c. Switching impulse withstand voltage	:	1050 kV peak (Phase to Earth) 1575 kV peak (Phase to Phase)
8.5	Minimum Creepage distance	:	31 mm/Kv
9.0	CONNECTION		
9.1	Line termination details	:	Bidder to finalized
9.2	Cable termination details	:	Bidder to finalized
9.3	Transformer termination details	:	Bidder to finalized

GSECL	GUJARAT STATE ELECTRICITY COPRORATION LIMITED	VOLUME - V
	1X800 MW ULTRA SUPER CRITICAL UNIT NO#7 ON ASH DYKE AREA AT UKAI TPS	ANNEXURE - 3
	BID SPECIFICATION NO.: ETG106-EPC-UKAI/UNIT # 7-TS-01	
	MANDATORY SPARES LIST	REV. - 0

Sl. No.	Description	Quantity
(ix)	Electronic modules of all types	10 % of each type
(x)	Interfacing cables & Power cords	Ten (10) percent or 2 sets (Whichever is more)
21.0	**POWER & CONTROL CABLES**	
21.1	11 kV Grade power cables	10% of installed quantity of each type and size
21.2	6.6 kV Grade power cables	10% of installed quantity of each type and size
21.3	3.3 kV Grade power cables	10% of installed quantity of each type and size
21.4	1.1 kV Grade power cables	10% of installed quantity of each type and size
21.5	1.1 kV Grade control cables	10% of installed quantity of each type and size
21.6	Trailing /EPR – Power & Control Cables	10% of installed quantity of each type and size
21.7	Any other Voltage grade cables and special cables	10% of installed quantity of each type and size
21.8	Cabling accessories	10% of installed quantity of each type and size
22.0	**TRANSFORMER OIL**	
22.1	Transformer Oil	10% of installed quantity of each type
23.0	**400 kV SWITCHYARD**	
23.1	400KV GIS	
23.1.1	400 kV GIS (For the following items each type & rating to be repeated)	
i)	Trip coils for circuit breaker	4 No.
ii)	Closing coils for circuit breaker	4 No.
iii)	Gaskets	6 Set

Sl. No.	Description	Quantity
iv)	Motor for circuit breaker operating mechanism (If applicable)	2 No.
v)	Valve block with drive cylinder for circuit breakers	2 Set
vi)	Motor for earthing switch	1 No.
vii)	Motor for disconnectors	1 No.
viii)	Operating mechanism for disconnectors	1 Set
ix)	Operating mechanism for earthing switch	1 Set
x)	SF6 gas cylinder with 40 kgs of SF6 gas	3 No.
xi)	Control switch and auxiliary relay	4 No.
xii)	MCB (as applicable)	4 No.
xiii)	Current Transformers	1 Set
xiv)	400 kV SF6 Air Bushing	3 No.
23.1.2	400 kV Capacitive Voltage Transformers (For the following items each type & rating to be repeated)	
i)	400 kV CVT	3 No.
ii)	Oil Seals	1 Set
iii)	Insulators	1 No.
iv)	Gaskets (all sizes used)	1 Set
v)	Oil filling, draining and sampling plugs	1 Set
vi)	Oil level gauge	2 No.
23.1.3	SWITCHYARD EQUIPMENT ACCESSORIES (For the following items each type & rating to be repeated)	
i)	400 kV Glazed Brown Insulator	2 Set
ii)	SF6 gas pressure Relief Devices, 3 No. of each type	2 set
iii)	SF6 Pressure gauge with coupling device cum switch or density monitors and pressure gauge, as applicable (1 no. of each type)	1 Set
iv)	Molecular filter for SF6 gas with filter bags (1set - 20% total quantity of absorber bags used in GIS)	1 Set

Sl. No.	Description	Quantity
v)	Covers with all accessories necessary to close a compartment in case of dismantling of any part of the Enclosure to ensure the sealing of the compartment for 1 phase enclosure (3 Nos. of each type)	1 Set
vi)	Locking device to keep the Dis-connectors and Earthing switches in close or open position in case of removal of the driving mechanism (If applicable)	3 No.
vii)	Bus support insulator of each type for single phase enclosure (6 Nos. of each type)	1 Set
viii)	SF6 to air bushing for 1 phase enclosure	2 Nos
ix)	Relay of each type & rating	1 Nos.
X	All types of Corona shield (3 Nos. of each type)	1 Set
Xi	Window scope/ Observing window, 3 Nos. of each type (if applicable)	1 Set
23.1.4	LA 400 kV side	3 no.
23.1.5	Local Control Panel	100% spares for 1 panel
23.1.6	Complete module for 400 kV Breaker	1
23.1.7	Complete module for 400 kV LA (With Earth Switch)	1
23.1.8	Complete module for 400 kV LA (Without Earth Switch)	1
23.1.9	Complete module for 400 kV CT	1
23.1.10	Complete module for 400 kV PT	1
23.1.11	SF6 Gas	10% of total filled qty.
23.1.12	Duct Insulator	10% of total installed qty.
23.1.13	Set of Gaskets, O rings	5 set
23.1.14	SF6 gas filling kit	1 set
23.1.15	CRM, DCRM kit with transducer of appropriate breaker fittings	1 set for each GIS & AIS

Sl. No.	Description	Quantity
23.1.16	AIS (400 kV)	
	a. Complete set of 1 no. of single phase disconnector including main circuit, enclosure and driving mechanism -	One (1) Set
	b. Complete Circuit Breaker 1 phase pole of each type & rating complete with interrupter, main circuit and enclosure with operating mechanism -	One (1) Set
23.1.17	SAS Including CRPs for GIS & AIS	
	a. Bay Control unit (complete with all components) -	Two (2) Nos.
	b. Numerical Relays comprising various bay protection units, Bus Bar and Islanding Scheme	One (1) No. of each type.
	c. Numerical Relays comprising GRP -	One (1) No. of each type
	d.Switchgear control unit -	two (2) no of each.
	e. Merging unit	two (2) no of each.
	f. Cards/modules of Generator Disturbance Recorder, Line DR (if stand-alone)	One (1) No. of each type.
	g. Energy Meter (ABT meter) class: 0.2s -	One (1) no. of each type.
	h. Terminal Blocks	5 nos. of each type, make, model and rating.
	i. MCBs	1no of each type, make and model used in the system.
	j. Relays other than Numerical Relays –	One (1) no of each type of total population (min One
	k. Transducers	One (1) no. of each type.
	l. Auxiliary CT/PT	One (1) no. of each type.
	Note: -1) The above SAS spares shall be applicable for each SAS – GIS & AIS. 2) Set means complete replacement for one circuit breaker and one isolator of each type 3) For CT, CVT and surge Arrestor number (nos.) means complete replacement of one pole/phase of the equipment.	
24.0	**CHP PROCESSES RELATED ELECTRICAL SPARES**	

VOLUME - II

SECTION - 1

PROJECT INFORMATION

PREPARED BY

(An ISO 9001:2015 certified Company)

STEAG Energy Services India Pvt. Ltd.

(A wholly owned subsidiary of STEAG Group, Germany)

A-29, Sector-16, NOIDA - 201301, INDIA

JANUARY, 2024

TABLE OF CONTENTS

1.00.00 GENERAL

1.01.01 GSECL proposes to set up 1x800 MW Coal based Supercritical Unit in the vicinity of existing Thermal Power Plant at Ukai, Dist. Tapi , Gujarat. The proposed unit shall be set up in the existing Ash dyke - A area.

2.00.00 SITE DETAILS

2.01.01 The project is located in Tapi district of Gujarat state in India. The geographical location of UTPS is at Latitude of 21°12'36.5"North and Longitude of 73° 33'26.3" East.

S. No.	Description	Data
1.	Seismic Zone	Zone-IIIasperIS1893-2002
2.	Maximum Temperature	45Deg C
3.	Minimum Temperature	5 Deg C
4.	Maximum dry bulb temperature	41DegC
5.	Minimum dry bulb temperature	24DegC
6.	Maximum Humidity	85%
7.	Minimum Relative Humidity	15%
8.	Average Rain fall	1500mm(During June -Sep)
9.	Elevation above mean sea level	82.2 M
10.	Wind velocity	20km/hr
11.	Basic Wind speed	44m/s as perIS:875 –Part3:1987.
12.	High Flood level	RL + 77.37 M

3.00.00 APPROACH

3.01.01 The project site is located at a distance of about 10 km from Ukai - Songadh Railway Station and the site is also connected by roads from highway at a distance of 10 km from Songarh.

3.01.02 The nearest Airport is Surat, which is about 93km from the site.

3.01.03 Nearest port is Hazira - Paradip Port, which approximately 120Km from the site

S.No.	Description	Data
A.	**Railway**	
a)	Nearest Railway Station and its distance from site	Ukai-Songadh,10 Km
b)	Gauge of railway line.	Electrified Double Line Broad Gauge (1.676 m)
c)	Nearest Jn. With siding and its distance.	Ukai - Songadh, siding at UTPS
B.	**Road**	
a)	Connecting National Highway (NH)	NH-53, Hazira-Pardip port (Surat-Kolkata)
b)	Distance of the Project Site from NH.	8 KM
c)	Description of Road Connecting Project Site.	Pakka Road, SH-174, Plant Road, Vadi

S.No.	Description	Data
		Ashram Road
d)	Load bearing capacity of the connecting Road.	Site-R&B Ukai
e)	Number of bridges and culverts with their dimension and load bearing capacity. (for connecting road).	Site-R&B Ukai

4.00.00 LAND

4.01.01 The land required for in plant facilities of the 1x 800 MW proposed power project is already available within the UTPS premises. The1x800 MW power plant is proposed to be built in existing Ash dyke - A area.

4.01.02 Approximately 105 acres of land is available within the premises of existing plant for setting up the proposed 1 x 800 MW unit. Out of 105 acres of land 65 Acre land is available in Dyke-A area and remaining 40 Acre lands are available in Bhola singh & Hussain Tekri area within the plant boundary.

4.01.03 Except Ash Disposal Dyke, all other facilities of plant are envisaged in the available plant boundary. For Ash Disposal, existing Ash Dyke area - B, C & D will be utilized.

5.00.00 SOURCE OF WATER

5.01.01 Water required by the Power Plant will be drawn from the left bank canal which is flowing by the side of the power plant.

6.00.00 SOURCE OF FUEL

6.01.01 The power plant shall be designed to operate by firing Indian coal. The coal supply agreement for the plant shall be done by Coal India Ltd and the sources of coal from the coal mines of South Eastern Coalfields Ltd., Western Coal fields Ltd and Northern Coalfields Ltd.

6.01.02 Apart from coal biomass is also mixed with coal for firing of fuel in boiler.

7.00.00 FUEL TRANSPORTATION

7.01.01 Coal from the mines shall be brought to plant by Indian railway wagons in top open type BOXN/BOXNH or as permitted by railway as per RDSO-G-33 standard.

7.01.02 Landed price of coal is Rs.5743/ton

8.00.00 STARTUP AND FLAME STABILIZATION FUEL

8.01.01 Light Diesel Oil (LDO) will be used for start-up and flame stabilization. LDO will meet from existing fuel oil unloading and storage system. LDO will be pumped to day storage tank of proposed plant from existing LDO storage tank.

8.01.02 LDO Relative Density at 15 deg C is 8500 gm/ml

8.01.03 LDO GCV is 10450Kcal/Kg

8.01.04 Total sulfur in LDO is maximum 1.8%

8.01.05 Landed cost of LDO is Rs.76735/KL

9.00.00 EVACUATION OF POWER

9.01.01 For evacuation of power through outgoing line feeders, 400 KV transmission lines established by GETCO between the proposed power plant and existing 400 KV substation of GETCO. The interface point between the switchyard and 400 KV transmission lines of GETCO will be at the take off gantry structures inside the switchyard fence.

10.00.00 COAL ANALYSIS

S.No.	Description	Unit	Data
1.	**Proximate Analysis**		
a)	Moisture	%	12
b)	Ash	%	42
c)	Volatile Matter	%	23
d)	Fixed Carbon	%	23
2.	**Ultimate Analysis**		
a)	Carbon	%	31.29
b)	Hydrogen	%	2.44
c)	Nitrogen	%	0.69
d)	Oxygen	%	11.08
e)	Sulfur	%	0.50
f)	Ash	%	42
g)	Moisture	%	12
h)	Gross Calorific Value	Kcal/Kg	3000
i)	HGI		55

11.00.00 RAW WATER ANALYSIS

S. No.	Parameter	Unit	Data
1	Conductivity (µmhos/cm)	µmhos/cm	277.5
2	pH	Unit	8.28
3	P-Alkalinity	ppm	4.00
4	M-Alkalinity	ppm	112.0
5	Chloride	ppm	32.00
6	Total Hardness	ppm	103.00
7	Ca Hardness	ppm	65.00
8	Mg Hardness	ppm	38.00
9	Turbidity	NTU	4.15
10	TDS	ppm	185.90
11	SiO2	ppm	26.00
12	SO4	ppm	9.00
13	Free Chlorine	ppm	Nil

12.00.00 METROLOGICAL DATA

12.01.01 Metrological data for last three years is as follows:

F.Y. 2021-22					
Date	HUMI	MAX	TEMP	TEMP(max)	TEMP(min)
	%	%	Degree C	Degree C	Degree C
January-21	63.93	83.47	24.27	26.67	21.59
February-21	39.88	53.12	25.36	29.16	22.47
March-21	31.28	53.69	30.15	33.33	27.85
April-21	45.86	59.50	33.45	35.74	31.10
May-21	50.83	83.47	34.46	35.73	31.66
June-21	74.69	86.01	31.36	34.09	28.24
July-21	79.50	85.97	30.45	33.54	27.45
August-21	84.46	85.95	28.38	30.09	25.43
September-21	85.64	85.90	28.02	30.08	26.32
October-21	66.52	84.77	27.73	30.51	25.12
November-21	52.98	80.18	27.67	30.98	23.60
December-21	61.91	85.92	22.58	26.00	17.79
F.Y. 2022-23					
Date	HUMI	MAX	TEMP	TEMP(max)	TEMP(min)
	%	%	Degree C	Degree C	Degree C
January-22	52.8	70.1	21.2	25.8	13.5
February-22	43.6	64.0	23.8	27.3	18.3
March-22	41.4	66.5	26.4	30.3	19.6
April-22	38.9	78.7	24.6	29.8	19.3
May-22	39.7	67.3	21.9	29.6	12.8
June-22	55.0	85.9	27.1	33.8	12.7
July-22	83.5	86.0	28.4	30.8	26.1
August-22	82.2	86.0	28.8	31.6	26.4
September-22	80.2	85.4	29.0	31.7	26.4
October-22	68.4	85.6	28.1	31.1	84.3
November-22	54.4	65.6	24.9	26.9	21.3
December-22	54.93	67.59	24.77	29.35	17.61
F.Y. 2023-24					
Date	HUMI	MAX	TEMP	TEMP(max)	TEMP(min)
	%	%	Degree C	Degree C	Degree C
January-23	51.93	97.20	21.97	26.33	13.67
February-23	39.49	65.30	28.55	20.3	10.23

March-23	68.64	476.00	27.80	25.30	14.30
April-23	37.36	75.06	32.21	34.85	26.83
May-23	48.32	86.01	35.18	37.50	30.08
June-23	60.55	85.81	32.87	35.86	26.97
July-23	84.72	85.85	28.71	31.64	27.13
August-23	80.69	85.82	29.14	30.27	27.74
September-23	80.26	85.80	28.87	30.77	26.07
October-23	64.40	80.04	29.01	31.98	21.64

12.01.02 Monsoon details for last three years is as follows:

Rain fall in Year -2021 (in mm)				
	Month	**Min.**	**Max. (mm)**	**Total**
1	June - 21	00	64	172 mm
2	July - 21	00	88	319 mm
3	Aug. - 21	00	31	174 mm
4	Sep. - 21	00	89	362 mm
5	Oct. - 21	00	02	05 mm
	Total in Year			**1032 mm**
Rain fall in Year -2022 (in mm)				
1	June - 22	00	17	41 mm
2	July – 22	00	252	883 mm
3	Aug. – 22	00	158	464 mm
4	Sep. – 22	00	76	270 mm
5	Oct. – 22	00	29	50 mm
	Total in Year			**1708 mm**
Rain fall in Year -2023 (in mm)				
1	June – 23	00	111	248 mm
2	July – 23	00	102	701 mm
3	Aug. – 23	00	25	134 mm
4	Sep. – 23	00	69	348 mm
5	Oct. - 23	00	00	00 mm
	Total in Year			**1431 mm**

ANNEXURE-A: COMPLIANCE CERTIFICATE OF TECHNICAL SPECIFICATION

The bidder shall confirm compliance to the following by signing and stamping this compliance certificate and furnishing same with the offer.

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same.

2. There are no deviation(s) with respect to specification other than those furnished in the schedule of deviations.

3. Only those technical submittals which are specifically asked for in Notice Inviting Tender (NIT) to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of technical offer.

4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.

5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in 'BOQ' of the specification shall not be considered (i.e., technical description & quantities as per the specification shall prevail).

Date: Bidder's Stamp & Signature

ANNEXURE-B: DEVIATION/ CHANGE REQUEST OF TECHNICAL SPECIFICATION

Bidder shall list out all technical potential deviation/ change request (s) along with clause with respect to technical specifications.

Sl. No.	Page No.	Clause No.	Deviation	Reason/ Justification(s)

Any deviation not specifically brought out in this section shall not be admissible for any commercial implication at later stage. Except to the technical deviations listed in this schedule, bidder's offer shall be considered in full compliance to the tender specifications irrespective of any such deviation indicated / taken elsewhere in the submitted offer.

Date: Bidder's Stamp & Signature

GSECL	GUJARAT STATE ELECTRICITY COPRORATION LIMITED	VOLUME - V
	1X800 MW ULTRA SUPER CRITICAL UNIT NO#7 ON ASH DYKE AREA AT UKAI TPS	ANNEXURE - 2
	BID SPECIFICATION NO.: ETG106-EPC-UKAI/UNIT # 7-TS-01	
	DATA SHEET – B (TO BE FILLED BY BIDDER)	REV. - 0

S. No.	Description	Particulars
15.10	Thickness of Galvanising	

3.03.00 400 kV GAS INSULATED SWITCHGEAR

S. No.	Description	Unit / Data
1.0	**GIS SW ITCHGEAR**	
1.1	Reference standard	
1.2	Type of design	
	Construction	
	Enclosure	
	Conductor	
1.3	Service	
1.4	Rated Voltage	KVrms
1.5	Phase	
1.6	Rated Frequency	Hz
1.7	System grounding	
1.8	Design ambient temperature	---°C
1.9	Rated continuous current at design ambient temperature	
	Bus bar	..... /..../.... A
	Line/trafo/ cable/bus coupler feeders	..... /..../..../... A
1.10	Temperature Limit	
	Conductor	... °C
	Enclosure : portion)	....°C /....°C (for accessible
1.11	Short Circuit Rating Rated short time withstand current : Duration	Karms . . S e c .
1.12	Rated peak withstand current	KVpeak
1.13	Insulation level	
	a) Rated oneminute power Frequency withstand voltage	KV (r.m.s)
	Phase- Phase	
	Phase- Earth	
	b) Rated Lightning impulse withstand voltage	KV (peak)
	Phase- Phase	
	Phase- Earth	
	c) Rated switching impulse withstand voltage	KV (peak)
	Phase- Phase	
	Phase- Earth	
1.14	SF6 gas	
	Characteristic	
	Leakage rate	less than % per year
	Rated filling pressure	Mpa
	Alarm pressure	Mpa
1.15	AC/DC Power Supply	
	Rated Control voltage	--- V DC (---V - --- V)

	Service voltage	240V, 1 Ph, 50 Hz
1.16	Termination details	
	Line feeder	Gas to air bushing
	Transformer feeder	Gas to oil bushing
1.17	Painting	
	Internal surface	
	External surface	
	a) base	
	b) Paint shade	
1.18	Support structure	
2.0	**CIRCUIT BREAKER**	
2.1	Reference Standard	
2.2	Type	
2.3	Pole	
2.4	Rated Voltage	KV rms
2.5	Rated Frequency	Hz
2.6	Mechanical Endurance Class	
2.7	Electrical Endurance Class	
2.8	Re-strike Probability Class	
2.9	Electromagnetic Compatibility (EMC)	
2.10	Rated Insulation Level	
	a) Rated one minute power frequency withstand voltage	
	- between phase to earth	KVrms
	- Across open contacts	KVrms
	b) Rated Lightning Impulse withstand voltage	
	- between phase to earth	KVpeak
	- Across open contacts	KVpeak
	c) Rated Switching Withstand Voltage	
	- between phase to earth	KVpeak
	- Across open contacts	KVpeak
2.11	Max.radio interference voltage at 1.1 $U_{rated}/\sqrt{3}$	Micro-Volts
2.12	Rated continuous Current at design ambient temparature	Arms
	Line/Trafo/Cable/Bus coupler	...../ ..... /...../ .....Arms
2.13	Temperature rise over Design Ambient Temperature	°C
2.14	Rated Short-circuit breaking current	
	- Symmetrical	KArms
	- Percentage D.C. component	
2.15	Rated short-circuit making current	KA (peak)
2.16	Rated peak withstand current	KA (peak)
2.17	Rated short time withstandcurrent for rated durationof 3 sec.	KArms
2.18	Rated line charging breakingcurrent	KArms
2.19	Rated cable charging breakingcurrent	KArms

2.20	Rated out of phase breakingcurrent in % of rated Short Ckt.Breaking current	%
2.21	Rated out of phase making current in % of rated out of phase breaking current	%
2.22	Characteristic for short-linefault related to rated short-circuitbreaking current	
2.23	Rated capacitive switching breaking (Arms)/ in rush making current(KA peak)	KArms/KApeak
2.24	TRV Characteristics	
2.25	Inductive current breaking capability without exceeding	
2.26	First pole to clear factor	
2.27	Operating mechanism	
2.28	Opening time (ms)	
2.29	Closing time (ms)	
2.30	Rated Operating Sequence	
2.31	Rated Supply Voltage and frequency for	
	- Closing & Tripping	V D.C
	- Heater/Lamp/Socket	
2.32	Nos. of trip coil per pole	
2.33	Minimum Creepage distance	mm
2.34	Noise level Db at the base of CB	db
3.0	**DISCONNECTING SWITCH**	
3.1	Reference standard	
3.2	Type	
3.3	Pole	
3.4	Rated voltage	KV rms
3.5	Rated Frequency	Hz
3.6	Rated Insulation Level	
	a) One Minute Power Frequency Withstand Voltage	KVrms
	b) Rated Lightning Impulse Withstand Voltage across open gap	KVpeak
	c) Rated Switching Impulse Withstand Voltage	KVpeak
3.7	Rated Continuous current at site ambient	Arms
3.8	Rated Short time current for 3secs	KA rms
3.9	Peak Withstand current	KA peak
3.10	Magnetising / capacitive current Make & brake ability	A
3.11	Operating Mechanism	
3.12	Operating voltage	220V Dc
4.0	**MAINTENANCE GROUNDING SWITCH**	
4.1	Reference standard	
4.2	Type	
4.3	Pole	
4.4	Rated Insulation Level	
	a) One Minute Power Frequency Withstand Voltage	KVrms

	b) Rated Lightning Impulse Withstand Voltage across open gap	KVpeak
	c) Rated Switching Impulse Withstand Voltage	KVpeak
4.5	Rated Short time current for3secs	KA rms
4.6	Peak Withstand current	KA peak
4.7	Capacitive currentswitching ability	A
4.8	Operating Mechanism	
4.9	Operating voltage	V DC
5.0	**FAST ACTING GROUNDING SWITCH**	
5.1	Reference standard	
5.2	Type	
5.3	Pole	
5.4	Rated Insulation Level	
	a) One Minute Power FrequencyWithstand Voltage	KVrms
	b) Rated Lightning Impulse Withstand Voltage across open gap	KVpeak
	c) Rated Switching Impulse Withstand Voltage	KVpeak
5.5	Rated Short time current for3secs	KA rms
5.6	Peak Withstand current	KA peak
5.7	Inductive & Capacitive current switching ability	A
5.8	Operating Mechanism	
5.9	Operating voltage	V DC
6.0	**CURRENT TRANSFORMER**	
6.1	Reference Standard	
6.2	Type	
6.3	Rated continuous thermal Current	
6.4	Rated Insulation Level	
	a. 1 minute 50 Hz withstand voltage	
	- HV terminal & earth	KVrms
	- Secondary winding	KVrms
	b. Impulse withstand voltage	KVpeak
	c. Switching impulse withstand voltage	KVpeak
6.5	Short time current	
	a) Short-time current for 3sec	KArms
	b) Dynamic current	KApeak
6.6	C.T. Ratios & Parameters	

Core No	**Description**	**Current Ratio A/A**	**Output Burden VA**	**Acc. Class**	**ISF**	**Min. Knee-point voltage V_K (volt) at highest ratio KPV**	**Max Excitation Current I_e (m A) at KPV**	**Max CT Sec. Resistance R_{ct} (ohm) at highest ratio**
Feeder type :								
Core-1								

Core-2								
Core-3								

7.0	**VOLTAGE TRANSFORMER**			
7.1	Reference standard			
7.2	Type			
7.3	Insulation Level			
	a. 1 minute 50 Hz withstand voltage			
	- Main circuit			KVrms
	-Secondary circuit			KVrms
	b. Impulse withstand voltage			KVpeak
	c. Switching impulse withstand voltage			KVpeak
7.4	Voltage ratio & other parameters			
		Secondary -I	Secondary - II	Secondary - III
Voltage Ratio		KV/110V √3 √3	.KV/110V √3 √3	KV/110V √ 3 √3
Application		Protection	Protection	Metering
Output burden		VA	VA	VA
Accuracy Class*				
(* within frequency variation range)				
7.5	Voltage factor			
8.0	**GAS TO AIR BUSHING**			
8.1	Reference standard			
8.2	Type			
8.3	Rated continuous current at Site condition			Arms
8.4	Insulation Level			
	a. 1- minute 50 Hz withstand voltage			Kvrms
	b. Impulse withstand voltage			KVpeak
	c. Switching impulse withstand voltage			KVpeak
8.5	Minimum creepage distance			mm/Kv
9.0	**CONNECTION**			
9.1	Line termination details			
9.2	Cable termination details			
9.3	Transformer termination details			
10.0	**BAY CONTROLLER**			
10.1	Type			
10.2	All interlock included			
10.3	Remote communication mode			
10.4	Communication protocol			
11.0	**SUBSTATION AUTOMATION SYSTEM**			
1.0	General System Design			
1.1	Write-up on the proposed system			
1.2	Proposed System Architecture			
1.3	Write-up on Communication system			
1.4	System protocol adopted			
1.5	Reference standard			
2.0	Device Details			