

SECTION- PROJECT

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1.0 GENERAL

1.1 Preamble:

Power Grid Corporation of India Ltd. (POWERGRID), A Govt. of India Enterprise is responsible for Bulk Power Transmission of electrical energy from various central Govt. Power Projects to various utilities/ beneficiaries and interconnecting regional grids, operating, and maintaining the National Electrical Grid of India. It is established with the mission of “We will become a Global Transmission Company with Dominant Leadership in Emerging Power Markets with World Class Capabilities by:

- a) World Class: Setting superior standards in capital project management and operations for the industry and ourselves.
- b) Global: Leveraging capabilities to consistently generate maximum value for all stakeholders in India and in emerging and growing economies.
- c) Inspiring, nurturing and empowering the next generation of professionals.
- d) Achieving continuous improvements through innovation and state-of-the-art technology.
- e) Committing to highest standards in health, safety, security and environment.

1.2 POWERGRID is implementing following transmission schemes through Regulated Tariff Mechanism (RTM) Route.:

- a) *Augmentation of 1X500MVA, 400/230kV ICT (7th) at Tuticorin-II GIS*
- b) *Implementation of 01 no of 230kV Line Bay at Tuticorin-II GIS for providing connectivity to M/s Indian Oil NTPC Green Energy Ltd*

1.3 The following elements are envisaged under 400kV GIS Extn Substation Package SS-156:

- i) Extension of 400/230kV Tuticorin-II GIS Substation associated with Augmentation of 1X500MVA, 400/230kV ICT (7th) at Tuticorin-II GIS
- ii) 1 no. 230kV line bay at Tuticorin-II GIS for providing Connectivity to M/s Indianoil NTPC Green Energy Pvt. Ltd

Construction of associated 220kV lines are not covered under present scope.

1.4 It is the intent of this specification to describe primary features, materials, and design & performance requirements and to establish minimum standards for the work. The specification is not intended to specify the complete details of various practices of manufactures/ bidders, but to specify the requirements with regard to performance, durability, and satisfactory operation under the specified site conditions.

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- 1.5** The work to be done under this specification shall include all labour, plant, equipment, material, and performance of all work necessary for the complete installation and commissioning of the switchyard. All apparatus, appliances, material, and labour etc. not specifically mentioned or included, but are necessary to complete the entire work or any portion of the work in compliance with the requirements implied in this specification is deemed to be included in the scope of contractor.
- 1.6** Before proceeding with the construction work, the Contractor shall fully familiarize himself with the site conditions and General arrangements & scheme etc. Though the Employer shall endeavor to provide the information, it shall not be binding for the Employer to provide the same. The bidders are advised to visit the substation sites and acquaint themselves with the topography, infrastructure and also the design philosophy. The contractor shall be fully responsible for providing all equipment, materials, system, and services specified or otherwise which are required to complete the construction and successful commissioning, operation & maintenance of the substation in all respects. All materials required for the Civil and construction/installation work including cement and steel shall be supplied by the Contractor. Complete design (unless specified otherwise in specification elsewhere) and detailed engineering shall be done by the Contractor.

2.0 SCOPE OF WORK

2.1 The broad scope for the substations is as follows:

S. No.	Scope
1.	<p>Extension of 400/230kV Tuticorin-II GIS Substation</p> <p>A. Under “Augmentation of 1X500MVA, 400/230kV ICT (7th) at Tuticorin-II GIS”</p> <p>400kV GIS: Switching Scheme: One and half breaker scheme Short circuit level: 63kA for 1 sec.</p> <ul style="list-style-type: none"> • 1 number of 400kV ICT bay • 1 number of 400kV Tie bay • 1 number of 400kV Line bay (equipped bay for future use) <p>230kV GIS (Hybrid GIS): Switching Scheme: Double main scheme Short circuit level: 50kA for 1 sec.</p> <ul style="list-style-type: none"> • 1 number of 230kV ICT bay • 1 number of 230kV Line bay for termination of 230kV NCL Industries Ltd. Line • GIS bus duct for extension of 245kV Main bus <p>B. Under “Implementation of 01 no of 230kV Line bay at Tuticorin-II GIS for</p>

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	<p><i>providing connectivity to M/s Indian Oil NTPC Green Energy Ltd”</i></p> <p>230kV GIS (Hybrid GIS): Switching Scheme: Double main scheme Short circuit level: 50kA for 1 sec.</p> <ul style="list-style-type: none"> • 1 number of 230kV Line bay for termination of 230kV Indian Oil NTPC Green Energy Ltd. Line
2.	<p>Supply, erection, testing and commissioning of owner supplied 1 x 500MVA, 400/230/33kV Auto Transformers along with Digital RTCC relays are covered under separate package(s). However, following associated works for the Transformer installation are covered under the scope of this package:</p> <ul style="list-style-type: none"> • Civil works for the Autotransformer foundation, all associated terminal connectors, firewall, earthing connection to main earth mat and earth pits etc. (as required) as per technical specification. • All erection hardware items, structure etc. required for Autotransformer along with overhead connection from bushings of Autotransformer to substation equipment, including all associated terminal connectors. • HVWS & Hydrant system for the Autotransformer by extension of existing main header from the nearest available Point

The detailed scope of work of the substation package is brought out in subsequent clauses of this section.

2.2 Extension of 400/230kV Tuticorin-II GIS Substation:

2.2.1 Design, engineering, manufacture, testing, supply including transportation & insurance, unloading, storage, erection, testing and commissioning at site of following equipment and items complete in all respect:

A. 400kV Gas Insulated Switchgear

The SF6 gas insulated switchgear (50 Hz) shall be of the indoor metal-enclosed type.

Existing 400kV GIS Main Bus-I & Main Bus-II is of M/s Hyosung make shall be extended for the present scope 400kV GIS bays.

Extension of 400kV GIS Hall. Necessary Ventilation System, Illumination System, Fire Protection System, etc. for 400kV GIS Building extension portion will be designed and provided to meet the technical requirements. Building shall be extended in such a way that existing EOT crane can be used in area of present scope for erection and maintenance purpose. Further, present scope of work involves extension of EOT crane girders and all necessary Electrical & Mechanical accessories to facilitate movement of

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existing EOT crane in the extended portion of GIS hall. Cost of the same shall be deemed to be covered in the building cost.

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 & foundation bolts. In addition, all necessary platforms, supports, ladders and catwalks etc. as required for operation & maintenance work shall also be provided.

- a) 400kV GIS modules/Equipment as per BPS and description given in Specific requirement Rev 10 (Annexure II of section project).
- b) 400kV equipped Line feeder bay for future use is envisaged for completion of 400kV diameter. 400kV GIS bus ducts shall be brought outside of the GIS hall and provided with end Piece (Interface) module suitably with isolating test link under present scope for future connections. Associated end piece (Interface) module shall be deemed to be part of outdoor bus duct. Outdoor Bus duct including end piece (Interface) module for Line feeder bay, shall be measured from outer edge of the wall of the 400kV GIS Hall/Building & Shall be paid separately, against respective BPS items.
- c) 400kV Gas Insulated Bus (GIB) Ducts: - 400 kV GIB (outdoor) ducts for connection of outdoor equipment (including support structures, gas monitoring devices, gas barrier, pressure switch, UHF PD sensor) be as per BPS.
Under present scope, 400kV GIS bus duct for ICT (7th) shall be terminated to bushing near the 400/230kV ICT. The outdoor GIS bus duct shall be measured from outside wall edge of GIS building to centerline of SF₆ to Air Bushing.
- d) Air conditioning system, Ventilation system and Fire detection & alarm system for GIS hall & relay panel room.
- e) Mandatory Spares as per **BPS** (Bid Price Schedule).
- f) Any other equipment/material required to complete the specified GIS scope of work.

B. 230kV Outdoor Hybrid Gas Insulated Switchgear (HGIS) Assembly:

- a) The 230kV (50Hz) SF₆ Gas Insulated Hybrid GIS assembly (also referred as Hybrid GIS Assembly for purpose of this specification) shall be outdoor metal enclosed type. Hybrid GIS Assembly shall consist of GIS components (i.e. CB, Disconnectors, Earthing Switches, CTs, GIS Bus ducts and SF₆ to Air Bushings as specified) suitable for connection with AIS bus bars and transmission line side AIS equipment. Hybrid GIS Assembly shall comply with the requirements of IEC 62271-203 & Section-GIS Rev 05A of technical specification. The Hybrid GIS Assembly shall be complete with all necessary terminal boxes, SF₆ gas filling, interconnecting power and control wiring, grounding connection arrangement, gas monitoring equipment & support structure (as required) along with common base frame & foundation bolts/fixing arrangement for fixing the Hybrid GIS Assembly with foundation.
- b) Alternatively, Mixed Technology Gas Insulated Switchgear (MTS) Assembly complying with requirements of IEC 62271-205 shall also be acceptable. In case contractor offers MTS Assembly, all type tests of individual equipment shall be as per applicable IEC & complete compact switchgear unit shall be type tested as per IEC

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62271- 205. MTS Assembly shall be suitable for outdoor applications and shall be suitable for connection with AIS bus bars and transmission line side AIS equipment. With regard to the specification of MTS the other clauses of Section: GIS, Rev-5A (as relevant/applicable), shall be referred to.

- c) 230kV GIS modules/Equipment as per BPS and description given in Annexure- IV.
- d) Outdoor Hybrid GIS/MTS Assembly along with LCC panel shall be mounted a common base frame as a single complete unit and base of above switchgear assembly shall be so designed that it shall be possible to move the complete switchgear assembly for maintenance purpose without damage.
- e) MTS assembly if offered shall be of free standing, self-supporting with easy accessibility to all the parts during installation & maintenance, including support structure (as required) along with common base frame & foundation bolts for fixing the MTS Assembly with foundation. Wherever necessary, fixed ladders, for general operation and maintenance, for access to the operating mechanism and monitoring devices, shall be provided. The structures shall be either aluminum or hot-dipped galvanized steel.
- f) Hybrid GIS/MTS assembly shall have suitable protective coating for outdoor application with High Pollution Level environmental conditions. The sealing provided between flanges of various enclosures shall be such that long term tightness is achieved for outdoor duty.
- g) LCC Panels shall be type tested for at least IP-55 degree of protection.
- h) Hybrid GIS/MTS assembly shall be connected with ground mat risers through copper connections at minimum of two nos. of grounding connections. Suitable grounding pads on Hybrid GIS/MTS Assembly shall be provided for above earthing arrangement. Raised plinth level for Outdoor Hybrid GIS/MTS Assembly shall be minimum 750mm from FGL of the switchyard.
- i) The minimum vertical clearance between FGL & bottom of the SF6 to air bushing insulator shall be 2.55 meters. If required, necessary GIB can be provided to meet this clearance requirement.
- j) **SITE TESTING:**
After the Switchgear assembly has been fully installed at site and SF6 gas filled at rated filling density, the complete Hybrid GIS/MTS assembly shall be subjected to the site tests as per IEC-62271-203 /IEC 62271-205 as applicable.

C. 220 kV Gas Insulated Switchgear

- a) Under present scope, 220kV GIS bus ducts and 220kV SF6 to Air bushings are included for interconnection of existing 220kV AIS Bus 1 & Bus 2 to the present scope 220kV AIS Bus 1 & Bus 2 as shown in Tender drawings. 220kV Gas Insulated bus ducts/SF6 to Air bushings shall be completed with all necessary terminal boxes, SF6

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gas filling, grounding connections, gas monitoring equipment & piping and support structures along with necessary base plate & foundation bolts, as required. In addition, all necessary Portable ladders, supports etc. as required for operation & maintenance work shall also be provided under present scope of work.

- b) LCC for monitoring GAS tight chambers shall also be supplied. The LCC shall be placed in the Switchyard Panel Room under present scope. Integration of Gas density signals in CRP & SAS is included under present scope. Price of same is deemed to be included in Bus Bar Augmentation item under present scope.

D. Air insulated switchgear (AIS) and Other Main Equipment

- i. **400kV and 230kV VOLTAGE CLASS AIS EQUIPMENT (As per BPS):** 400 kV Class Bus Post Insulators and Surge Arresters; 230kV Class Bus Post Insulators, Wave Trap (pedestal mounted), Surge Arresters and CVT.

For 230kV system, equipment with highest system voltage of 245kV as per BPS shall be supplied.

- ii. Controlled Switching device (as per BPS).

- iii. **CONTROL, RELAY & PROTECTION SYSTEM:** Complete control, relay and protection system as per Section–Control and Relay panels

The Augmentation of 400kV Busbar protection scheme (duplicate) is included in the present scope. The existing Busbar protection scheme is of NR Electric make (model PCS-915) with Centralized busbar protection system. All required Trip Relays, wiring, modification etc. as per requirement for augmentation of bus bar for 2 nos. main bays is under present scope. No supply item is envisaged for 400kV busbar protection augmentation. In case any minor item is required for the augmentation of 400kV bus bar protection, same shall be deemed to be included in service item of same.

The Augmentation of 230kV Busbar protection scheme is included in the present scope. The existing Busbar protection scheme is of M/s Schneider Electric make decentralize (model P741) protection system. Under present scope, 3 nos. peripheral unit shall be supplied for 3 nos 230kV bays. All required Trip Relays, wiring, modification etc. as per requirement for augmentation of bus bar for 3 nos. main bays are under present scope.

Analog and digital protection coupler shall be provided by the owner of the respective transmission line. However, the integration of same with CRP panels and wiring between the coupler and CRP is included under present scope.

- iv. **SUBSTATION AUTOMATION SYSTEM:** Augmentation of Substation Automation System based on IEC-61850 as per Section Substation Automation (including hardware and software) along with associated equipment.

The existing Tuticorin-II GIS substation is equipped with substation automation system based on IEC 61850 protocols supplied by M/s NR Electric. Bidder shall include BCU

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required for bays (Bay as defined in technical specification, Sec. - Substation Automation) as listed below including all necessary hardware and software to integrate IEDs offered under present scope with the existing Substation Automation System as indicated above.

- 400kV bays – 3 Nos.
- 230kV bays – 3 Nos.

The scope of bidder shall include but not limited to integration of BCU and protection IEDs under present scope of work with existing substation automation (which is based on IEC 61850) including up-dating of system database, displays, development of additional displays and reports as per requirement.

Necessary configuration of data at Gateway for remote operation from NTAMC, Backup NTAMC, RTAMC & supervision from RLDC (RSCC)/NLDC is included in present scope. However, no work is envisaged at remote end (RLDC/NLDC/NTAMC/RTAMC etc.) under the present scope.

Integration of ODS (On-line Oil Drying system) based on IEC-61850, for 400kV transformer (being supplied under separate package) with substation automation system is also included under present scope.

Integration of digital remote tap changer relay with SAS is also included under present scope

- v. **Complete Fire Protection System** HVWS and hydrant system for 400/230/33kV 3-Phase Autotransformers (Employers supplied). Smoke detection, Fire alarm & annunciation System for GIS Hall, Switchyard panel room, LCC Room and AHU room.
- a) Fire protection system including HVWS & Hydrant system for 1x500MVA, 400/230/33kV, 3-ph Autotransformers is included in present scope. Hydrant Piping for fire protection system shall be extended from nearest existing Main Header in the switchyard.
 - b) The hydrant system for 400kV GIS hall extension area is also included under present scope. This will include dismantling and shifting of existing piping required for extension of GIS hall. The cost of the new piping and dismantling of old piping as per requirement shall deemed to be included in overall cost of firefighting works under this specification.
 - c) Conventional type Smoke detection, Fire alarm & Annunciation System and Fire Extinguishers for Switchyard panel Rooms under the present scope.
 - d) Fire detection & alarm system for 400kV GIS hall (including AHU rooms) and 400kV LCC room. Fire detection and alarm system for AHU rooms under present scope is deemed to be included in GIS hall.
 - e) New panel for fire detection and alarm system at control room building shall be supplied with 6+6 Zone cards.
- vi. **AIR CONDITIONING:** Air Conditioning System for Switchyard panel rooms and LCC Rooms.

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vii. **CABLES:** 1.1 kV grade Power & Control Cables (and special cables, if any) along with complete accessories including cables for oil filtration units and cabling from common marshaling box of 400kV Transformers to bay kiosks/ Relay Panel Room / Control Room. Power receptacle for oil filtration unit shall also be provided under present scope of work. Methodology for supply, installation & sizing of cables shall be as per Annexure-V.

viii. **VISUAL MONITORING SYSTEM** for watch and ward of substation premises.

Specification as described at Specific Requirement REV-10 to be referred to.

Visual Monitoring System (VMS) for area under present scope. Make of existing VMS is GE Nice vision. The provided system has to be integrated with existing Video Monitoring software. The bidder shall provide 2 nos. Fixed Color IP Camera suitably located in the 400kV GIS hall. 3 nos. IP camera with PAN, Tilt & Zoom facility suitably located in 400kV/220kV Outdoor switchyard in the present scope area. The scope of bidder shall include providing all Items, Accessories, Line Interface units, Fiber patch cords, Power supply units, Junction Boxes, Cables, Fiber Optic Cables, Hardware and Software, etc. as are applicable to the product design, to meet functional requirements. Compatibility and capability enhancement of existing VMS system, if needed, shall be done to integrate present scope visual monitoring system with existing Visual monitoring system of the station.

ix. **ILLUMINATION SYSTEM:** LED based Lighting and illumination system for the switchyard area under present scope, Switchyard panel room GIS hall including Relay Panel Room and AHU rooms. Illumination system shall be provided using the fixture types as specified in Technical Specification Section-Lighting System. Further, contractor shall submit lighting design calculations for finalizing the number of fixtures in GIS hall including LCC Room and AHU rooms, in line with Annexure-III (Specific Requirements). Illumination of AHU room and relay panel room is deemed to be included in Illumination system for 400KV GIS Hall

x. **ERECTION HARDWARE:** Erection hardware of a bay shall include Insulator strings and hardware, Disc Insulators/Long Rod Insulators (as applicable), Conductor(s), Al tube, Cable Trays & covers, spacers, clamps & connectors (including terminal connectors for 400/230/33kV transformer bushings), Junction box, earthwire, earthing material risers, auxiliary earthmat (excluding main earth mat), buried cable trenches/pipes for equipment & lighting, cable supporting angles/channels Cable pull pit, cable trays & covers, Insulating mats, cable sealing arrangement, , all accessories etc. as required.

• **Erection Hardware under respective BPS Item shall also cover the following:**

a) Earthing of all the equipments including cable trenches, auxiliary earthmat for isolators etc., & scope shall include Earthing of employer-supplied Transformer by connecting them to the main Earthmat.

xi. **MAIN EARTHMAT:** Main Earthmat shall be paid as per actual length executed at site. The main earthmat is existing in some areas under present scope. In areas under present scope, where main earthmat is not available, it shall be laid under present scope All the equipments (including owner supplied 400/230kV Transformers), structures,

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cable trenches, etc. to be earthed by risers connecting them to the Main Earthmat and the same shall be part of Erection Hardware.

For 400kV GIS grounding inside the GIS building, contractor shall refer Annexure-S10 of Specific requirement, Rev 10 and the same shall be deemed to be included as Part of GIS equipment.

- xii. **LIGHTNING PROTECTION (DSLPP):** The lightning protection (DSLPP) for area under present scope is to be provided by the contractor. The contractor shall design the lightning protection by utilizing the structures provided under present scope.

If the existing structures are not adequate for Lightning Protection, then LM shall be provided. LM shall be paid under MT rate quoted for steel structure in BPS. Earthing of LM shall be done by the contractor and same shall be deemed to be part of erection hardware for the bay.

- xiii. **LT SWITCHGEAR:**

415V ACDB (Extn.)- As per BPS includes:

- Existing ACDB-I & II shall be augmented under present scope by providing 8 sets of 63A, 4P MCCB, 4 set of 32A, 4P MCCB, 2 set of 100A, 4P MCCB and 1 set of incomer MCCB, 4P 300A along with required TB's and wiring on each ACDB. The MCCBs under present scope shall be provided in separate extension board (1 each for ACDB I & II). Further, 1 no. outgoing 300A 4P, MCCB on each existing ACDB, shall be provided. The separate extension board shall be integrated with existing ACDB and shall be kept adjacent to existing ACDB. All materials including cables required for extension of ACDB are deemed to be covered under ACDB Extn item of BPS.

220V & 48V DCDB (Extn.):

- DCDBs are not envisaged under present scope and necessary feeder modules with MCCB/MCB shall be made available. Necessary cabling and connection for the bays under present scope is in the scope of the contractor.

- xiv. **TELE-COMMUNICATION EQUIPMENT:**

The broad Scope of the procurement of FO based Communication Equipment shall include planning, designing, engineering, supply, transportation, insurance, delivery at site, unloading, handling, storage, installation, termination, testing, training and demonstration for acceptance, commissioning and documentation for:

1. SDH Equipment along with suitable interfaces and line cards.
2. All cabling, wiring, Digital Distribution frame patch facilities and interconnection to the supplied equipment at the defined interfaces
3. System integration of all supplied subsystem
4. Integration with the existing communication system based on SDH and PDH of employer
5. Integration of supplied subsystem with SCADA system, PLCC equipment, PABX of RLDC/SLDC, VOIP (SIP compliant) for voice.

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6. Fibre Optic Approach Cable (FOAC) along with duct, GI pipe, GI Elbow, GI Flexible conduit and Fibre Optic Distribution Panel (FODP)
7. Integration of new Communication equipment in the existing regional Network Management System. All required support to existing NMS vendor for integration of new Communication equipment.
8. Validity of Type Test for GA&C communication equipment (Like FOTE, Fiber Optics cable, OPGW, DG set, Battery bank and Charger etc) shall be as per CEA Guidelines January 2026.

xv. **PHASOR MEASUREMENT UNIT:**

The broad Scope of the procurement of PMU shall include planning, designing, engineering, supply, transportation, insurance, delivery at site, unloading handling, storage, installation, termination, testing and demonstration for acceptance, commissioning, and documentation for PMU as per BPS.

1. The PMU shall comply with latest version of IEC/IS 60255-118-1-2018 and IEEE C 37.118.2 protocols standards.
2. The PMU shall be integrated with Phasor data Concentrator (PDC) at respective Regional Load Despatch Centre (RLDC)/ State Load Despatch Centre (SLDC).
3. The Contractor shall extend technical support at Substation end for seamless integration of PMU with PDC at respective RLDC/SLDC end. The integration work at RLDC end will not be under the scope of the Contractor. The PDC at RLDC/SLDC is of M/s GE make.
4. The PMU supplied in this project shall support measurement of voltages and currents of at least 2 feeders/bays.
5. All cabling and interconnections for extension of CT/CVT, Digital inputs from the Line Bays, ICTs/Reactors/STATCOM bays up to PMU panel for measurement by PMU, shall be in the scope of the Contractor. Accordingly, the associated 1.1KV Control cables as required for Non-Adjacent Inter- Control and Relay panel (CRP) CT /PT connections & Digital input connections to PMU panel shall also be under the Contractor's scope. The scope of these cabling work (supply, laying & termination), as applicable in subject project, shall be deemed to be included in price of PMU equipment.
6. Validity of Type test for PMU shall be as per CEA Guidelines January 2026.

2.2.2 Civil Works

A. The design of foundation shall be based on the soil investigation report and other parameters as per relevant IS codes & technical specification. The foundations may be open foundation or pile foundation as per the site requirement / soil report.

B. General:

(i) Reinforced Cement Concrete:

- a) The environmental exposure condition of the site falls under severe category as per IS:456. All RCC shall be of Design mix with minimum M-30 grade. Further,

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for pile foundation works RCC shall be of minimum M-30 grade with minimum cement content of 400 kg/Cum.

- b) The type of cement to be used for this project shall be as per the recommendation of soil consultant/ soil investigation report.
- c) All foundations surfaces including boundary walls, Cable Trenches, underground RCC works, RCC drains etc. touching with soil shall be painted with bituminous or silica fluoride coatings as per IS:456. The cost of painting/coating shall deemed to be included in the corresponding item of BPS.
- d) Water used for mixing of any type of concrete and curing shall be conforming to IS456.

(ii) **Reinforcement Steel:** The corrosion resistant steel (CRS) as per Technical Specification shall be used.

(iii) **PEB structure and Materials:**

- a) The steel sheets of walls & roofing panels, Trims, Downspouts, Flashings, Gutter etc. shall be provided with 200 GSM zinc aluminium coating. After zinc aluminium coating, the steel sheet shall be provided with PVDF (Polyvinyl di fluoride) paint coating in place of SMP (Silicon Modified Polyester) paint.
- b) Protective coating shall be applied to the surface of all the structural steel members after grit/shot blasting of structural members. The final DFT (dry film thickness) shall not be less than 200 microns. The complete Work shall be as below: Shot blasting to SA 2 ½ + Zinc silicate primer of thickness 40-60 microns DFT + MIO (Micaceous Iron Oxide) Epoxy Intermediate coat of thickness 100-120 microns DFT + PU (Polyurethane) finish coat of thickness 40-60 microns DFT.
- c) All other details shall be as per technical specification.

C. The scope of civil work shall include but shall not be limited to the following based on **drawings developed by the contractor:**

- (i) Structure and Foundation of non-Standard structures (if any) envisaged during detailed engineering. The design of foundation shall be based on the soil investigation report and other parameters as per relevant IS code & technical specification.
- (ii) **Site levelling work:** The item site levelling works includes Contouring of plot area in the present scope as per technical specification. The final area of levelling will be decided during detailed engineering.

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- a) The Quantity of earthwork cutting & filling borrowed earth and FGL shall be proposed by vendor for approval of POWERGRID based on the approved contour level drawing and site HFL data.
 - b) Mode of measurement of this item is in Cum of earthwork as per BOQ and technical specification. The contouring of the plot area in scope as per technical specification is also deemed to be included in quoted rates of this item.
 - c) HFL data duly verified by POWERGRID Site is required to be arranged by contractor for finalization of FGL (Finished Ground Level).
- (iii) Slope Protection Works & Retaining Walls:** Design & Drawings pertaining to slope protection works & retaining walls (if required) shall be finalized during detailed engineering and same shall be measured under respective line items of BPS.
- (iv) HGIS Module Foundation**
- (v) 400kV GIS Building Extension, Panel Room and AHU Room:**
- a. The dimensions of these building shall be finalized during detailed engineering based on the equipment layout and requirement of technical specification.
 - b. Any dismantling work (if any) required in the existing Building/hall to support the present scope of the work. No extra payment shall be made towards it. Rates shall be deemed to be included in the plinth area rates for the new Building/hall.
 - c. All civil works including foundations associated with erection of SF6 gas insulated metal enclosed switchgear along with its SF6 bus ducts upto the outer edge of the wall of GIS building. Civil works including all foundations for all equipment inside GIS building.
 - d. The cable trenches inside GIS halls & associated LCC/Relay rooms.
- (i)** Structure and foundation for tertiary delta formation for Transformers along with associated spare unit connection arrangement.
- (ii)** Other miscellaneous requirements & scope:
- a. Stone spreading and anti-weed treatment including PCC in the switchyard. Over the prepared sub-grade, 75mm thick base layer of cement concrete in 1:5:10 (1 cement: 5 fine aggregate: 10 burnt brick aggregate 40mm nominal size) shall be provided in the area as per detailed engineering drawing or as directed by Engineer-in-charge. Layout for the same shall be developed by the contractor.
 - b. Foundation for lighting poles, bay marshalling boxes, panels and control cubicles wherever required. The cost of these foundations shall deemed to be included in erection/installation of corresponding item/ equipment of BPS.

- c. For all building, all doors except fire escape doors, windows, glazed partitions shall be of UPVC type.
 - d. Any other item/design/drawing required for successful completion of the scope of works.
- D.** The scope of civil work shall include but not be limited to the following based on **drawings developed by POWERGRID:**
- (i) Concrete Road including Road Crossing**
Concrete Road including approach road (if any), shall be constructed as per POWERGRID standard drawings provided in tender. However, Road layout shall be prepared by vendor for approval.
 - (ii) Switchyard panel Room**
 - (iii) Cable Trenches**
Cable trenches shall be constructed as per POWERGRID standard drawings provided in tender. However, Cable trench layout shall be prepared by vendor for approval of POWERGRID based on the standard sections.
 - (iv) Drains**
Drain layout including peripheral drains if any required along the boundary shall be prepared by vendor and to be submitted for approval of POWERGRID based on the standard sections.
 - (v) Transformer foundation and associated structures**

Foundation of Transformer including Rail cum road, unloading platform, jacking pad, Oil tank, pulling blocks, gratings etc. as per technical specification.
 - (vi) Fire resistant walls between Transformer**
 - (vii) Equipment Support Structures**
220kV & 400kV Equipment support structures except support structure for Circuit Breaker which shall be as per manufacturer's design.
 - (viii) Foundations of Equipment Support Structure**
 - a) 400kV & 220kV Equipment support structure foundations including CB foundation,
 - b) The foundations of these structure are including of embedment/grouting of foundation bolts.
 - (ix) Gantry tower and beam, LM Structure**
220kV Gantry tower and beam, LM Structure.
 - (x) Foundations of 220kV Towers and LM**
 - a) Foundations of 220kV Towers and LM.

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- b) The foundations of these structures are including of embedment/grouting of foundation bolts.
- E. Zinc coating for galvanization of towers, beams, LM structures, equipment support structures, ladders of equipment, cleats, base plates, foundation bolts etc. shall not be less than 900 gm/sqm.
- F. For buildings, the complete civil works including internal and external finishing, stone soling for flooring, Structural steel, plinth protection, drain along plinth protection, electrical conduit and junction boxes, fan boxes, cable transit system etc. required to complete the building in all respect as per the drawing shall be payable in the plinth area rate. However, the quantity of earthwork (excavation, backfilling, disposal etc.), concrete (all types), reinforcement steel, shall be measured and paid under respective items under BPS.
- 2.3 The work to be done under this specification shall include all labour, plant, equipment, material and performance of all work necessary for the complete installation and commissioning of switchyard. All apparatus, appliances, material and labour etc. not specifically mentioned or included, but are necessary to complete the entire work or any portion of the work in compliance with the requirements implied in this specification is deemed to be included in the scope of contractor.
- 2.4 The bidder shall be fully responsible for providing all equipment, materials, system and services specified or otherwise which are required to complete the construction and successful commissioning, operation & maintenance of the substation in all respects. All materials required for the Civil and construction/installation work including cement and steel shall be supplied by the Contractor. The complete design (unless specified otherwise in specification elsewhere) and detailed engineering shall be done by the Contractor based on conceptual tender drawings.
- 2.5 The Contractor shall also be responsible for the overall co-ordination with internal/external agencies, project management, loading, unloading, handling, moving to final destination for successful erection, testing and commissioning of the substation/switchyard.
- 2.6 Design of substation and its associated electrical & mechanical auxiliaries systems includes preparation of single line diagram, electrical layout, foundation & cable trench layouts (including invert levels), erection key diagrams, direct stroke lightning protection, electrical and physical clearance diagrams, Control and protection schematics, wiring and termination schedules, design of firefighting system, outdoor lighting/illumination and other relevant drawings & documents required for engineering of all facilities within the fencing to be provided under this contract, are covered under the scope of the Contractor.
- 2.7 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.

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- 2.8 Employer has standardized its technical specification for various equipment and works for different voltage levels. Items, which are not applicable for the scope of this package as per schedule of quantities described in BPS, the technical specification for the items should not be referred to.

3.0 SPECIFIC EXCLUSIONS:

The following items of work are specifically excluded from the scope of the specifications at all sub-stations:

3.1 400/230kV Tuticorin-II GIS Sub-station:

- a) Approach road & Boundary wall.
- b) Employer's site office and stores.
- c) Supply, erection, testing & commissioning of 500 MVA, 400/230/33kV three phase autotransformers.
- d) Tariff Meters
- e) Employer's site office and stores
- f) Soil investigation.

4.0 PHYSICAL AND OTHER PARAMETERS

- 4.1 **Location of the Substation** – The location of substation is indicated below:

S. No	Name of Substation	Name of State	Nearest Rail Head
1.	Tuticorin -II GIS	Tamil Nadu	Tuticorin

- 4.2 **Meteorological data** - The meteorological data are as below:

Station Name	Tuticorin-II GIS
Altitude	Less than 1000 meter above mean sea level (MSL)
Snow fall	NIL
Seismic Zone	As per IS 1893 (Part 1)
Wind Zone	IS 875 Part 3
Min./Max. Ambient Temp.	0 / 50 degree centigrade
Coastal Area Consideration	Yes

5.0 SCHEDULE OF QUANTITIES

The requirement of various items/equipments and civil works are indicated in Bid price Schedules.

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All equipments/items, Structures and civil works for which quantities has been given in the BPS shall be payable on unit rate basis. During actual execution, any variation in such quantities shall be paid based on the unit rate under each item incorporated in Letter of award.

Wherever the quantities of items/works are indicated in Set/LOT/LS, the bidder is required to estimate the quantity required for entire execution and completion of works and incorporate their price in respective Bid price schedules. For erection hardware items, Bidders shall estimate the total requirement of the works and indicate module-wise lump sum price bay wise and include the same in relevant Bid price schedules. Any material/works for the modules not specifically mentioned in the description in BPS, as may be required shall be deemed to be included in the module itself.

No cost compensation shall be considered on account of “Set/LOT/LS” items in any case if number of bays specified in section project remains unchanged.

Bidder should include all such items in the bid proposal sheets, which are not specifically mentioned but are essential for the execution of the contract. Item which explicitly may not appear in various schedules and required for successful commissioning of substation shall be included in the bid price and shall be provided at no extra cost to Employer.

6.0 BASIC REFERENCE DRAWINGS

- a) The substation shall be designed considering current ratings as indicated below:

S. No.	Description of bay	Tuticorin-II GIS	
		400kV	230kV
1.	Bus Bar	4000A	3000A (AIS Bus bar to be matched with existing)
2.	Line bay	3150A	1600A
3.	ICT bay	3150A	1600A

- b) The reference drawings, which form a part of the specifications, are given at **Annexure-I**. The bidder shall maintain the phase to earth clearance, phase to phase clearance and sectional clearances, clearances between buses, bus heights but may alter the locations of equipment to obtain the statutory electrical clearances required for the substation.

The enclosed drawings give the basic scheme and associated services etc. In case of any discrepancy between the drawings and text of specification, the requirements of text shall prevail in general. However, the Bidder is advised to get these clarified from Employer.

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- c) It is responsibility of contractor to develop general arrangement drawing, layout drawings, single line drawing, foundation & cable trench layout, erection key diagram & all other layout drawings for present scope of work.

7.0 DIFFERENT SECTIONS OF TECHNICAL SPECIFICATION

Employer has standardized its technical specification for various equipment and works for different voltage levels. Items which are not applicable for the scope of this package as per schedule of quantities described in BPS, the technical specification for the items should not be referred to.

For the purpose of present scope of work, technical specification (Vol. II) shall consist of following sections, and they should be read in conjunction with each other.

Sl. No.	Description	Revision
1.	Section - Project	Rev 00
2.	Section - General Technical Requirement	Rev 15
3.	Section - Gas Insulated Switchgear (GIS)	Rev 05A
4.	Section - Switchgear- Instrument Transformer	Rev 12
5.	Section - Switchgear- Surge Arrester	Rev 13
6.	Section - Power & Control Cable	Rev 06
7.	Section - Lighting System	Rev 07
8.	Section - Fire Protection System	Rev 06
9.	Section - LT Switchgear	Rev 05
10.	Section - Air Conditioning System	Rev 04
11.	Section - Switchyard Erection	Rev 10
12.	Section - Structure	Rev 07
13.	Section - Civil Works	With Rev 12 (correction slip -1)
14.	Section - Control & Relay Panel	Rev 09
15.	Section - Substation Automation System	Rev 04
16.	Section - PLCC	Rev. 05
17.	Section - Telecommunication System	Rev. 05
18.	Section - PMU	Rev 01

In case of any discrepancy between Section-PROJECT and Section-GTR and other technical specifications on scope of works, Section-PROJECT shall prevail over all other sections.

In case of any discrepancy between Section-GTR and individual sections for various equipment, requirement of individual equipment section shall prevail.

In case of any discrepancy between Main body of Section-Project and Annexure(s) of Section-Project, provisions specified in Main body of Section-Project shall prevail.

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In case of any discrepancy between BPS and other sections, BPS shall prevail over the other sections of the technical specifications. However, for rating of the BPS items, associated Section-Project shall prevail & is to be referred to.

8.0 MANDATORY SPARES

The prices of mandatory spares shall be given by the Bidder in the relevant schedule of BPS and shall be considered for evaluation of bid. It shall not be binding on the Employer to procure all of these mandatory spares. The bidder is clarified that no mandatory spares shall be used during the commissioning of the equipment. Any spares required for commissioning purpose shall be arranged by the Contractor. The unutilized spares if any brought for commissioning purpose shall be taken back by the contractor.

Wherever spares in BPS/Technical Specification has been specified as “each type/each rating/each type & rating”: If the offered spare/spares are sufficient to replace the respective main equipment of all types/ratings, then such offered spare/spares shall be acceptable. It implies that common spare/spare set fulfilling the spare requirement of all types/ratings shall also be acceptable, provided it is configurable at site itself without special assistance of OEM.

Mandatory Spares, wherever mentioned, are envisaged for the equipment/items being supplied under the main equipment heads under present scope meeting the requirements of Technical Specifications. The component/sub-component of an equipment/item specified in BPS under Mandatory Spare, which is not applicable as per the offered design of respective main equipment, shall not be referred to.

9.0 SPECIFIC REQUIREMENT

9.1 Relevant/applicable clauses of Specific Requirements as mentioned at C/ENGG/SPEC/SEC-PROJECT/SPECIFIC REQUIREMENT Rev. no. 10 (attached as **Annexure-II**) shall also be referred for specified scope of work. Any discrepancy between clause 9.0 Section-PROJECT and Specific Requirements as mentioned at C/ENGG/SPEC/SEC-PROJECT/SPECIFIC REQUIREMENT Rev. no. 10 (attached at Annexure-II) on scope of works, the requirement stipulated at clause 9.0 of section project shall prevail.

9.2 Tuticorin-II GIS substation is situated in coastal area. Hence, all the specifications defined for coastal area in various sections of Technical Specifications shall be applicable.

9.3 “Minimum specified creepage distance for insulator string/ longrod insulators/ outdoor bushings shall be 31 mm/kV”.

9.4 Extension piece (Interface) module, as required to extend existing bus to maintain minimum possible interconnection space between GIS supplied under present scope and the GIS being extended, stands excluded from the description of 400kV GIS Bus bar Module Extension given in Annexure-S11 of Specific requirement, Rev 10. Bidder

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to quote the cost against the above item(s) under respective BPS line item for GIS Extension piece (Interface) module.

Further, the configuration of 400kV & 220kV GIS Extension piece (Interface) module shall be as specified below: GIS Extension piece (Interface) module:
Extension of Three isolated phase/Three Phase, SF6 gas insulated metal enclosed bus bar/duct module, each set comprising of the following:

- a) Extension piece (Interface) module, as required to extend existing bus bar/duct.
- b) Gas monitoring devices, barriers, pressure switches, UHF PD Sensors, Support structures etc., as required.
- c) All associated consumable items i.e., O-ring, adsorbents etc. with supervision of existing OEM."

9.5 Sl.No. A.5 of Annexure-III of Section-Project [Specific Requirement Rev.10] is amended as follows:

The reports for all type tests as per technical specification shall be furnished by the Contractor along with equipment / material drawings. However, type test reports of similar equipment/ material already accepted in POWERGRID shall be applicable for all projects with similar requirements. The type tests conducted earlier should have either been conducted in accredited laboratory (accredited based on ISO / IEC Guide 25 / 17025 or EN 45001 by the national accreditation body of the country where laboratory is located) or witnessed by POWERGRID/representative authorized by POWERGRID/representative of Utility /representative of accredited test lab/ representative of The National Accreditation Board for Certification Bodies (NABCB) certified agency shall also be acceptable.

Unless otherwise specified elsewhere, the type test reports submitted shall be of the tests conducted within the years specified below from the originally scheduled last date of bid submission (Soft Copy). In case the test reports are of the test conducted earlier than the years specified below from the originally scheduled last date of bid submission (Soft Copy)., the contractor shall repeat these test(s) at no extra cost to the Employer: -

S. No.	Name of Equipment	Validity of type test (in years)
1	Power Transformer	10
2	LT Transformer	10
3	Shunt Reactor/Series Reactor /Neutral Grounding Reactor	10
4	OLTC	10
5	Bushing of Power Transformers/Reactors	10
6	Fittings and accessories for Power transformers & Reactors	10
7	Circuit Breaker	15
8	Isolator	15
9	Lighting Arrester	15
10	Wave Trap	15
11	Instrument transformer	15
12	GIS & Hybrid GIS	15

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13	LT Switchgear	10
14	Cable and associated accessories	10
15	Relays/BCU/Process Interface units /Standalone Merging unit	10
16	Capacitors	10
17	Battery and Battery charger	10
18	Conductor & Earth wire	10
19	Insulators (Porcelain/Glass)	10
20	Composite Insulators	10
21	PLCC	10

Note:-

1. For all other equipment's validity of type test shall be 10 years from **the originally scheduled last date of bid submission (Soft Copy)**.
2. Equipment shall be supplied from the same manufacturing work, where from the sample unit was manufactured and successfully type tested as per relevant standard.

Further, where offered equipment is based on the design of technology transfer of Parent organization / Joint Venture (JV), type test reports of Parent organization / Joint Venture (JV) shall also be acceptable for the initial period of 03 years from the date of establishment manufacturing facility for offered equipment provided that the design, material, and manufacturing process of the offered equipment are identical to those of the type-tested sample of the original facility. In such cases, while submitting the Type Test Reports, the Original Equipment Manufacturer (OEM), shall furnish an undertaking with it declaring that there is

- i. No change in the Design,
 - ii. No change in the material,
 - iii. No change in manufacturing process, and
 - iv. No amendment/revision in the relevant standard as regard to type test conditions, since the type test
3. In case of own manufacturing plant at different location within India, the type test of the original manufacturing works shall also be acceptable for the equipment manufactured and supplied from the different location subject to the following conditions:
 - i. The relevant standard does not bar the same,
 - ii. The equipment being manufactured at different locations shall be identical in design, drawings, specifications, ratings to that of the type tested sample in the original facility (where it was manufactured and successfully type tested),
 - iii. The equipment being manufactured at different locations shall be identical in material & critical components, manufacturing process/ practices, and quality control to that of the type tested sample in the original facility (where it was manufactured and successfully type tested),
 - iv. Also, while submitting the Type Test Reports, the Original Equipment Manufacturer (OEM), shall furnish an undertaking for above conditions (i), (ii) and (iii).

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Further, in the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design/manufacturing changes or due to non-compliance with the requirement stipulated in the Technical Specification or any/all type tests not carried out, same shall be carried out without any additional cost implication to the Employer. The Contractor shall intimate the Employer the detailed program about the type tests atleast two (2) weeks in advance in case of domestic supplies & six (6) weeks in advance in case of foreign supplies.

9.6 The 220kV Line Protection shall be as under –

Line Protection	Local end		Remote End
	Main 1 Protection	Main 2 Protection	
Single Circuit-220kV line	Line Current differential with built-in back-up distance protection as per TS	Line Current differential with built-in back-up distance protection as per TS	Matching Line Current differential relay with built-in back-up distance protection to be supplied. However, Erection and commissioning is not in present scope.

9.7 Annexure S1 of Specific Requirements enclosed at Annexure-II of Section Project stands deleted.