



DEENDAYAL PORT AUTHORITY

ISO 9001:2008 | ISO 14001 | ISPS Compliant Port



Office of Superintending Engineer (Electrical),
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Date: 02/08/2023

EXPRESSION OF INTEREST [EOI] for “Design, Supply, Installation, Testing & Commissioning and Operation & Maintenance of Low Voltage Shore to Ship Power System of 1 MVA capacity each at Cargo Berth No. 8 & 9”

(This EOI is issued to elicit Expression of Interest from the parties interested in the work and does not constitute any binding commitment from the Deendayal Port Authority to proceed with the work or invite any or all the parties in the subsequent bidding process. The Open Tenders will be issued subsequently.)

Superintending Engineer (Electrical), DPA invites Expression of Interest for the work of **“Design, Supply, Installation, Testing & Commissioning and Operation & Maintenance of Low Voltage Shore to Ship Power System of 1 MVA capacity each at Cargo Berth No. 8 & 9”** from the OEM/Firms those who have executed similar work in Government/public sectors/private organization. The Expression of Interest (EOI) documents containing details of Scope of Work and Technical Specifications are enclosed herewith.

The interested OEM/firms are requested to submit their expression of interest for the said work in BOQ format as enclosed at Annexure – I. The completed EOI (Expression of Interest) shall be submitted to the office of the undersigned on or before 21/08/2023. A soft copy of EOI is also acceptable through e-Mail IDs see@deendayalport.gov.in & lightingkandla@gmail.com

-/sd

Superintending Engineer (E)
Deendayal Port Authority

ANNEXURE – I

Sr. No.	Description	Qty.	Unit	Rate	Amount
	Part – I: Supply of Material				
1	Supply of 11kV GIS Panel for existing 66/11kV Substation as per Technical Specification No. 1	4	Each		
2	Supply at site 3 core, 300 Sq. mm armoured aluminium conductor XLPE cable of 11kV grade as per IS: 7098 (Part - II) 1988 & as per Technical Specification No. 2	2500	m		
3	Supply of 11kV GIS Panel for Shore Power Substation as per Technical Specification No. 3	5	Each		
4	Supply at site Indoor type Heat shrink end termination kit for 3 core, 300 Sq. mm, 11kV XLPE aluminium cable as per Technical Specification No. 4	10	Each		
5	Design, manufacturing & supply of 1MVA capacity Low Voltage Shore Power System for 8 th Cargo Berth as per Technical Specification	Lump Sum	Compete Job		
6	Design, manufacturing & supply of 1MVA capacity Low Voltage Shore Power System for 9 th Cargo Berth as per Technical Specification	Lump Sum	Compete Job		
7	Design, manufacturing & supply of movable Cable Management System for 8 th Cargo Berth as per Technical Specification	1	Each		
8	Design, manufacturing & supply of movable Cable Management System for 9 th Cargo Berth as per Technical Specification	1	Each		
9	Supply of 3 Star rating 1000kVA, 11/0.433kV, Dyn11, ONAN Indoor type Distribution Transformer as per Technical Specification No. 9	1	Each		

10	Supply at site LT power distribution panel as per Technical Specification No. 10	1	Each		
11	Supply of 4 Way TPN Double Door IP 42 Distribution Board as per Technical Specification No. 11	1	Each		
12	Supply of 8 Way SPN Double Door IP 42 Distribution Board as per Technical Specification No. 12	2	Each		
13	Supply of 63A TPN MCB with 10kA Breaking Capacity as per Technical Specification No. 13	1	Each		
14	Supply of 32A TPN MCB with 10kA Breaking Capacity as per Technical Specification No. 14	5	Each		
15	Supply of 32A SP MCB with 10kA Breaking Capacity as per Technical Specification No. 15	8	Each		
16	Supply at site 18 Watt LED Tube light luminary complete with batten as per Technical Specification No. 16	40	Each		
17	Supply of wall mounting industrial fan oscillating type of 30 inch (750mm) sweep size as per Technical Specification No. 17	3	Each		
18	Supply at site 300mm sweep exhaust fan as per Technical Specification No. 18	10	Each		
Total Amount of Part – I:					
Part – II: Installation, Testing & Commissioning					
1	Installation, testing & commissioning of 11kV GIS Panel at existing 66/11kV Substation as per Technical Specification No. 1	4	Each		
2	Laying, Testing & Commissioning of 3 core, 300 Sq. mm HT XLPE cable through existing Substation Cable Trench as per Technical Specification No. 2	100	m		
3	Laying, Testing & Commissioning of 3 core, 300 Sq. mm HT XLPE cable	2400	m		

	through Existing RCC Cable Trench as per Technical Specification No. 3				
4	Installation, testing & commissioning of 11kV GIS Panel at Shore Power Substation as per Technical Specification No. 4	5	Each		
5	Fixing of Indoor type Heat shrink end termination kit for 3 core, 300 Sq. mm, 11kV XLPE aluminium cable as per Technical Specification No. 5	10	Each		
6	Installation, testing & commissioning of 1MVA capacity Low Voltage Shore Power System for 8 th Cargo Berth as per Technical Specification	Lump Sum	Compete Job		
7	Installation, testing & commissioning of 1MVA capacity Low Voltage Shore Power System for 9 th Cargo Berth as per Technical Specification	Lump Sum	Compete Job		
8	Testing & commissioning of movable Cable Management System 8 th Cargo Berth as per Technical Specification	1	Each		
9	Testing & commissioning of movable Cable Management System 9 th Cargo Berth as per Technical Specification	1	Each		
10	Installation, Testing & Commissioning of 3 Star rating 1000kVA, 11/0.433kV, Dyn11, ONAN Indoor type Distribution Transformer as per Technical Specification No. 10	1	Each		
11	Installation, Testing & Commissioning of LT power distribution panel as per Technical Specification No. 11	1	Each		
12	Fixing of 4 Way TPN Double Door IP 42 Distribution Board as per Technical Specification No. 12	1	Each		

13	Fixing of 8 Way SPN Double Door IP 42 Distribution Board as per Technical Specification No. 13	2	Each		
14	Fixing of TPN/SP MCBs with 10kA Breaking Capacity as per Technical Specification No. 14	14	Each		
15	Providing & fixing surface wiring with 4 x 4 sq.mm copper conductor (three phase and neutral) for three phase sub-circuit from the DB/MCBs to the DB/MCBs as per Technical Specification No. 15	40	m		
16	Providing & fixing surface wiring with 2 x 2.5 sq.mm copper conductor (single phase and neutral) for single phase sub-circuit from the DB/MCBs to the switch board as per Technical Specification No. 16	100	m		
17	Providing and fixing surface wiring with 1.5 sq. mm copper conductor for light /tube point with PVC insulated single core standard copper conductor wire as per Technical Specification No. 17	50	Each		
18	Providing and fixing surface wiring for 20A & 10A, 240 Volt, 50Hz Power point as per Technical Specification No. 18	5	Each		
19	Providing and fixing 5 pin, 5/6A, 240V half plug point as per Technical Specification no. 19	3	Each		
20	Installation of 18 Watt LED Tube light luminary complete with batten as per Technical Specification No. 20	40	Each		
21	Fixing of wall mounting industrial fan oscillating type of 30 inch (750mm) sweep size as per Technical Specification No. 21	3	Each		
22	Fixing of 300mm sweep exhaust fan as per Technical Specification No. 22	10	Each		
Total Amount of Part – II:					
Part – III: Operation & Maintenance					

1	Comprehensive charges of operation & maintenance of the shore to ship power facility project for 1 st Year	1	Annum		
2	2 nd Year	1	Annum		
3	3 rd Year	1	Annum		
4	4 th Year	1	Annum		
5	5 th Year	1	Annum		
Total Amount of Part – II:					
Total					
<p>(In words Rupees _____ only)</p> <p>(Note: The rates should be inclusive of all taxes, duties, fees, cess etc. and all incidental charges; but exclusive of GST).</p>					
<p>Signature & Seal of Firm</p>			<p>-/sd</p> <p>Superintending Engineer (E) Deendayal Port Authority</p>		

SCOPE OF WORK

The scope of work covers supply, installation, testing & commissioning of 1 MVA capacity Low Voltage Shore Connection Systems for providing Shore Power to Vessels during berthing at each Cargo Berth No. 8 & 9, as per IEC/ISO/IEEE 80005-3 standard with latest amendment, considering all safety parameters and operational aspects to meet the green energy initiative under Maritime Vision 2030.

Part – I: Scope of work for supply of materials

Part – II: Scope of work for erection, testing & commissioning activities

Part – III: Scope of work for operation & maintenance activities for 5 years

General:

The materials, design and workmanship shall satisfy the relevant Indian Standard, the Specification and conditions herein referred to. Where the Specifications stipulate requirement in addition to those contained in the Standard codes and Specifications, these additional requirements shall also be satisfied. Where it is mentioned in the Specifications that the Contractor shall perform certain Work or provide certain facilities, it is understood that the Contractor shall do so at his own Cost.

Description of Work:

The scope of work covers design & development of 1 MVA capacity Low Voltage Shore Connection System for providing Shore Power to Vessels at each Cargo Berth No. 8 & 9, including the following works:

- (a) Supply, installation, testing & commissioning of 11kV GIS Panels at existing 66/11kV Substation. Contractor shall extend 11kV Bay of existing 66/11kV Substation for providing 11kV power supply to Shore Power Substation. The 11kV GIS Panels shall be compatible with existing Siemens make 11kV GIS Panels and shall integrate to the existing SCADA system at 66/11kV Substation as required.
- (b) Supply, Laying, Testing & Commissioning of 3 core, 300 Sq. mm 11kV grade XLPE cable including End Termination. Contractor shall lay the 11kV power cable from existing 66/11kV Substation to Shore Power Substation through existing Cable Trench of 66/11kV Substation, existing RCC Cable Trench inside Cargo Jetty area & Cable Trench of Shore Power Substation. There will be separate route of existing RCC cable trench up to Shore Power Substation.
- (c) Supply, installation, testing & commissioning of 11kV GIS Panels at Shore Power Substation. There shall be two incomer panel, one bus coupler panel & three outgoing panel.

- (d) Construction of Shore Power Substation with plinth height of 1m and ceiling height of 5m at the Location in front of wharf area between cargo berth no. 8 & 9 at a distance of approximately 100m from jetty's protection wall. Shore Power Substation shall be constructed for installing 11kV GIS Panels, Stepdown Transformer(s), Static Frequency Converter(s), Isolation Transformers, Switchgear Panels etc. as per the design requirement and one 11/0.433kV distribution transformer & one LT power distribution panel. The 11/0.433kV distribution transformer & the LT power distribution panel is considered in the scope of work as per the requirement for providing station power supply of the Shore Power Substation and spare power supply source for Berth No. 8 & 9.
- (e) Design, supply, installation, testing & commissioning of 1MVA capacity Low Voltage Shore Connection System for 8th Cargo Berth as per IEC/ISO/IEEE 80005-3 standard with latest amendment.
- (f) Design, supply, installation, testing & commissioning of movable Cable Management System for 8th Cargo Berth as per IEC/ISO/IEEE 80005-3 standard with latest amendment.
- (g) Design, supply, installation, testing & commissioning of 1MVA capacity Low Voltage Shore Connection System for 9th Cargo Berth as per IEC/ISO/IEEE 80005-3 standard with latest amendment.
- (h) Design, supply, installation, testing & commissioning of movable Cable Management System for 9th Cargo Berth as per IEC/ISO/IEEE 80005-3 standard with latest amendment.
- (i) DPA will provide Trench-lines only between locations (1) existing 66/11kV Substation and Shore Power Substation for laying of HT power cable and (2) Shore Power Substation and Shore Power Unit for laying of LT power cable(s).
- (j) Comprehensive Operation & Maintenance of Unit Substation and Low Voltage Shore Connection System for Cargo Berth No. 8 & 9 for a period of five years.

TECHNICAL SPECIFICATION

TECHNICAL SPECIFICATION FOR DESIGN, MANUFACTURING & SUPPLY AND INSTALLATION, TESTING & COMMISSIONING OF 1MVA CAPACITY LOW VOLTAGE SHORE POWER SYSTEM FOR 8TH & 9TH CARGO BERTHS

Bidder shall visit & examine the site and obtain for itself on its own responsibility all information that may be necessary for preparing the design for the Low Voltage Shore Connection System complying the IEC/ISO/IEEE 80005-3 standard. The costs of visiting the Site shall be at the bidder's own expense.

The Low Voltage Shore Connection System installation shall be capable to provide 440V/450V at 50Hz/60Hz frequency as required by coastal/foreign vessels and for synchronization duly complying the IEC/ISO/IEEE 80005-3 standard.

The Vessels berthed at these jetties are for both loading/unloading of bulk cargo like coal, fertilizer, gypsum, aggregate, rock phosphate, sulphur, etc. The Vessels at these berth are mostly Bulk Carrier, Panamax type and presently do not have any provision for accepting the Shore Power during cargo handling at berth. The provision is available for accepting only the emergency power supply from Shore.

The bidder shall consider at least 60m cable length for cable reel type dispenser to provide the shore power supply through flexible cables going from top of the deck of vessel.

These berths have Mobile Harbour Cranes for loading/unloading of the cargo. However, there will not be any constraint to move the Mobile Cable Management System on the Quay. The Mobile Cable Management System during operation shall be stationed next to the bridge of the Vessel and the Port's Mobile Harbour Cranes/Vessel Cranes shall be working for the cargo handling.

There shall be total four Shore Power Units, two each for 8th & 9th Berth. The enclosure material of Shore Power Unit shall be of stainless steel. The Shore Power Unit shall have ingress protection of IP65.

The bidder shall submit the design of Low Voltage Shore Connection System covering Stepdown Transformer(s), Static Frequency Converter(s), Isolation Transformers, Switchgear Panels, SCADA, Metering etc. as required to meet the requirement of IEC/ISO/IEEE 80005-3 standard with latest amendment for low voltage shore connection along with the bid document. The bidder shall submit the guaranteed technical specifications of Stepdown Transformer(s), Static Frequency Converter(s), Isolation Transformers, Switchgear Panels, SCADA, Metering etc. along with the bid document.

This specification covers design, supply, installation, testing & commissioning of 1MVA capacity Low Voltage Shore Connection System each for Cargo Berth No. 8 & 9 for providing Shore Power Supply to Vessels. The Low Voltage Shore Connection System shall comply the IEC/ISO/IEEE 80005-3 standard with latest amendment.

The contractor shall provide two Shore Power Unit for each 8th & 9th Berth as the berthing of Vessel is done at the Port side or Starboard side to the quay. The movable Cable Management System shall be connected to the nearest Shore Power Unit through Plug-socket arrangement. The small length of cable connection shall be laid out on the quay floor without obstructing the movement of any other equipment at shore.

This specification covers design, supply, laying in existing trench-line, testing & commissioning of LT power cables between Shore Power Substation and two Shore Power Units for each 8th & 9th Berth.

Cable Management System shall maintain cable tension, preventing cables from slacking when vessels move due to displacement, waves, and tidal motion. The Vehicle of Mobile Cable Management System shall be Electric Vehicle type. The charging facility shall be provided at the Shore Power Substation.

The contractor shall provide required earthing system to all the equipment supplied & installed in the project work at site. All electrical frames shall be effectively connected to earth at least two points. Material required for earth electrode as well as earth current conductor shall be supplied by contractor. The earth electrode must be designed to withstand the maximum possible short circuit and the length of the electrode shall be such that the combined earth resistance is less than two Ohm with GI strips. Effective earth resistance on individual electrodes shall be less than five Ohm and the combined earth resistance shall be less than two ohm. The work shall be executed as per IS 2309/3043. Care should be taken to protect electric and electronic equipment within the control panel against any lightning/switching surges which are expected in electrical network.

The contractor shall provide necessary air conditioning system for the Static Frequency Converter system.

The contractor shall supply necessary fire extinguishers & necessary safety arrangements for the power supply system.

The contractor shall submit detailed technical specification, general arrangement drawing, quality assurance plans for approval of Engineer in charge.

The contractor shall prepare drawings, single line diagrams, earthing layout etc. and submit the scheme to CEA for necessary approval & arrange inspection and rectify defects, if required.

Static Frequency Converter:

The Static Frequency Converter (SFC) shall allow connection of 60Hz/50Hz powered equipment to 50 Hz supply network. The system shall function by converting the input AC power through sine wave rectifier to DC link and then through an AC sine wave inverter to produce clean, full sine wave output at the new frequency and voltage.

A) GENERAL:

- Rating: 1000 kVA

- Efficiency: 95%
- Enclosure: IP rating IP 20
- Pollution degree: Rating 2
- Operating Temperature: 0°C to 40°C
- Cooling: Forced Air
- Humidity: < 95% non-condensing
- Noise: 75-85 dBA typical
- Electromagnetic Compatibility: CISPR 11 class A
- Enclosure Materials: Electro-galvanized steel
- Panel Thickness: Sides & Rear Panels (1.5mm, 2mm)
- Enclosure Access: Hinged doors with key lock.

Sr. No.	Particulars	Standards
1	Insulation Coordination for equipment within Low Voltage systems	IEC 60664
2	Semiconductor Converters	IEC / EN 60146
3	Noise Immunity	EN 61000-6-2
4	Radiated & Conducted Emissions	CISPR11 ed 6.0 2016 06 Class A Group 1
5	Quality Management System	ISO 9001:2015
6	Environmental Management System	ISO 14001:2015
7	Marking	CE
8	Safety of Electrical Installations	IEC 62477-1
9	Electronic equipment for use in power installations	IEC 62103
10	Recommended practice & requirements for harmonic control in electric power systems	IEEE519-2014

Before undertaking manufacturing of 11kV GIS Panel, Stepdown Transformer(s), Static Frequency Converter(s), Isolation Transformers, LT Switchgear Panels the relevant test certificate along with relevant drawing shall be submitted to Engineer In-charge, DPA for approval and all Electrical accessories shall be used as per approved Make List of DPA.

Shore Power Unit at Wharf:

- The Shore Power Unit shall be provided for power supply applications in tough environments prevailing in the Port where the need of protection is vital.
- Shore Power Unit shall have Socket with integrated cover operated by the push & pull arms
- Socket housing material: LM6 grade aluminum
- Push & Pull arm material: Bronze
- Separate cable terminals allowing fast and easy exchange of contacts
- Contacts and cable terminal material: silver plated brass
- Standard insulator material: injection moulded PPO
- High quality gaskets and sealing with a minimum life span of 10 years
- Ingress Protection: IP 65
- Cabinet material: 2mm stainless steel sheet, Unit of suitable size including 1 socket 3x630A+E+2P/440V, 240sqmm, push pull type mounted on lower module.

- MCCB/ACB 1250A with under voltage coil 440V/ 50-60Hz for control through pilot pins.
- Electric interlocking through under voltage trip unit connected to pilot circuits.
- Cable glands on bottom for XLPE Copper Cable.
- Suitable capacity of Plug Points (2 x 630A rating) to be mounted so as to cater power supply to ship through copper trailing cable.
- Connection terminal ground, copper bar mounted on the mounting plate.
- MCCB breaker and socket connected with single cable 400sqmm copper.
- Manual motor starter and under voltage coil connected with single cable 2.5 Sq.mm.

Plug Units:

- Ingress Protection: Minimum IP66 (when connected or with covers closed)
- Standard ambient temperature: -40 Deg C to +80 Deg C
- Socket & connector connection with integrated cover operated by the push & pull arms (Plug in straight or bent version)
- Standard finishes: Marine grade aluminium ISO 3522 – Hardware in stainless steel
- Push & Pull arm material: Bronze ISO 1338:1977
- Female contact, male pin and cable terminal: Silver plated brass
- Easy wiring with male and female insulators fully interchangeable made in PPO (polyphenylene Oxide)
- Interchangeable pins without dismantling the connector
- All Cable terminals suits for cable of Class 5, IEC 60228
- 3x630A+E+2P, push & pull, phase cable, crimp cable

Trailing Cable:

1.1kV Grade, Trailing cable, Flexible Annealed Tinned Copper Conductor (Class 5 to IS: 8130/84), EPR Type IE2 to IS: 6380 /84 Insulated, Core identification by coloured insulation/ PC taped Cores Laid up together suitably and suitable binder taped, Inner Sheathed with PCP to IS:6380/1984), Reinforcement material shall be provided over inner sheath and Outer Sheathed with PCP to IS:6380/1984. Generally to IS: 9968 (Part-1)/ 1988.

SCADA requirements:

The following equipment at Shore Power Substation shall be connected to the suitably designed Remote I/O Units (RIO) or Control and Monitoring units (CMU) for effective automatic control and monitoring from Supervisory Control and Data Acquisition (SCADA) system to be provided by contractor at Shore Power Substation:

- Energy Meters
- Numerical Relays
- Status of Breaker

RTU/ RIO/ CMU Panel:

The RTU/ RIO/ CMU of Shore Power Substation System shall have the following features:
The Stand-alone type RTU/ RIO/ CMU panel or other suitable panel shall be placed in Shore Power Substation. The chronological event list shall contain:

- 1) Position changes of Circuit Breakers
- 2) Indication of relay operations
- 3) Fault signals from the switch gear

4) Indication when measured values (i.e., voltage, frequency, PF, etc.) exceed upper and lower limits.

5) Loss of communication

The timing of each event shall be as per GPS based time synchronizing equipment to be supplied by the Contractor. All the necessary software for the RTU function and for downloading the data at Shore Power Substation shall be provided by the Contractor.

Performance Tests and Final Acceptance:

Following are few typical performance tests/ procedures envisaged for Low Voltage Shore Power System. Based on the Field Quality Plan (FQP) submitted by the equipment and system suppliers, the contractor shall finalize all sequences, tests and commissioning protocol to be followed at site.

- The Frequency converter shall be energized up to LT panel and all functional test parameters like output voltage range, frequency range, tap changer functions, trip functions, indications, etc. shall be checked and recorded.
- Power Connector Panel shall be energized and output power parameters at the ship end connector plug shall be measured and recorded.
- On installation of movable Cable Management System, required test shall be conducted as per test standards. Cable Management System shall be powered and checking of all functions shall be performed and recorded.

Shore Power supply to minimum five different vessels at 8th & 9th Berth shall be performed by the contractor in coordination with Engineer In-Charge to ensure the supplied system is trouble free, to correct any parameter which cause disturbance during shore power supply to vessel and to train Engineers of DPA in handling the shore power system for establishing required protocols.

PART – I: SUPPLY OF MATERIAL

TECHNICAL SPECIFICATION

Technical Specification No. 1:

This item includes supply at site 11kV GIS Panels at existing 66/11kV Substation. Contractor shall extend 11kV Bay of existing 66/11kV Substation for providing 11kV power supply to Shore Power Substation. The 11kV GIS Panels shall be compatible with existing Siemens make 11kV GIS Panels and shall integrate to the existing SCADA system at 66/11kV Substation as required.

Supply at site 4 module Compact GIS panel extension at site having following Technical specification.

Technical Data:

3.1 System particulars:

- 1) Feeder Rating: 1250 Amp.
- 2) Circuit Breaker type VCB: 1250 Amp, 12 kV, 25kV/3Sec, Fixed type.
- 3) Disconnecter + Earth Switch: 3 Position Disconnecter Switch Motor operated 24V, DC, Earth Switch Manual operated 24V DC.
- 4) Current Transformer: Metering Core-1 CT Ratio 300-200/1 A, CL 02.-02, Burden 5-2.5 VA. Isf<10, STC 25KA/3 Sec.
Prot. Core 300-200/1A, CL-5P20-5P20, Burden 5-2.5VA
STC 25KA/3 Sec.
 - a. Rated voltage ... 12Kv
 - b. Rated Frequency ... 50 Hz ±3%
 - c. Rated short –duration power frequency with stand voltage: 28KV¹⁾
 - d. Rated lightning impulse withstand voltage: 75KV¹⁾
 - e. Rated peak withstand current: 65.75kA
 - f. Rated short-circuit making current: 65.75kA
 - g. Partition Class: PM
 - h. Normal Feeder current: 1250A
 - i. Internal Arc Classification: IAC A FLR 26.3kA 1s
 - j. Rated short-time withstand current 3s: 26.3kA
 - k. Rated short circuit breaking current: 26.3kA
 - l. Relative Humidity 90 %.
 - m. Maximum ambient Temp. ---- 45°C.

Standards:

Metal Enclosed switchgear:	IEC 62271-200
General Purpose switches:	IEC 60265-1
Dis-connector and Earthing switches:	IEC 62271-102
Switch Fuse Combination:	IEC 62271-105
Circuit Breakers:	IEC 62271-100
Common clauses:	IEC 60694
Pressure of SF6 gas:	1.4 bar at 20 °C
Cable bushings:	DIN 47636
Temperature class:	-25 °C - +40 °C Indoor

Degree of protection:

- SF6 tank:	IP 67
- Fuse canisters:	IP 67
- Front cover:	IP 4X
- Cable cover:	IP 4X

Bus bars to be designed for 1250Amps.

Earth bar (external):	120 mm ² Cu - Bolt dimension: M10
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The item includes 4 module Fixed-mounted 12KV Gas insulated medium voltage Switchgear, three position isolator/earthing switch, bus bars, interlocking, earth bar and stored spring energy mechanism (A-mech.).

Detailed technical particular as under:

1	Switchgear Panel	<ul style="list-style-type: none"> ➤ The Gas insulated Metal clad switchgear shall be complete with all the accessories for efficient and trouble free operation. The equipment offered shall be safe, reliable and compact to install. The workmanship shall be high order. The circuit breaker switches and protective device etc shall be latest design so as to ensure rapid and efficient interruption of fault current low arc energy, small arcing time and freedom from fire hazards. The switchgear panel shall be fully arc proof, free standing, floor mounted, fully compartmentalized, metal enclosed construction complying requirements of IEC 62271- 200. Each circuit shall have a separate vertical panel with required compartments for circuit breaker, cable termination, main bus-bars and auxiliary control devices. ➤ Switchgear shall have an Internal Arc Classification of IAC-A-FLR 26 KA, 1 sec. (as per EI guidelines all switchgear shall be at least 1.2 meters away from wall) The switchgear construction shall be such that the operating personnel are
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		<p>not endangered by breaker operation and internal explosions, and the front of the panels shall be specially designed to withstand these. Gas Pressure relief device/Explosion Vent/ Pressure relief duct shall be provided for each SF6 gas compartment, so that in case of a fault in a compartment, the gases produced are safely vented out, thereby minimizing the possibility of it's spreading to other compartments and panels. The pressure relief device/Explosion Vent/ Pressure relief duct shall not however reduce the degree of protection of panels under normal working conditions.</p> <ul style="list-style-type: none"> ➤ The switchgear shall be cooled by natural air flow. The switch board shall have the facility for extension on both sides. The facility of Extension of additional breakers (to existing set up) for future expansion shall be provided. ➤ The manufacturer shall give guarantee for maximum leakage rate of SF6 gas will be lower than 0.1 % per year. In case of Gas leakage the GIS should have the capability to withstand die-electric strength at 1bar pressure. Separate gas monitoring sensors should be available for all the gas filled chambers. ➤ The minimum operating SF6 gas pressure shall be 1.4 Bar at 20°C. Alarm shall be generated if the SF6 gas pressure drops to 85% of the minimum operating pressure and if it further drops below 80% the Circuit breaker shall trip & go into lockout mode. ➤ Thermostatically controlled space heater with common MCB shall be provided for various compartments.
2	GIS SWITCHGEAR WITH BUS BAR IN SF6 GAS:	<ul style="list-style-type: none"> ➤ The SF6 gas insulated metal enclosed switchgear shall be constructed from corrosion- resistant stainless steel sheet of min 2 mm thickness, filled with SF6 accommodating the primary switching devices (Busbar and Three position disconnecter cum earthing switch) and all live parts. This panel complying ingress protection min IP 67. ➤ The GIS switchgear shall be provided with Silicon coated Busbars. ➤ The Switchgear enclosure complying ingress protection IP4X. ➤ Paint shade of Indoor Switchgear shall be 694 as per IS: 5(Dove Grey).
3	Bus Bar	<ul style="list-style-type: none"> ➤ Busbar shall be of made of electrolytic high grade Copper of adequate size and bus bar size calculation / supporting type test report shall be submitted for approval (current density of copper shall not have exceeded more than 1.6 Amp/sq.mm). They shall be adequately supported on insulators to withstand electrical and mechanical stresses due to specified short circuit currents. ➤ Capacity 1250 Amps. ➤ All piping for SF6 gas shall be made of copper & their fittings shall be made of non- magnetic stainless steel.

		<ul style="list-style-type: none"> ➤ The temperature of the busbars and all other equipment, when carrying the rated current continuously shall be limited 60deg C above ambient temperature 45deg C as per the relevant Standards.
4	GIS Circuit Breaker	<ul style="list-style-type: none"> ➤ GIS Circuit Breaker can be used for system voltage 11KV. ➤ 11 KV GIS breaker shall comprise of three single pole interrupting units or 3-pole interrupting unit, operated through a common shaft by a sturdy operating mechanism. ➤ Closing spring charging shall only be acceptable. Anti-pumping features shall be provided for each breaker. An arrangement of two breakers in parallel to meet a specified current rating shall not be acceptable. (No parallel interrupter). ➤ Circuit breaker shall be provided with two trip coils. ➤ Suitable indicators shall be provided on the front of panel to indicate OPEN / CLOSED conditions of the circuit breaker, and CHARGED / DISCHARGED conditions of the closing spring, SF6 gas density monitor for all gas compartments. ➤ For 11kv feeder: Tripping time; 45-50 ms (Including Relay Time) Closing Time: 40-60 ms. ➤ Manual/ Auto Spring Charging shall be provided in all feeders. ➤ The circuit-breaker has to control at least 10,000 Make-Break cycles without maintenance. The mechanical life and operating cycles of the vacuum interrupter shall confirm relevant IS/IEC amended up to date. ➤ The circuit breaker shall be provided with motor operated spring charged closing. Spring charging motor shall be suitable for 240V, 50 Hz, single phase AC. Suitable rating starter shall be provided for Motor protection. Spring release coil for closing shall be suitable for 24 V DC. ➤ Tripping of the circuit breakers shall be through "Shunt trip" coils rated for 30V DC auxiliary supply. It shall be possible to trip the breaker manually in case of necessity.
4	Dis-connector & Earth Switch	<ul style="list-style-type: none"> ➤ Switchgear panel shall be provided with three (3) position disconnecting-cum-earthing switch of required rating. ➤ The earthing position for all 3 phases must be visible via a mechanical position indicator (MIMIC) directly connected to the drive shaft on panel front Fascia. The mechanical operation of isolator / 3 position dis-connector switch must be possible with door closed for operator safety.
5	Control & Interlock	<ul style="list-style-type: none"> ➤ Switchgear having Mechanically & Electrically Interlock as per scheme configuration. ➤ Necessary mechanical & Electrical interlocks shall be provided between CB, Isolator & Earth switches for safe operation.
6	SCADA compatibility	<ul style="list-style-type: none"> ➤ Panel shall have SCADA compatibility
7	Numerical protection	<ul style="list-style-type: none"> ➤ Indoor switchgear panels shall have communicable numerical protection relays (IEDs) complying with IEC-61850 on all feeders which shall be networked on Ethernet

	Relay	<p>to communicate with substation SAS/SCADA system on IEC-61850. Relay shall have redundant RJ45 ports complying to PRP redundancy of IEC 61850. These IEDs shall also be used for control & monitoring the switchgear from SAS. In addition to status of devices (CBs/Isolators/Earth Switches) and equipment alarms, Metering data shall also be made available to SAS/SCADA station from protection IEDs. Directional numerical relays shall have provision of both current (CT) and voltage (PT) inputs as required for protection & measurement purposes using protection cores.</p> <ul style="list-style-type: none"> ➤ All Numerical relays shall have features for electrical measurements of current. ➤ Numerical relays as per IEC including report for IEC 61850 protocols from accredited lab. ➤ All numerical relays shall be rated for control supply voltage 24 Volt DC and shall be capable of satisfactory continuous operation between 80-110% of the rated voltage. Making, carrying and breaking current ratings of their contacts shall be adequate for the circuits in which they are used. Heavy duty binary output contacts of IEDs to be used for breaker close and trip commands shall be so rated as to be used directly used in the closing and tripping circuits of breaker without the need of any interposing / master trip relays.
8	Numerical Protection for I/C feeder	<ul style="list-style-type: none"> ➤ The relay shall have instantaneous as well as time delayed three over current (50) and one earth fault (50N) protection elements. with standard inverse characteristics (1.3 and 3 Sec) IDMT. <p>The over current element should have the minimum setting adjustable between 20-200% of CT secondary rated current with increment/decrement by 1 % and high set setting 100-2000%.</p> <ul style="list-style-type: none"> ➤ The earth fault element of relay shall be suitable for detection of earth fault currents in the range of 5% to 80% of the CT rated current (IDMT) and high set 100-1000%. ➤ The relay shall have selectable directional & non-directional feature. ➤ For transformers of rating Min. 6.3 to 10MVA, definite time delayed Stand by earth fault protection shall be provided having a pick up setting range of 10% to 40% with a timer delay of 0sec to 3 sec. in step of 0.01s. ➤ Trip circuit supervision shall be provided to monitor the circuit breaker trip circuit both in pre-trip and post-trip conditions.
9	Numerical Protection for O/g Feeder	<ul style="list-style-type: none"> ➤ Earth Fault, O/C, instantaneous earth Fault.
10	4 O/G. feeder	<p style="text-align: center;"><u>CT Ratio 300-200/1-1.</u></p> <ul style="list-style-type: none"> ➤ Accuracy Class =0.2 ➤ CT shall be designed considering the 25 KA for 3 sec. ➤ CT shall have metering & protection core both. ➤ Rated Burden 5/5 VA. ➤ Insulation Class E. ➤ 5P20

		<ul style="list-style-type: none"> ➤ The CTs shall be resin/epoxy cast. Correct polarity shall be invariably marked on each primary and secondary terminal. ➤ All current transformers for GIS shall be ring type (Tape wound / resin cast). ➤ Confirming to IEC: 60044-1. ➤ No of secondary core: 2.
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Technical Specification No. 2:

This item includes supply at site 3 Core, 300 Sq. mm (E), 11kV grade aluminium conductor XLPE insulated armoured cable confirming to IS: 7098 (Part-II) 1988 with latest amendments with ISI mark. The cable shall have marking/embossing at an interval of every meter showing its progressive length. The contractor shall submit type test certificate at the time of supply of Cable at site. The type test certificate shall not be more than 3 years old. The rate shall be inclusive of all taxes (excluding GST), packing, forwarding, insurance, transportation, and unloading at site of work.

Technical Specification No. 3:

This item includes supply at site 11kV GIS Panels for Shore Power Substation.

Supply at site 7 module Compact GIS panel extension at site having following Technical specification.

Technical Data:

3.1 System particulars:

- 1) Feeder Rating: 1250 Amp.
- 2) Circuit Breaker type VCB: 1250 Amp, 12 kV, 25kV/3Sec, Fixed type.
- 3) Disconnecter + Earth Switch: 3 Position Disconnecter Switch Motor operated 24V, DC, Earth Switch Manual operated 24V DC.
- 4) Current Transformer: Metering Core-1 CT Ratio 300-200/1 A, CL 02.-02, Burden 5-2.5 VA. Isf<10, STC 25KA/3 Sec.
Prot. Core 300-200/1A, CL-5P20-5P20, Burden 5-2.5VA
STC 25KA/3 Sec.
 - a. Rated voltage ... 12Kv
 - b. Rated Frequency ... 50 Hz ±3%
 - c. Rated short –duration power frequency with stand voltage: 28KV¹⁾
 - d. Rated lighting impulse withstand voltage: 75KV¹⁾
 - e. Rated peak withstand current: 65.75kA
 - f. Rated short-circuit making current: 65.75kA

- g. Partition Class: PM
- h. Normal Feeder current: 1250A
- i. Internal Arc Classification: IAC A FLR 26.3kA 1s
- j. Rated short-time withstand current 3s: 26.3kA
- k. Rated short circuit breaking current: 26.3kA
- l. Relative Humidity 90 %.
- m. Maximum ambient Temp. ---- 45°C.

Standards:

Metal Enclosed switchgear:	IEC 62271-200
General Purpose switches:	IEC 60265-1
Dis-connector and Earthing switches:	IEC 62271-102
Switch Fuse Combination:	IEC 62271-105
Circuit Breakers:	IEC 62271-100
Common clauses:	IEC 60694
Pressure of SF6 gas:	1.4 bar at 20 °C
Cable bushings:	DIN 47636
Temperature class:	-25 °C - +40 °C Indoor

Degree of protection:

- SF6 tank: IP 67
- Fuse canisters: IP 67
- Front cover: IP 4X
- Cable cover: IP 4X

Bus bars to be designed for 1250Amps.

Earth bar (external): 120 mm² Cu - Bolt dimension: M10

The item includes 7 module Fixed-mounted 12KV Gas insulated medium voltage Switchgear, three position isolator/earthing switch, bus bars, interlocking, earth bar and stored spring energy mechanism (A-mech.).

Detailed technical particular as under:

1	Switchgear Panel	➤ The Gas insulated Metal clad switchgear shall be complete with all the accessories for efficient and trouble free operation. The equipment offered shall be safe, reliable and compact to install. The workmanship shall be high order. The circuit breaker switches and protective device etc shall be latest design so as to ensure rapid and efficient interruption of fault current low arc energy, small
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		<p>arching time and freedom from fire hazards. The switchgear panel shall be fully arc proof, free standing, floor mounted, fully compartmentalized, metal enclosed construction complying requirements of IEC 62271- 200. Each circuit shall have a separate vertical panel with required compartments for circuit breaker, cable termination, main bus-bars and auxiliary control devices.</p> <ul style="list-style-type: none"> ➤ Switchgear shall have an Internal Arc Classification of IAC-A-FLR 26 KA, 1 sec. (as per EI guidelines all switchgear shall be at least 1.2 meters away from wall) The switchgear construction shall be such that the operating personnel are not endangered by breaker operation and internal explosions, and the front of the panels shall be specially designed to withstand these. Gas Pressure relief device/Explosion Vent/ Pressure relief duct shall be provided for each SF6 gas compartment, so that in case of a fault in a compartment, the gases produced are safely vented out, thereby minimizing the possibility of it's spreading to other compartments and panels. The pressure relief device/Explosion Vent/ Pressure relief duct shall not however reduce the degree of protection of panels under normal working conditions. ➤ The switchgear shall be cooled by natural air flow. The switch board shall have the facility for extension on both sides. The facility of Extension of additional breakers (to existing set up) for future expansion shall be provided. ➤ The manufacturer shall give guarantee for maximum leakage rate of SF6 gas will be lower than 0.1 % per year. In case of Gas leakage the GIS should have the capability to withstand die-electric strength at 1bar pressure. Separate gas monitoring sensors should be available for all the gas filled chambers. ➤ The minimum operating SF6 gas pressure shall be 1.4 Bar at 20°C. Alarm shall be generated if the SF6 gas pressure drops to 85% of the minimum operating pressure and if it further drops below 80% the Circuit breaker shall trip & go into lockout mode. ➤ Thermostatically controlled space heater with common MCB shall be provided for various compartments.
2	GIS SWITCHGEAR WITH BUS BAR IN SF6 GAS:	<ul style="list-style-type: none"> ➤ The SF6 gas insulated metal enclosed switchgear shall be constructed from corrosion- resistant stainless steel sheet of min 2 mm thickness, filled with SF6 accommodating the primary switching devices (Busbar and Three position disconnector cum earthing switch) and all live parts. This panel complying ingress protection min IP 67. ➤ The GIS switchgear shall be provided with Silicon coated Busbars. ➤ The Switchgear enclosure complying ingress protection

		<p>IP4X.</p> <ul style="list-style-type: none"> ➤ Paint shade of Indoor Switchgear shall be 694 as per IS: 5(Dove Grey).
3	Bus Bar	<ul style="list-style-type: none"> ➤ Busbar shall be of made of electrolytic high grade Copper of adequate size and bus bar size calculation / supporting type test report shall be submitted for approval (current density of copper shall not have exceeded more than 1.6 Amp/sq.mm). They shall be adequately supported on insulators to withstand electrical and mechanical stresses due to specified short circuit currents. ➤ Capacity 1250 Amps. ➤ All piping for SF6 gas shall be made of copper & their fittings shall be made of non- magnetic stainless steel. ➤ The temperature of the busbars and all other equipment, when carrying the rated current continuously shall be limited 60deg C above ambient temperature 45deg C as per the relevant Standards.
4	GIS Circuit Breaker	<ul style="list-style-type: none"> ➤ GIS Circuit Breaker can be used for system voltage 11KV. ➤ 11 KV GIS breaker shall comprise of three single pole interrupting units or 3-pole interrupting unit, operated through a common shaft by a sturdy operating mechanism. ➤ Closing spring charging shall only be acceptable. Anti-pumping features shall be provided for each breaker. An arrangement of two breakers in parallel to meet a specified current rating shall not be acceptable. (No parallel interrupter). ➤ Circuit breaker shall be provided with two trip coils. ➤ Suitable indicators shall be provided on the front of panel to indicate OPEN / CLOSED conditions of the circuit breaker, and CHARGED / DISCHARGED conditions of the closing spring, SF6 gas density monitor for all gas compartments. ➤ For 11kv feeder: Tripping time; 45-50 ms (Including Relay Time) Closing Time: 40-60 ms. ➤ Manual/ Auto Spring Charging shall be provided in all feeders. ➤ The circuit-breaker has to control at least 10,000 Make-Break cycles without maintenance. The mechanical life and operating cycles of the vacuum interrupter shall confirm relevant IS/IEC amended up to date. ➤ The circuit breaker shall be provided with motor operated spring charged closing. Spring charging motor shall be suitable for 240V, 50 Hz, single phase AC. Suitable rating starter shall be provided for Motor protection. Spring release coil for closing shall be suitable for 24 V DC. ➤ Tripping of the circuit breakers shall be through "Shunt trip" coils rated for 30V DC auxiliary supply. It shall be possible to trip the breaker manually in case of necessity.
4	Dis-connector & Earth Switch	<ul style="list-style-type: none"> ➤ Switchgear panel shall be provided with three (3) position disconnecting-cum-earthing switch of required rating. ➤ The earthing position for all 3 phases must be visible via a mechanical position indicator (MIMIC) directly connected to the drive shaft on panel front Fascia. The mechanical operation of isolator / 3 position dis-connector switch must

		be possible with door closed for operator safety.
5	Control & Interlock	<ul style="list-style-type: none"> ➤ Switchgear having Mechanically & Electrically Interlock as per scheme configuration. ➤ Necessary mechanical & Electrical interlocks shall be provided between CB, Isolator & Earth switches for safe operation.
6	SCADA compatibility	<ul style="list-style-type: none"> ➤ Panel shall have SCADA compatibility
7	Numerical protection Relay	<ul style="list-style-type: none"> ➤ Indoor switchgear panels shall have communicable numerical protection relays (IEDs) complying with IEC-61850 on all feeders which shall be networked on Ethernet to communicate with substation SAS/SCADA system on IEC-61850. Relay shall have redundant RJ45 ports complying to PRP redundancy of IEC 61850. These IEDs shall also be used for control & monitoring the switchgear from SAS. In addition to status of devices (CBs/Isolators/Earth Switches) and equipment alarms, Metering data shall also be made available to SAS/SCADA station from protection IEDs. Directional numerical relays shall have provision of both current (CT) and voltage (PT) inputs as required for protection & measurement purposes using protection cores. ➤ All Numerical relays shall have features for electrical measurements of current. ➤ Numerical relays as per IEC including report for IEC 61850 protocols from accredited lab. ➤ All numerical relays shall be rated for control supply voltage 24 Volt DC and shall be capable of satisfactory continuous operation between 80-110% of the rated voltage. Making, carrying and breaking current ratings of their contacts shall be adequate for the circuits in which they are used. Heavy duty binary output contacts of IEDs to be used for breaker close and trip commands shall be so rated as to be used directly used in the closing and tripping circuits of breaker without the need of any interposing / master trip relays.
8	Numerical Protection for I/C feeder	<ul style="list-style-type: none"> ➤ The relay shall have instantaneous as well as time delayed three over current (50) and one earth fault (50N) protection elements. with standard inverse characteristics (1.3 and 3 Sec) IDMT. The over current element should have the minimum setting adjustable between 20-200% of CT secondary rated current with increment/decrement by 1 % and high set setting 100-2000%. ➤ The earth fault element of relay shall be suitable for detection of earth fault currents in the range of 5% to 80% of the CT rated current (IDMT) and high set 100-1000%. ➤ The relay shall have selectable directional & non-directional feature. ➤ For transformers of rating Min. 6.3 to 10MVA, definite time delayed Stand by earth fault protection shall be provided having a pick up setting range of 10% to 40% with a timer delay of 0sec to 3 sec. in step of 0.01s. ➤ Trip circuit supervision shall be provided to monitor the circuit breaker trip circuit both in pre-trip and post-trip conditions.

9	Numerical Protection for O/g Feeder	➤ Earth Fault, O/C, instantaneous earth Fault.
10	2 Nos. I/C feeder + 1 no. Bus Coupler	<p><u>CT Ratio 300-200/1-1.</u></p> <ul style="list-style-type: none"> ➤ Accuracy Class =0.2 ➤ CT shall be designed considering the 25 KA for 3 sec. ➤ CT shall have metering & protection core both. ➤ Rated Burden 5/5 VA. ➤ Insulation Class E. ➤ 5P20 ➤ The CTs shall be resin/epoxy cast. Correct polarity shall be invariably marked on each primary and secondary terminal. ➤ All current transformers for GIS shall be ring type (Tape wound / resin cast). ➤ Confirming to IEC: 60044-1. ➤ No of secondary core: 2. <p><u>PT Ratio 11KV/3/110 V AC</u></p> <ul style="list-style-type: none"> ➤ P.T. shall be epoxy/resin cast. Contact tips of primary/secondary contacts shall be silver plated. Correct polarity shall be distinctly marked on primary and secondary terminal. ➤ 3 Phase Primary Input 11 KV. ➤ Output 110 Volt. ➤ Core 2. ➤ Rated Burden SEC 1 15 VA. Class 0.5 ➤ Rated Burden SEC 2 25 VA. Class 3P
11	4 O/G. feeder	<ul style="list-style-type: none"> ➤ CT=> 200-100/1-1 ➤ Accuracy Class - 0.2 ➤ Metering & Protection Core. ➤ Insulation Core Class E ➤ The CTs shall be resin/epoxy cast. Correct polarity shall be invariably marked on each primary and secondary terminal. ➤ Burden Core1 5-2.5VA. Core 2 5-2.5VA, 5P20

Technical Specification No. 4:

This item includes supply at site indoor type heat shrink end termination kit for 3 core, 300 Sq. mm HT armored aluminium conductor XLPE Cable of 11 kV grade as per the approved make list.

Technical Specification No. 9:

The item includes supply at site 3 Star rating, 1000 kVA, 11/0.433 kV indoor type, three phase, 50 Hz, core type double copper wound oil immersed distribution transformer with on load tap changer, accessories etc. as mentioned below:

The transformer shall conform to IS 2026 (Part I, II & III): 1977 / IS 1180 (Part 1): 2014 as applicable and transformer oil shall conform to IS 335 with up to date amendment. The transformer shall have three Star Rating of BEE.

- (i) Capacity : 1000 kVA
- (ii) H.V. : 11000 Volts
- (iii) L.V. : 433 Volts
- (iv) Supply System : 3 phase, 50 Hz
- (v) H.V. winding : Copper wound delta connected
- (vi) L.V. winding : Copper wound star connected having Neutral separately brought out on porcelain bushing for connecting the same to earth.
- (vii) Type of cooling : ONAN (Oil immersed with natural air cooled)
- (viii) Vector group : Dyn11
- (ix) Impedance : Below 5%
- (x) Conservator : With sump, drain valve, cover plate and magnetic oil level gauge including minimum oil filling level marking and low level alarm contacts.
- (xi) On load tap : Tap changer shall be changer unidirectional type for voltage variation of +5% to -15% on HT winding in equal step of 1.25% (17 step). The on load tap changer shall have independent chamber and attached to transformer with first fill of transformer oil manually operated with counter.
- (xii) The transformer shall be provided with the following accessories:
 - (a) Oil drain valve with plug
 - (b) Filter valve with plug
 - (c) Thermometer pocket
 - (d) Two nos. earthing terminals
 - (e) Silica gel dehydrating breather
 - (f) Air release plug
 - (g) Explosion vent
 - (h) 4 nos. bidirectional flat rollers
 - (i) Lifting lugs for main tank and for all items to be handled independently
 - (j) Rating and terminal marking plate
 - (k) Buchholz relay, double float type with testing and sampling cocks

- (l) 150 mm dial, winding temperature gauge with maximum reading pointer, alarm and trip contacts
 - (m) 150 mm dial, oil temperature gauge with maximum reading pointer, alarm and trip contacts
 - (n) Marshalling box
 - (o) Base channel with towing holes.
- (xiii) Temperature rise in oil/winding shall be 50/55 °C above ambient temperature of 45°C.
- (xiv) CRCA pressed sheet radiator bank complete with air release plug, drain plug and isolating valve at points of connections with tank.
- (xv) Painting:
- (a) Internally with oil resisting varnish paint and,
 - (b) Externally with two coats of zinc rich primer followed by two coats of colour epoxy paint shade no. 631 of IS 5.

Special Conditions for 1000 kVA Distribution Transformer

- Maximum Losses at 50% loading at 75°C (Watts): 1510
 - Maximum Losses at 100% loading at 75°C (Watts): 4300
 - Normal Flux Density (at rated voltage and frequency): 1.6 T
 - Maximum flux density (Increase of +12.5% combined voltage and frequency variation from rated voltage and frequency: 1.9 T (Max.)
 - Maximum current density (A/mm²): 2.8
 - Metering CT for LV side : 800/5
 - Accuracy Class for metering CT: 0.5 Burden : 20 VA
- (1) The transformer shall be double wound, copper coil, oil immersed, naturally cooled (ONAN) and non-sealed type with plain rectangular tank.
 - (2) The transformer shall be suitable for service with fluctuations in supply voltage up to plus 12.5% to minus 2.5%.
 - (3) The transformer and accessories shall be designed to facilitate operation, inspection, maintenance and repairs. The design shall incorporate every precaution and provision for the safety of equipment as well as staff engaged in operation and maintenance of equipment.
 - (4) All outdoor apparatus, including bushing insulators with their mountings, shall be designed so as to avoid any accumulation of water.

2. Core

- The core shall have low loss and good grain properties. It should be coated with hot oil proof insulation, bolted together with frames to prevent vibration and noise.

- The core thickness should be 0.23mm or less and grade should be M3 or better.
- All core clamping bolts (if any) shall be effectively insulated.
- Only one grade and one thickness of core shall be accepted and mixing of different grades shall not be allowed.
- The complete design of the core must ensure maximum permanency of the core losses without continuous working of the transformers.
- The value of the maximum flux density allowed in the design and grade of lamination used shall be clearly stated. The vendor shall submit the calculations in support of the same.
- The transformer shall be suitable for continuous service without damage under 'over fluxing' where the ratio of voltage over frequency exceeds the corresponding ratio at rated voltage and rated frequency up to 12.5% and the core shall not get saturated.
- The No Load current shall not exceed 2% of the Full Load current and shall be measured by energizing the transformer at rated voltage and frequency. Increase of 12.5% of rated voltage shall not increase the no - load current by 5% maximum of full load current.
- The bidder shall be required to submit the following documents in regard to procurement of core material:
 1. Invoice of supplier
 2. Mill's test certificate
 3. Packing list
 4. Bill of landing
 5. Bill of entry certificate by custom
 6. Description of material, electrical analysis, physical inspection certificate for surface defects, thickness and width of material.
- 3.** The contractor shall offer the core for inspection and approval of DPA during the manufacturing stage. Penalty or black listing shall be imposed on the bidders using defective CRGO sheets.
- 4.** CT terminal box of suitable size made up of Mild Steel and with theft proof locking arrangement for secondary of CT shall be provided on the side of transformer.
- 5.** Box shall be provided with 12 Stud Type terminal blocks (10 + 2 spare) with shorting link.
- 6.** 10 core multi-stranded PVC wire (2.5 sq.mm Cu FRLS PVC stranded panel wires) shall be used to terminate connections from CTs at LV side to the CT terminal box.
- 7.** Plastic ferrules engraved with black letters shall be used to mark the wires coming from CTs.
- 8.** Plastic ferrules engraved with black letters shall be used to mark the wires in the terminal box.
- 9.** Suitable holes with glands to be provided on bottom side of this box as incoming and outgoing for 10 core 2.5 sq.mm cable.
- 10.** CT terminal box shall have IP 55 protection.

11. SURFACE PREPARATION AND PAINTING

The equipment shall be designed & painted for saline weatherproof & should be guaranteed for any type of damage due to harsh climatic condition for 10 Years.

12. RADIO INTEREFENCE

When operated at voltages up to 12.5% in excess of the normal system rating, transformers shall be substantially free from partial discharges (i.e. corona discharges in either internal or external insulation) which are likely to cause interference with radio or telephone communication.

13. OVERLOAD CAPACITY

The transformer shall be suitable for loading as per IS 6600.

RAW MATERIAL / EQUIPMENT

Make

Copper	M/S Sterlite, M/S Hindustan Copper, M/S Hindalco
Core:	M/S AK Steels/POSCO/ Kawasaki/ JFE/Nippon Steel
Insulation paper:	Raman Boards - Mysore,/ Senapathy Whiteley – Bangalore
Transformer Oil:	Savita/ Apar/ Gandhar
Gaskets & Corks:	Nu Cork/ Anchor Corks
Steel For Tank:	M/S TISCO/M/S SAIL/ M/S ISSCO/ M/S RINL/ M/S Jindal Steel/ JSW

The contractor has to provide all test certificates from original manufacturers & relevant sourcing documents. The manufacturer shall have valid BEE certification having Type Test Report (TTR) issued by CPRI/ERDA/International Accredited Laboratory. The type tests report shall be submitted to the Engineer In-charge of the same design.

The contractor shall conduct all routine tests as specified in IS 2026 on the transformer at his own cost at the manufacturer's works in presence of TPIA/representative of DPA and shall submit test report to the Engineer In-charge.

Technical Specification No. 10:

This item includes design, manufacture, testing & supply at site 8 Way, 1600 Amp, LT Power Distribution Panel suitable for 415V, 3 Phase 4 Wire, 50Hz AC supply system including Switchgears and internal wiring complete in all respect. The LT panel shall be extensible on one side.

The Panel shall be dust and vermin proof, free standing, compartmentalized made from 14 SWG, indoor type, and fabricated from CRCA sheet on robust angle iron frame painted with two coats of Zinc rich primer paint and two coats of colour pigmented epoxy paint shade no. 631 of IS: 5. Before painting the panel, the surface treatment shall be carried out by 7 tank process including degreasing etc.

LT distribution panel shall have Bus-bars which shall be made of high conductivity aluminum alloy of E91E grade, Bus bar joints shall be complete with high tensile steel bolt and washers and nuts bus bar of 1250 Amp rating for three Phases and Half the size of Neutral including and PVC sleeving. All the bus bar shall be supported on hylem/epoxy insulator. The Bakelite sheet of 12 mm (Minimum) thickness shall be provided in side enclosure of panel and wherever it is found necessary under relevant IS specification and IER 1956.

The panel shall be provided with metallic engraved/Radium film labels on front for identification of Incoming & Outgoing feeders.

The neoprene gaskets shall be provided on the periphery of the doors of all feeders.

The sleeved electrolytic copper bus-bars with epoxy insulators with Bakelite support and separators shall be provided with colour code.

All power cables shall enter the switchboard from the bottom on the back of the panel. Sufficient space shall be provided for ease of connection and termination of cables.

Any other electrical component for which details not mentioned but required for operational point of view is to be also considered.

The panel shall be complete in all respect with cable glands, lugs for incoming & outgoing cables along with 2 nos. of earthing terminals.

The panel shall be comprised with following accessories:

1) Main Incomer (1 No.)

The Main Incomer Feeder shall be provided with 1 no. 1600 Amp, 50 kA, 415 Volt, Triple Pole – MDO (Draw out type) ACB (Air Circuit Breaker) with Microprocessor released over current, Short circuit and Earth fault relay with Shunt Trip & under Voltage Coil.

The Digital Multi-Function Energy Meter (accuracy class 0.5) with LCD display shall be provided with parameters like kWh, MD, Voltage of each phase, Line current for each Phase, PF of each Phase, P.F average, Instantaneous kW, Frequency & Date & Time. The Energy Meter shall have RS485/RS232/Ethernet communication port for output.

The LED Indication lamps 6 nos. for R, Y, B, ON, OFF and trip indication shall be provided.

The 3 Nos. CTs having ratio of 1600/5 Amps, class 1 tape wound, shall be provided for metering on each feeder and 4 nos. control fuses / neutral links are to be provided with incomer & the control wiring shall be done with copper wire.

2) OUTGOING FEEDERS (10 Nos.):

The Outgoing Feeders shall be provided with

- (1) 2 No. TPN MCCB, 400 Amp, 415 Volt, 36kA breaking capacity with Microprocessor based

- (2) 4 No. TPN MCCB, 250 Amp, 415 Volt, 36kA breaking capacity with Microprocessor based
- (3) 2 Nos. TPN MCCB, 63 Amp, 415 Volt, 25 kA breaking capacity with Microprocessor based

Each feeder shall have Digital Multi-Function Energy Meter, Accuracy Class 0.5 for measurement of energy consumption of the feeder with RS485/RS232/Ethernet communication port for output. The LED Indication lamps for ON & OFF indication shall be provided on each feeder. The control wiring & power wiring shall be done with copper wire properly and the power wiring shall be brought up to the Power terminal block of suitable ampere capacity.

The LT Panel shall be tested as per the relevant IS standard. Before Manufacturing the LT Panel, the relevant test certificate in support of LT distribution panel manufacturing, along with design & drawing shall be submitted to DPA for approval and also all Electrical accessories shall be used as per approved Make List of DPA.

Technical Specification No. 11:

This item includes supply at site 4 Way double door TPN Distribution Board with IP42 degree of protection. The DB shall be made from special grade of CRCA sheet and powder coated. The DB shall be fitted with Bus bar, DIN Rail and neutral link.

Technical Specification No. 12:

This item includes supply at site 8 Way double door SPN Distribution Board with IP42 degree of protection. The DB shall be made from special grade of CRCA sheet and powder coated. The DB shall be fitted with Bus bar, DIN Rail and neutral link.

Technical Specification No. 13:

This item includes supply of DIN Rail mounted 'C' Series 63 Amp, 415 Volts, 50 Hz Triple Pole Neutral (TPN) MCB with 10kA Breaking Capacity. The supplied MCB shall conform to IS 8828 or IEC 60898-1.

Technical Specification No. 14:

This item includes supply of DIN Rail mounted 'C' Series 32 Amp, 415 Volts, 50 Hz Triple Pole Neutral (TPN) MCB with 10kA Breaking Capacity. The supplied MCB shall conform to IS 8828 or IEC 60898-1.

Technical Specification No. 15:

This includes supply of DIN Rail mounted 'C' Series 32 Amp, 415 Volts, 50 Hz Single Pole (SP) MCB with 10kA Breaking Capacity. The supplied MCB shall conform to IS 8828 or IEC 60898-1.

Technical Specification No. 16:

This item includes supply at site energy efficient 18W LED tube fixture complete with batten. The Technical Specification is as below:

Sr. No.	Description	Specification
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1	Input Power	18 Watt
2	Input voltage AC	120-270 V AC
3	Input Frequency	50 Hz +/-1 Hz
4	Life	50,000 burning hours @ L70B50, Ta 35°C Outdoor
5	Mounting type	Suitable for Suspension/Surface mounting
6	Total Harmonic Distortion	≤ 10%
7	Working Temperature	0°C to +45°C
8	Working Humidity	10% to 90% RH
9	Temperature	6500K
10	Colour rendering index	≥ 80
11	Efficacy	≥ 120 Lumen/Watt
12	Ripple	< 5%
13	Power factor	≥ 0.95
14	Construction	Polycarbonate Extrusion
15	Surge Protection	The Luminaire should have a 5kV SPD duly bolted inside the Luminaire.
16	Electrical Protection	The Luminaire should have high voltage cut-off above 325 VAC.
17	Impact Resistance	Minimum IK08
18	Electrical Insulation	Class 1
19	Ingress Protection Level of LED Light Fitting	IP 65 or more
20	Makes of LEDs	Osram, Cree, Lumileds, Nichia, Seoul.
21	Specification of LED	SMD type with wattage of each LED should be > 1 Watt and ≤ 3 Watt.
22	Certificate/Report	(1) Type test reports for LED fittings & LED Driver. (2) BIS Certificate for LED Driver. (3) BIS Certificate for LED Luminaire. Contractor shall submit the above certificate/report at the time of supply of fittings.

The rate shall be inclusive of all taxes (excluding GST), insurance, transportation, unloading at site as directed by Engineer in charge.

Technical Specification No. 17:

This item includes supply of heavy duty wall mounting industrial fan of size 30 inch (750mm) sweep fitted with heavy duty grease filled double ball bearing that ensures noiseless performance and long lasting smoother life of fan suitable for single phase 230 Volts A.C. 50Hz with separate speed regulator operated at 230V AC supply. The guards shall be powder coated & blades of fan shall be Aluminum alloy powder coated. The rates shall be inclusive of all the taxes (excluding GST), insurance, transportation, unloading at site as directed by Engineer-in-Charge.

Technical Specification No. 18:

This item includes supply at site, exhaust fan of size 300 mm with capacitor start and run type motor, continuously rated, totally enclosed fitted with heavy duty grease filled double ball bearing that ensures noiseless performance and long lasting smoother life of fan suitable for single phase 230 Volt AC 50Hz. The impeller shall be used in an Exhaust Fan shall be of the propeller type & both hub and impeller shall be dynamically balanced, frames and arms mounted on rubber bushings, to avoid vibrations.

Signature & Seal of Firm

-/sd

Superintending Engineer (E)
Deendayal Port Authority

Part – II: Installation, Testing & Commissioning

TECHNICAL SPECIFICATION

Technical Specification No. 1:

This item includes installation, testing & commissioning of supplied 11kV GIS Panel Extension at existing 66/11kV Substation. Contractor shall extend 11kV Bay of existing 66/11kV Substation for providing 11kV power supply to Shore Power Substation. The 11kV GIS Panels shall be compatible with existing Siemens make 11kV GIS Panels and shall integrate to the existing SCADA system at 66/11kV Substation as required.

All the GIB's shall be erected on fabricated "C" Channel platform of suitable size of M.S. channel having height of 1 m & the platform shall be grouted with suitable Anchor Fasteners. Surrounding the MS platform the brick masonry with fine plaster may be provided. Each panel shall be connected with 2 separate and distinct Earthing. After installation of GIB panel, necessary test and trial are to be carried out for proper functioning of safety, devices, relay etc. and before charging GIB's all the tests required under relevant ISS and IEC – Rules 1956 shall be carried out and the result shall be in conformity with specifications and copies of test results shall be furnished to Engineer in Charge. The complete work shall be carried out as directed by Engineer in Charge. The side cable fix/adopter box wherever necessary/required shall be provided, to interconnect to existing feeder. This includes all required material, tools & tackles and labour as directed by Engineer in charge.

Technical Specification No. 2:

The item includes laying of single length cable of size 3 Core, 300 Sq. mm XLPE Insulated aluminium conductor armoured cable of 11kV grade in the existing Substation cable trench. The cable shall be laid after opening of trench by removing the MS chequered plates. After laying of the cable, cable trench shall be properly covered with the existing chequered plates as per original. This includes all required material, tools & tackles and labour as directed by Engineer in charge.

Technical Specification No. 3:

The item includes laying of single length cable of size 3 Core, 300 Sq. mm XLPE Insulated aluminum conductor XLPE insulated armoured cable of 11kV grade in the existing RCC Cable trench. The cable shall be passed through the existing RCC cable trench after opening & removing RCC trench manhole cover. After laying of the cable, the manhole shall be properly covered with existing removed RCC covers as per its original position. At every approximately 25m length of RCC cable trench, a suitable size of manhole will exist. This includes all required material, tools & tackles and labour as directed by Engineer in charge.

Technical Specification No. 4:

This item includes installation, testing & commissioning of supplied 11kV GIS Panel at Shore Power Substation.

All the GIB's shall be erected on fabricated "C" Channel platform of suitable size of M.S. channel having height of 1 m & the platform shall be grouted with suitable Anchor Fasteners. Surrounding the MS platform the brick masonry with fine plaster may be provided. Each panel shall be connected with 2 separate and distinct Earthing. After installation of GIB panel, necessary test and trial are to be carried out for proper functioning of safety, devices, relay etc. and before charging GIB's all the tests required under relevant ISS and IEC – Rules 1956

shall be carried out and the result shall be in conformity with specifications and copies of test results shall be furnished to Engineer in Charge. The complete work shall be carried out as directed by Engineer in Charge. This includes all required material, tools & tackles and labour as directed by Engineer in charge.

Technical Specification No. 5:

This item includes fixing of Indoor type heat shrink end termination kit of 3 Core, 300 Sq. mm size for HT armored aluminum conductor XLPE Cable of 11 kV grade. The joint shall make in such a way that joined section can be reeled without sagging and the joint shall be electrically and mechanically permanent. This includes all required material, tools & tackles and labour as directed by Engineer in charge.

Technical Specification No. 10:

This item includes installation, testing and commissioning of 1000 kVA, 11/0.433 kV indoor type distribution transformer at shore power substation. The distribution transformer shall be installed on prepared pedestal in the substation. Before charging the transformer all the tests shall be carried out as per relevant IS specifications and IE Rules 1956. The transformer shall be properly leveled on foundation including suitable stoppers. The transformer oil shall be tested before transformer is charged and dielectric strength acidity, Sulphur contents shall be in accordance with IS 335 with latest amendments.

Technical Specification No. 11:

This item includes installation, testing and commissioning of supplied 8 way LT Power Distribution Panel in Shore Power Substation. The work includes end termination, connection of cables laid between Distribution Transformer's LT side and the LT Power distribution panel including earth connection. This includes necessary mounting hardware for bolting/welding down the base frame to the foundation. All alignment, leveling, grouting, anchoring adjustments shall be carried out in accordance with manufacturer's instruction or as directed by Engineer in charge. The work includes termination of the laid Cables along with providing suitable size of lugs, glands and necessary earth linking connection. All connections in Distribution Panel shall be completed, checked and adjusted to ensure safety and satisfactory operation of the equipment. After installation of the Distribution Panel, testing and commissioning shall be done as directed.

Technical Specification No. 12:

This item includes fixing & commissioning of supplied 4 Way double door TPN DB on wall/structure of Shore Power Substation as directed. The DB shall be fixed rigidly on wall through suitable size of nut bolts/anchor fasteners/cemented wooden gutties as directed. This includes necessary wiring, connections & earth linking with all material, labour tools & tackles as directed by Engineer-In-charge.

Technical Specification No. 13:

This item includes fixing & commissioning of supplied 8 Way double door SPN DB on wall/structure of Shore Power Substation as directed. The DB shall be fixed rigidly on wall through suitable size of nut bolts/anchor fasteners/cemented wooden gutties as directed. This includes necessary wiring, connections & earth linking with all material, labour tools & tackles as directed by Engineer-In-charge.

Technical Specification No. 14:

This item includes fixing & commissioning of supplied TPN/SP MCB in existing TPN double door DB on wall / structure. The MCB shall be fixed on DIN Rail provided in existing DB. This includes necessary wiring, connections, distribution & earth linking of DB with all material, labour tools & tackles as directed by Engineer-In-charge.

Technical Specification No. 15:

This item includes providing & fixing surface wiring for three phase sub-circuit from the Distribution Board/MCBs to the Distribution Board/MCBs with Flame Retardant, 1100 Voltage grade, single core stranded copper conductor wire with IS: 694/1990 of size 4 sq. mm for phase & 2.5 Sq.mm for neutral wire and continuous stranded copper conductor wire for earth to be laid through PVC Oval Pipe with IS: 9537 (Part-III) of size 32 mm Diameter of Medium Mechanical Strength (MMS) type and other accessories such as Tee, junction box, inspection bends, elbow etc. of approved make as directed by Engineer in Charge. The PVC Oval conduit shall be fixed rigidly on wall/ceiling with suitable size heavy duty PVC saddle set with base, clamp & screw at the interval of 0.5 meter. Complete work consists of necessary wiring connections and earth linking at both the ends with all materials and labour as directed by Engineer in Charge.

Technical Specification No. 16:

This item includes providing & fixing surface wiring for single phase sub-circuit from the Distribution Board/MCB to the switchboard with Flame Retardant, 1100 Voltage grade, single core stranded copper conductor wire with IS: 694/1990 of size 2.5 sq. mm for phase & neutral wire and 1.5 Sq.mm continuous stranded copper conductor wire for earth to be laid through PVC Oval Pipe with IS: 9537 (Part-III) of size 25 mm Diameter of Medium Mechanical Strength (MMS) type/oval shape PVC conduit pipe of 25mm and other accessories such as Tee, junction box, inspection bends, elbow etc. of approved make as directed by Engineer-in-Charge. The PVC oval conduit shall be fixed rigidly on wall/ceiling with suitable size heavy duty PVC saddle set with base, clamp & screw at the interval of 0.5 meter. Complete work consists of necessary wiring connections and earth linking at both the ends with all materials and labour as directed by Engineer in Charge.

Technical Specification No. 17:

This item includes providing & fixing surface wiring for light/tube light point from switchboard with Flame Retardant, 1100 Voltage grade, single core stranded copper conductor wire with IS 694: 1990 of size 1.5 sq. mm for phase & neutral wire and 1.0 Sq. mm continuous stranded copper conductor wire for earth to be laid through PVC Round Pipe with IS 9537 (Part-III) of size 20 mm Diameter of Medium Mechanical Strength (MMS) type /20mm oval shape PVC conduit pipe of 20 mm and other accessories such as Tee, junction box, inspection bends, elbow etc. of approved make as directed by Engineer-in-Charge. The PVC round /oval conduit shall be fixed rigidly on wall /ceiling with suitable size heavy duty PVC saddle set with base, clamp & screw at the interval of 0.5 meter. The work consists of providing & fixing of Bell Push /Flush type SP switch 6A, 240V semi modular Anchor Nova type or equivalent with ISI mark and to meet specifications of IS 3854 & 3 plate Ceiling Rose /Angle Holder made from polycarbonate on suitable size of PVC box with cover. The PVC box shall be rigidly fixed with cemented wooden gutties on the wall and the switches shall be fixed on cover of the box. The complete work consists of necessary wiring connections and earth linking at both the ends with all materials and labour as directed by Engineer in Charge.

Technical Specification No. 18:

The item includes providing & fixing surface wiring for Power point with Flame Retardant, 1100 Voltage grade, single core stranded copper conductor wire with IS 694: 1990 of size 2.5 Sq. mm for phase & neutral wire and 1 Sq. mm continuous stranded copper conductor wire for earth to be laid through PVC Round Pipe with IS 9537 (Part-III) of size 20 mm Diameter of Medium Mechanical Strength (MMS) type /20mm oval shape PVC conduit pipe and other accessories such as Tee, junction box, inspection bends, elbow etc. of approved make as directed by Engineer-in-Charge. The PVC round /oval conduit shall be fixed rigidly on wall /ceiling with suitable size heavy duty PVC saddle set with base, clamp & screw at the interval of 0.5 meter. The work consists providing & fixing of 20 A & 10 A, 5 in 1 combined Unit 240V, 50Hz with switch, socket, fuse & indicator with ISI mark. The Combined unit shall be rigidly fixed with cemented wooden gutties on the wall as directed. The complete work consists of necessary wiring connections and earth linking at both the ends with all materials and labour as directed by Engineer in Charge.

Technical Specification No. 19:

The item includes providing & fixing half point in existing switch board with Flame Retardant, 1100 Voltage grade, single core stranded copper conductor wire with IS: 694/1990 of size 1.5 sq. mm. for phase, neutral & earth. The work consists providing & fixing of Flush type SP switch 6A, 240V semi-modular type or equivalent with ISI mark and to meet specifications of IS: 3854, and 2 in 1 socket 6A, 240V made from polycarbonate on existing switchboard. The complete work consist necessary wiring connections and earth linking with all materials and labour as directed by Engineer in Charge.

Technical Specification No. 20:

This item includes installation of supplied 18W LED tube fitting with suspension mounting accessories in the substation as directed. The light fitting shall be hung from the ceiling by two stainless steel suspension cable of 3m length and anchor fasteners. The work includes necessary connection from existing ceiling rose with 3 core, 1.5 Sq.mm flexible Cable. This includes all material, labour, tools & tackles as directed by Engineer in Charge.

Technical Specification No. 21:

This item includes fixing of supplied wall mounting industrial fan 2.5 meter from floor or at suitable height as directed. The fan shall be fixed with suitable size of anchor fastener bolts as directed. The work includes necessary connection from existing ceiling rose with 3 core, 1.5 Sq.mm flexible Cable. This includes all material, labour, tools & tackles as directed by Engineer in Charge.

Technical Specification No. 22:

This item includes fixing of supplied 300mm sweep exhaust fan on existing exhaust hole. The grouting of the fan is to be done by suitable size of anchor fastener bolts, and by providing metallic mesh/louvers as directed to other side so that birds can be restricted in the passage. This includes connections with 3 core flexible copper cable from nearest source of supply & necessary connections & earth linking with all material and labour and as directed by Engineer in Charge.

Signature & Seal of Firm

Superintending Engineer (E)
Deendayal Port Authority

Comprehensive Operation & Maintenance of Shore to Ship Power Facility

Comprehensive operation & maintenance of the shore to ship power facility project shall be for a period of five years after the date of successful completion of the work i.e., final acceptance of the shore to ship power facility project work.

Contractor shall develop and implement plans and procedures including those for firefighting, maintenance planning, procuring and inventory control of stores and spares, plan to meet emergencies, plant safety and security; and such other facilities and systems as may be necessary to commence contractor's ongoing responsibilities.

After taking over the activity of O&M of the system, the contractor shall be responsible for the operation & maintenance of the complete Shore to Ship Power System from 11kV GIS Panel Incomer of the Unit Substation.

Supply of required manpower, spares, consumables, tools & tackles, testing equipment & instruments etc. required for efficient operation and maintenance of shore to ship power facility, safety of equipment and operating personal is deemed to have been included in the Scope of Work.

Contractor shall provide all operation & maintenance services necessary to efficiently operate and maintain the Shore to Ship Power System, including all associated mechanical and electrical equipment keeping in view the objectives set forth below:

- (a) Maintain the system accurate and up-to-date operating logs, records and monthly reports regarding the operation and maintenance of the system including operating data, repairs performed and status of equipment.
- (b) Regularly update and implement an equipment repair or replacement and preventive maintenance program that meet the specifications of the equipment manufacturers and the recommendations of the manufacturers.
- (c) Perform periodic preventive maintenance required in accordance with the recommendations of equipment manufacturers. Also, attend Breakdown and other maintenance in the System. Inform DPA, the time and action taken with root cause analysis after attending to such breakdown shortly after restoration of the system.
- (d) Provide technical and engineering services for solving operation and maintenance problems.
- (e) Procure all spare parts, or equipment(s) as required, overhaul of parts, tools and equipment at their cost, and to operate and maintain the System in accordance with the recommendations of individual original equipment manufacturer.
- (f) Operate and maintain System fire protection and safety equipment.

MANPOWER:

The contractor shall employ only such manpower who are adequately qualified and experienced for operating and maintaining the shore to ship power system. Contractor shall

ensure that such personnel are on duty at the system at all times, twenty four hours a day and seven days a week commencing of shore to ship power system.

During the execution of the contract, the contractor shall ensure that a Site Engineer along with required skilled & semi-skilled manpower be available at Unit Substation for smooth operation & maintenance of the System. Site Engineer deputed by the contractor shall report to the Engineer In-charge for smooth operation of the System. The contractor shall be responsible for any misconduct/indiscipline by his manpower posted at site. The contractor shall abide by the instructions of the Engineer In-charge, if given in this regard.

AVAILABILITY:

The contractor shall guarantee the average availability of Shore to Ship Power System as minimum 95% on monthly/annual basis.

Pre-Determined Compensation regarding System Availability:

The contractor shall maintain the shore to ship power system for both berths in full working condition at all the time. The contractor has to ensure the monthly individual berth's shore to ship power system availability of 95% during each month of every year. In case the individual berth's shore to ship power system availability is less than 95%, 1% of the monthly O&M charges will be recovered for every 1% fall in availability of individual berth's system for such months, capped to maximum to 100% of the monthly O&M charges.

Availability of the individual berth's shore to ship power system shall be calculated in the following manner:

$$\{D - (GF + FM + S + U)\} \times 100 / \{D - (GF + FM)\}$$

D = Number of total hours for a system in the applicable period. Total 24 Hours shall be considered for the calculation in a day.

GF = Grid Failure hours. Non availability of Power Supply to both 11kV GIS Incomer Panels of the Unit Substation.

FM = Force Majeure hours.

S = Scheduled Maintenance Hours for a Shore to Ship Power System

U = Unscheduled or Forced or Breakdown Maintenance Hours for a Shore to Ship Power System.

O&M PERFORMANCE GUARANTEE:

Contractor shall submit a bank guarantee before the start of O&M services. The O&M performance guarantee should be before the expiry of Performance Guarantee and it should be for an amount equivalent to 10% (Ten percent) of O & M Charges for the particular year. Every year a fresh bank guarantee shall be submitted by the contractor before the expiry of earlier bank guarantee. The performance guarantee should be issued by any nationalized bank having its branch at Gandhidham.

INSURANCE:

Contractor shall provide or obtain and maintain in force throughout the period of contract the following insurance coverage:

Workmen compensation and /or group personal accidents Insurance policy covering all its employees and works. Insurance to cover third party liability Insurance in respect of claims for personal injury to or death of any person in the employment of contractor and arising out of and in the course of such employment, which insurance shall comply with all applicable Indian law and directives. EAR policy may be required by applicable Indian law or in order to enable the contractor to comply with prudent utility practice. Nevertheless fire and allied perils including earthquake, flood, storms, cyclone, tempest, theft & burglary, insurance policy shall be taken by DPA regularly during O&M contract period. In case of any loss/ claim under the policy, O&M Contractor shall immediately inform the same to DPA & Insurance Company & thereafter shall take all the measures required to protect the interest of owner / underwriters and required for settlement of claim.

The Contractor shall bear the risk for system breakdown and it would be the responsibility of the Contractor to operate and maintain the system and it's all the equipment in perfect condition at his own cost for the entire period for which DPA shall pay the agreed O&M charges only. The replacement / repair / modification of any / all equipment have to be carried out by the Contractor at his own cost for the entire period of contract. DPA shall not be responsible for any break down / failure of any equipment to any reason thereof and that Contractor shall maintain requisite stock of spares of various equipment.

MEASUREMENT OF ENERGY AND METERING:

The Contractor shall maintain the Metering System (which shall include energy meter, current and potential transformers). The Metering System should be designed so as to measure outgoing energy and power delivered to the Vessel at the delivery point, i.e. point of inter connection. Accuracy class of all metering equipment shall not be less than 0.2%. Meter reading shall be done jointly with representative of Engineer In-charge.

The Metering System shall be sealed in the presence of Engineer In-charge, DPA. When the Metering System and/or any component thereof is found to be outside the acceptable limits of accuracy or otherwise not functioning properly, it shall be repaired, re-calibrated or replaced by the contractor as soon as possible at their own cost. Any meter seals shall be broken only by the contractor's representative in the presence of the Engineer In-charge, whenever the Metering System is to be inspected, tested, adjusted, repaired or replaced.

PAYMENT:

Payment period shall be monthly. The contractor shall submit bills in respect of the month ended, in triplicate after the end of each month for the payment after submission of PBG.

Documents to be submitted along with monthly claim of payment:

- Details of schedule maintenance done as per OEM standards.

- The system availability report of both Berths of particular month.
- Details of Manpower engaged (Name and designation etc.).
- Any other documents/information sought by DPA.

Signature & Seal of Firm

-/sd

Superintending Engineer (E)
Deendayal Port Authority

Make List for Electrical Items		
Sr. No.	Description	Recommended Makes
1	HV VCB	SIEMENS / CROMPTON GREAVES/ABB/Schneider
1(a)	HV Gas Insulated Breakers	SIEMENS /Schneider/ABB
2	POWER TRANSFORMERS	VOLTAMP/CROMPTON GREAVES /BHARAT BIJLEE/ BHEL/ SIEMENS/ABB/ Schneider/T&R
3	DISTRIBUTION TRANSFORMERS	EMCO/KIRLOSKAR/PATSON/VOLTAMP/A BB/Schneider/T&R
4	RESIN CAST TRANSFORMERS	
	A) RESIN CAST IMPREGNATED	VOLTAMP / KIRLOSKAR / EMCO
	B) DRY CAST	VOLTAMP/KIRLOSKAR/EMCO
5	HT XLPE CABLES	POLYCAB/ TORRENT/ RPG ASIAN/ GLOSTER/ UNISTAR
6	LT XLPE CABLES	POLYCAB/TORRENT/RPG ASIAN/ RALLISON/PRIMECAB/ HAVELLS/ UNISTAR/AVOCAB/ALLCAB/ ADCAB
7	LT ACB	SIEMENS/L&T/SCHNEIDER/C&S
8	PROTECTION RELAYS	AREVA/L&T/SIEMENS/ABB/C&S
9	LT PANEL	CPRI APPROVED
10	CHANGE OVER SWITCH	SIEMENS/L&T/ABB/C&S/SCHNIDER/ LEGRAND / INDOASIAN
11	SFU FOR MAIN LT DISTRIBUTION PANELS	SIEMENS/L&T/ABB/C&S
12	SFU FOR DISTRIBUTION PANELS & FEEDER PILLERS	SIEMENS/L&T/ABB/C&S/ SCHNEIDER/ LEGRAND/ INDOASIAN/HAVELLS
13	MCCB FOR MAIN LT DISTRIBUTION PANELS	SIEMENS/L&T/ABB
14	MCCB FOR DISTRIBUTION PANELS AND FEEDER PILLERS	SIEMENS/L&T/ABB/C&S/ SCHNIDER/ LEGRAND/ INDOASIAN/HAVELLS

15	MCB/ELCB/RCCB/ RCCBO FOR MAIN LT DISTRIBUTION PANELS	SIEMENS/HAGER L&T/ABB
16	MCB FOR DISTRIBUTION PANELS AND FEEDER PILLERS	SIEMENS/L&T/ABB/C&S/ SCHNEIDER/ LEGRAND/ INDOASIAN/ HAVELLS/ STANDARD
17	MCB DISTRIBUTION BOARD	STANDARD / HENSEL/LEGRAND / INDOASIAN / HAVELLS
18	MULTI FUNCTION DIGITAL METER FOR MAIN LT DISTRIBUTION PANELS/DIGITAL KWH METERS	L&T/ENERCON/SECURE/L&G/ RISHABH
19	ANALOG VOLT/AMPARE METER FOR DISTRIBUTION PANELS AND FEEDER PILLERS	RISHABH/AE/ENERCON/L&T
20	SLECTOR SWITCH FOR VOLTMETER/AMPARE METER	L&T/SIEMENS/C&S
21	POWER CONTACTOR & OVER LOAD RELAYS	L&T/SIEMENS/ABB
22	QUARTZ TIME CLOCK SWITCH	L&T/INDOASIAN/SIEMENS
23	PVC WIRE WITH COPPER CONDUCTOR	RRKABEL/KEI/POLYCAB/MILEX/GUJCAB/ STANDARD/ FINOLEX/ ANCHOR
24	FLUSH TYPE SWITCHES, SOCKETS, HOLDERS AND CEILING ROSES & ELECTRONIC REGULATORS	ANCHOR/MK/NORTHWEST/VINAY/PANA MA/HAVELLS
25	DOOR BELLS/CALL BELLS	ANCHOR/LEGEND/MK/NORTHWEST
26	MODULAR SWITCHES, SOCKETS, PLATES & BOXES	ANCHOR / MK / NORTHWEST / LEGRAND /HAVELLS/ INDOASIAN/ SIEMENS
27	PVC CONDUIT/OVAL CONDUIT & CASSING CAPPING AND ACCESSORIES	PRECISION/VULCAN/FINOLEX/ GARWARE/ RESTOPLAST/ SWASTIK/ BPI
28	GLS LAMPS & FLUORESCENT LAMPS	PHILIPS / BAJAJ / WIPRO / CROMPTON GREAVES / OSRAM / SURYA ROSHNI /GE
29	HPSV, HPMV & METAL HELIDE LAMPS	PHILIPS / BAJAJ / WIPRO / CROMPTON GREAVES / OSRAM / SURYA ROSHNI /GE
30	IGNITORS FOR HPSV, METAL HELIDE LAMPS	PHILIPS / BAJAJ / WIPRO / CROMPTON GREAVES / OSRAM / SURYA ROSHNI /GE
31	LUMINARIES	PHILIPS/BAJAJ/WIPRO/CROMPTON GREAVES / OSRAM / SURYA ROSHNI /GE

31a	LED Luminaries	Philips /Bajaj/Wipro/CG/Surya/Pyrotech/Syska/ Nessa having surge Protection $\geq 10KV$ for fittings & internal Surge protection for Driver of $\geq 4KV$, LED Chip only OSRAM/CREE/Philips Lumileds/Citizen/Nicia with LM-79,80 CERTIFICATION
32	CEILING FANS	BAJAJ/ORIENT/USHA/CROMPTON GREAVES / ALMONARD/GEC
33	WALL MOUNTING FANS	BAJAJ/ORIENT/USHA/CROMPTON GREAVES / ALMONARD/GEC
34	EXHUAUST FANS	BAJAJ/ORIENT/USHA/CROMPTON GREAVES / ALMONARD/GEC
35	HEAVY DUTY INDUSTRIAL WALL MOUNTING FANS	BAJAJ/ORIENT/USHA/CROMPTON GREAVES / ALMONARD/GEC
36	WATER COOLER	VOLTAS/SHRIRAM USHA/BLUE STAR
37	AIR CONDITIONERS	VOLTAS/CARRIER/BLUESTAR/USHA/ HITACHI/LG/ SAMSUNG/ONIDA
38	REFRIGERATORS	VOLTAS/CARRIER/BLUESTAR/USHA/ HITACHI/LG/ SAMSUNG/WHIRLPOOL
39	VOLTAGE STABILIZER	VEELINE / CAPRI
40	INVERTERS	SUKAM / MICROTEK
41	D.G. SETS (a) ENGINE (b) ALTERNATOR	CUMMINS/GREAVES/KIRLOSKAR/ CATERPILLAR/ ASHOK LEYLAND/VOLVO STAMFORD/CROMPTON GREAVES /JYOTI/ KIRLOSKAR ELECTRIC
42	ELECTRIC MOTOR	ALSTOM/CROMPTON GREAVES /SIEMENS/ KIRLOSKAR/ABB
43	WATER PUMPS	SWASTIK / KSB
44	WATER GEYSER	BAJAJ/USHA / CROMPTON GREAVES / SPHEREHOT / RACOLD
45	LUGS & CABLE GLANDS	DOWELLS / JAINSON / BRACO
46	STATIC FREQUENCY CONVERTER	ABB / SIEMENS / SCHNEIDER ELECTRIC/FUJI ELECTRIC
47	CABLE MANAGEMENT SYSTEM	CAVOTEC / IGUS / SHORELINK
48	SCADA	HONEYWELL / ABB / SIEMENS LTD. / ROCKWELL / GE / SCHNEIDER ELECTRIC
49	PLUG / SOCKETS	CAVOTEC / PROCONNECT

TERMS AND CONDITIONS

1. Time Schedule: The work shall be completed within 12 months from the date of issue of Work Order.
2. The bidder, at his own responsibility and risk is encouraged to visit and examine the site of work and its surroundings and obtain all information that may be necessary for preparing the Bid. The costs of visiting the site shall be at the Bidders' own expense.
3. The contractor shall install display board at site of work indicating the details of the work such as name of the work, name of contractor, scheduled date of start & completion of work, value of work etc. at his own cost.
4. DPA will award the work to the bidder whose bid has been evaluated to be techno – commercially responsive and the lowest evaluated amount bid.
5. Work shall be guaranteed for 12 months from the date of completion of the work.
6. The rates should be quoted in figures and words both. In case of difference in figure & words, the rate mentioned in words will be considered.
7. The contractor shall affix SEAL along with SIGNATURE in the Offer.
8. The work shall be carried out in accordance with the best standards of workmanship and to the entire satisfaction of the Engineer-in-Charge.
9. Security Deposit @ 5% recovered from the bill and the SD can be released only after successful completion of guarantee period.
10. Payments Terms: Stage wise payment shall be released against supply, installation, commissioning and handing over to Engineer in Charge, DPA.
All payments shall be made in Indian rupees unless specifically mentioned.
11. Payment will be made by RTGS only after satisfactory completion of work and submission of duly signed bill.
12. The contractor shall not deposit any materials at such a place that may cause inconvenience to the public or staff or nearby offices.
13. The Contractor shall execute the work in such a way that not to cause inconvenience to the public or staff or nearby offices and not to cause hindrance to traffic. Necessary barricading shall be done by the contractor at his own cost if required.
14. Income-tax and surcharge as applicable will be deducted from the bill while making payment to the contractor for carrying out the work and only net amount shall be paid to the contractor.
15. All tools, plants, scaffolding ladder etc. and other machinery etc. required temporary for the purpose of execution of work will have to be arranged by the contractor at his own cost and storing of such tools, plants etc. will have to be made by him.
16. All the materials should be got approved from Engineer-in-Charge before put into use.
17. Correction if any should be signed / initialed by the contractor. White ink correction will not be allowed and lead to rejection of quotation.
18. All the rules and regulations governing DPA will be applicable.

19. After completion of the work, the site should be neatly cleaned by the contractor.
20. The contractor shall ensure not to cause any damages to the port properties in the vicinity of work site during execution of work. If any damage occurs due to workmen/ machinery of the contractor, the contractor has to make good the loss / damage at his cost.
21. For Entry & exist of material and contractor personnel, pass shall be arranged by contractor.
22. The contractor shall quote the price exclusive of GST. The contractor shall quote prevailing GST rate separately, which shall be reimbursed by DPA after ascertaining necessary compliance as per Goods & Service Tax, 2017. All other duties, taxes, cesses applicable if any, shall be borne by the contractor.

Income-Tax deductions and surcharge as applicable thereon shall be made good while making payments due to the contractor for carrying out the work and only net amount shall be paid as directed by the Central Board of Direct Taxes, Ministry of Finance, Government of India.

The rates quoted by the contractor shall be deemed to be inclusive of the taxes, duties etc. which the contractor will have to pay for the performance of this contract, except GST. The employer will perform such duties in regard to the deduction of such taxes at sources as per applicable law.

23. All the work shall be carried out to the entire satisfaction of Engineer in Charge.

Signature & Seal of Firm

-/sd
Superintending Engineer (E)
Deendayal Port Authority