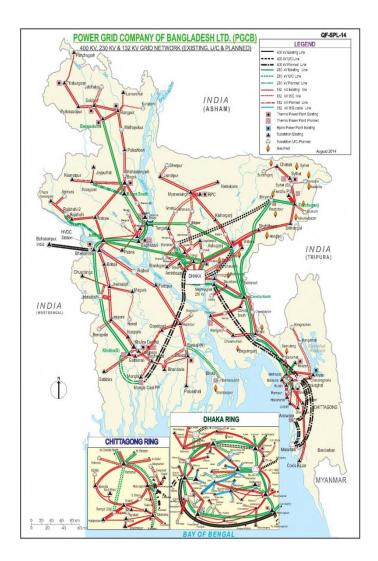


Energy Efficiency in Grid-based Power Supply



Tender Documents for Design, Supply, Installation, Testing & Commissioning of 132/33 kV Substations, on Turnkey Basis Package 3

Contract No. PGCB/KfW/BMZ.2014.67.976/2018/Package-3

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Employer:



Consultant:



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1. Schedule A: Introduction and Preamble to the Price and Technical Schedules

1.1 Description of the Overall Project

The Government of Bangladesh undertakes extensive efforts to meet the growing electricity demand and to minimize the unpleasant consequences of the load shedding throughout the country. In that respect, it developed the ambitious plan to provide electricity throughout the country by the year 2021.

The investigation on the transmission network revealed that a significant number of grid substations and transmission lines would be overloaded. A number of existing substations experience problems in service as a result of aged equipment and unconventional design. These facilities need renovation and modification. Some of this equipment required increase of installed capacity to meet the increasing consumer needs.

The objective of this project is to increase reliability and efficiency of the electrical power supply in Bangladesh through expanding and improving the 230 and 132 kV power transmission systems of PGCB.

System expansion contributes to an efficient power transmission, reduces transmission losses, eliminates the operational bottlenecks apparent from the load flow analysis, and provides an adequate infrastructure for the future development of the power sector.

Due to the actual condition of the power system, PGCB started to improve the transmission system. The aim is to strengthen the transmission system and to avoid power shortages and operational constraints during exploitation.

For this project, the Government of Bangladesh appealed to the German Government to receive new financial assistance to be used in that respect, i.e. to strengthen the transmission system in the country, especially the 132 kV transmission facilities. KfW will provide a loan, while the remaining program costs will be financed from PGCB funds. The scope of the project that has to be financed from these funds is specified in the continuation.



1.2 Description of this Package

The scope of works under this turnkey contract is: **design**, **supply**, manufacture, quality assurance, inspection and testing, **delivery**, new packing for export, insurance, shipment & transport to the site, complete construction and **installation**, jointing, terminating, bonding, earthing, painting, setting to work, site **testing and commissioning**, defect liability for all equipment, including all civil works of new and the extension and renovation of existing 132/33 kV substations

All necessary works have to including in the contract price, including all kinds of dismantling works, if any.

The civil design has to incorporate countermeasures against flooding so as not to affect any substation equipment during the wet season. Given the recorded past maximum flood water level in the project area, sufficient ground level height for land formation is required at the Contractor's responsibility.

The Bidders are advised to conduct site visits, to inform themselves and to carry out their own assessment on all concern sites according to their needs before the submission of their bids. The Employer may arrange necessary permission, if required by the Bidders.

The geotechnical studies and soil investigations are in the Contractor's scope of work.

The Civil Design and backfilling has to consider and incorporate protection measures against flooding. The sufficient ground level height for land formation is required at the Contractor's responsibility and will be subject of the Employer's approval. Finishing Ground Level (FGL) shall be at least 500 mm above the Highest Flooding Level (HFL). The Bidders has to inform themselves about the HFL.

Generally, **land development** of **new substation** shall be made for the **total substation area** and **boundary wall** shall be made for the **total substation area**

Generally, **land development** of the **substation**, which has to be extended/renovated, shall be made only for the **required substation area** and **extension** of the **boundary wall** shall be made only if it is required

The Contractor's responsibility is to provide that all parts of the works be completed in every respect for commercial operation, to the requirements of the Engineer.

All details, accessories etc. required for the complete installation and satisfactory operation of the works not specifically mentioned in this specification are deemed included in the contract price.

The Contractor is responsible for ensuring that all and/or any item(s) of work required for the safe, efficient and satisfactory completion and functioning of the works, are included in the Bid Price whether they be described in the specification or not.

In case of extension and renovation works, not all required as-built drawings may be available for the existing plant and equipment, which required modification/renovation; the Contractor is also responsible to make drawings as required to complete the works.

The drawings provided in the bidding documents are indicative only and hence do not reflect the entire scope of works. The Bidder has to consider all Tender drawings as preliminary and for Tender purpose only. The drawings may be changed at the time of execution. All dimensions are preliminary and



general. Not all equipment is shown on the drawings. Details are not shown at all. The Contractor has to make Engineering and to provide detail calculation, detail design and detail drawings of the complete facilities, which will be subject of the Employer's approval.

The Bidder is be deemed to have visited site, inspected, gathered data and verified details of the asbuilt system in order to design, supply and interface their new equipment.

The other ends of Transmission Lines have to be covered from the tele-communication point of view under the scope of this contract. All equipment and services have to be provided

All necessary materials, adjustments, dismantling, remedial and tiding-up work in order to complete the work specified shall be included in the contract price.

The bid price shall include costs of witnessing of **factory acceptance tests** by the Employer's Engineer (two Engineers in each visit, and maximum seven days for each visit) for:

- Power transformers 132/33 kV,
- Gas Insulated Switchgear (GIS) 132 kV,
- Circuit breakers 132 kV,
- Disconnectors 132 kV,
- Instrument transformers 132 kV,
- Substation Automation System and Protection relays

Factory acceptance tests shall be organized separately for each equipment.

The bid price shall include costs of training during and after the installation. The Contractor should provide trainer(s) for on-site training on operation and maintenance of the works, for each new substation, for no more than 15 (fifteen) Employer's staff for minimum 1 (one) week.

The bid price shall include supply and delivery of mandatory spare parts, maintenance tools and test equipment.

The bid price shall include all other miscellaneous works required.

The "Schedule of Requirements" for equipment, materials and services and the detailed technical specifications of equipment and materials as included in Volume 3 of the bidding documents shall be read in conjunction with the scope of works described herein.

The programme of works shall be as shown in Schedule C - Times for Delivery and Completion. Within one month of acceptance of the bid, the Contractor shall submit a programme chart detailing times required for the design, supply, delivery, installation, testing and commissioning for the complete work.

New 132 kV GIS and Control Building

The new 132 kV GIS and control building has to be with cable basement, but no full cable basement is required. Generally, the cable basement will be only for primary and secondary cables. The height of the cable basement should be 3 (three) meters. On the first floor, the 132 kV switchgear shall be installed, as well as all necessary facilities, including motorized crane and space for HV testing equipment and SF₆ gas treatment plant. On the second floor, the complete control room, including control, protection, metering, communication, auxiliary power supply, etc., shall be installed. The building shall have a size of approximately 36 x 12 meters.



Provisions for an elevator shall be made (civil part), but the elevator itself is not required. On some drawings, the provisions for the elevator are not shown, but Bidders shall consider the provisions for the elevator as mandatory for all new GIS 132 kV and control buildings.

The main entrance for the equipment shall be on the opposite side of the main entrance of the building.

In transformer and bus coupler bays, the minimum number of operating mechanism for the AIS and/or GIS circuit breaker is one, but Bidders can propose circuit breakers with three OMs.

New 132 kV GIS Switchgears

For all new 132 kV GIS switchgears, Bidders shall provide as part of the bidding documents: Conceptual method statements incl. gas schematics and relevant chamber pressures etc., for several applicable cases (BB, BC, CB, DS, ES, outgoing, etc.), in order to ensure that a single failure and its repair would still ensure the minimum operation requirements.

- Segregation of compartments
- Barrier insulators
- Compartment pressures during repair allowing operation of unaffected switchgear
- Accessibility of individual bays and their drives

The following method of reference shall be used to identify the various required items:

| Denomination | Description |
|--------------|--|
| A | 230 kV switchgear |
| В | 132 kV switchgear |
| С | 33 kV switchgear |
| D | 230/132/33 kV auto transformers and 132/33 kV transformers |
| E | Neutral earthing equipment |
| F | Earthing / auxiliary transformers |
| G | Control, protection, substation automation and metering etc. |
| Н | Fibre optic multiplexer equipment for communication and protection |
| I | Multicore low voltage power and control cables |
| J | Batteries, chargers and DC distribution |
| К | LVAC distribution |
| L | Civil works, building and foundations |
| М | Building lighting, small power and air conditioning |
| N | Switchyard lighting |
| Р | Earthing and lightning protection |
| Q | 230 kV and 132 kV Cable |

The Contractor is to carry out the works taking full account of the limitations imposed by existing sites and the requirement to maintain all existing supplies during the construction works.

Any temporary works, structures, connections, etc., necessary to achieve this requirement are to be included in the bid price.

The brief description of works under this contract is as follows.



The works under this turnkey contract include the following:

- Renovation / New 132/33/11 kV GIS Substation Shahjibazar
- Renovation / Upgrading of existing 132/33 kV AIS Substation Satkhira
- Renovation / New 132/33 kV GIS Substation Sylhet
- Extension of existing 132/33 kV AIS Substation Bhandaria for 2 132 kV bays
- Extension of existing 230/132/33 kV AIS Substation Barisal (N) for 2 132 kV bays



1.2.1 Renovation / New 132/33/11 kV GIS Substation Shahjibazar

132/33/11 kV Substation Shahjibazar is an existing substation, inside the power plant, which shall be completely renovated.

Several power plants are connecting or will be connected in near future at the substation, and the substation is also connected to the substations Nabiganj, Sreemongal, Ashuganj and B. Baria by several transmission lines 132 kV.

The **scope of work** under this turnkey contract includes design, supply, delivery, installation, testing & commissioning of:

- 132 kV GIS Switchgear with thirteen bays and space for future extension by six bays, with:
 - 132 kV double busbar system
 - eight (8) 132 kV transmission line bays (all transmission lines have to terminated to the new gantries at the boarder of power plant and have to be connected to the new 132 kV GIS Switchgear by 132 kV power cables)
 - four (4) 132 kV transformer bays (all power transformers have to be connected to the new 132 kV GIS Switchgear by 132 kV power cables)
 - one (1) 132 kV bus coupler bay
- 132 kV cable connection of approximately 12 x 100 meters
- two (2) three phase power transformers 132/33 kV, 80/120 MVA.
- two (2) existing power transformer 132/33 kV, 25/41 MVA and 132/33 kV, 50/75 MVA shall be also connected to the new 132 kV GIS Switchgear
- Existing 33 kV AIS Switchgear has to be completely renovated with:
 - new 33 kV single busbar, divided at four sections by three disconnectors
 - four (4) 33 kV transformer (132/33 kV) bays
 - two (2) 33 kV auxiliary transformer bays
- two (2) three phase, 33/0.415 kV, 200 kVA, auxiliary power transformers
- 33 kV cable connection of approximately 4 x 100 meters
- SCADA Control for four (4) numbers of 33 kV shed feeders (BCU and panels)
- associated substation control and monitoring system, relay protection, metering, telecommunication, AC & DC auxiliary power supply, cables, metal structure, earthing and lightning protection.
- land development of complete switchyard area by cutting, land filling, compacting up to a suitable level including slope protection. The approximate total required area of the substation is 3 acres.
- complete outdoor civil works, including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformer and auxiliary transformer foundations, blast wall, substation main gate and guard house, internal security boundary wall and internal fencing, internal roads, parking and storage place, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing
- Complete civil works and facilities for new GIS 132 kV and control buildings with cable basement, including foundation works, super structure works, finishing works like rendering, painting, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipe lines, etc., sewage facilities including septic tank, etc.
- **De-installation and transport of existing power transformers** at the location chosen by PGCB no longer than 100 km
- The existing switchgear has to be completely dismantled and stored at the storage place, the area has to be cultivated and not used equipment and material has to be removed.



| No. | Equipment | Unit | Qty. |
|------|--|------|------|
| В | 132 kV Switchgear, Equipment Connection and Steel Structures | | |
| | One (1) set of complete equipment for switchgear 132 kV shall be designed, sup- plied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 |
| BG.1 | A complete indoor and partly outdoor GIS Line feeder 145 kV, 3150 A busbars / 2000 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: Q0 - One (1) set of three pole, GIS type, SF₆ gas circuit breaker with three spring-stored energy operating mechanism Q1, Q2, Q9 - Three (3) sets of three pole, three positions, motor operated, insulated disconnector with earthing switch Q8 - One (1) set of three pole, make-proof, motor operated earthing switch T1-Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1/1 A, GIS type current transformers T5 - Three (3) single-phase, 2-secondary winding, 132/V3 / 110/V3 / 110/V3 kV/V/V, GIS type voltage transformers T6 - One (1) set of three-phase, GIS type, hand operated disconnector link SA - Three (3) single-phase outdoor surge arresters, GIS type Z1 - One (1) set of three phase indoor and outdoor GIB with three outdoor GIS/AIR bushings GIS.X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | Set | 8 |
| BG.2 | A complete indoor and partly outdoor GIS Transformer feeder 145 kV, 3150A busbars / 2000 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: Q0 - One (1) set of three pole, GIS type, SF₆ gas circuit breaker with one spring-stored energy operating mechanism Q1, Q2, Q9 - Three (3) set of three pole, three position, motor operated, insulated disconnector with earthing switch Q8 - One (1) set of three pole, make-proof, motor operated earthing switch T1-Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1/1 A, GIS type current transformers SA - Three (3) single-phase outdoor surge arresters, GIS type Z1 - One (1) set of three phase indoor and outdoor GIB with three outdoor GIS/AIR bushings X - Control cabinet, cables, metal support structure, grounding, etc. and all accompariso for approximation. | Set | 4 |
| BG.3 | cessories for complete bay A complete indoor GIS Bus Coupler bay 145 kV, 3150A busbars / 3150 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: Q0 - One (1) set of three pole, GIS type, SF₆ gas circuit breaker with one spring-stored energy operating mechanism | Set | 1 |



| No. | Equipment | Unit | Qty. |
|-------|--|-------|------|
| | • Q1, Q2 - Two (2) set of three pole, three position, motor operated, insulated | | |
| | disconnector with earthing switch | | |
| | • T1-Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1/1 A, GIS | | |
| | type current transformers | | |
| | X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | | |
| BG.4 | A complete indoor GIS Metering bay 145 kV, 3150A busbars, 40 kA, 50Hz, | Set | 1 |
| | 650/275 kV BIL, equipped with: | | |
| | • Q21, Q22 - Two (2) set of three pole, three position, motor operated, insulated | | |
| | disconnector | | |
| | • T5 - Three (3) single-phase, 2-winding, 132/V3 / 110/V3 / 110/V3 kV/V/V, GIS | | |
| | type voltage transformers | | |
| | • X - Control cabinet, cables, metal support structure, grounding, etc. and all ac- | | |
| | cessories for complete bay | | |
| BG.5 | A complete indoor GIS Busbars Earthing bay 145 kV, 3150A busbars, 40 kA, | Set | 1 |
| | 50Hz, 650/275 kV BIL, equipped with: | | |
| | • Q81, Q82 - Two (2) set of three pole, make-proof, motor operated earthing | | |
| | switch | | |
| B5 | Surge arrester 145 kV, 120 kV continuous operating voltage, 10kA nominal dis- | Set | 36 |
| | charge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide | | |
| | | | |
| B6 | Post Insulator 132 kV, 50 Hz, 650/275 kV BIL, 10 kN | Set | 72 |
| B7.X | Conductors for double busbar system and for connection of the 132 kV switch- | Lot | 1 |
| | gear, 145 kV, 3150 & 2000 A & 1250 A, 40 kA | 1 - 4 | |
| B8.X | Insulators and fittings incl. all necessary clamps and connectors required for | Lot | 1 |
| | completing 132 kV switchgear | Lat | 1 |
| B9.X | Gantry steel structures and equipment supports required for completing 132 kV switchgear | Lot | I |
| B10.X | All other necessary material and equipment required for completing 132 kV | Lot | 1 |
| D10.A | switchgear. | LUI | I |
| С | 33 kV Switchgear, Equipment Connection and Steel Structures | | |
| | One (1) set of complete equipment for switchgear 33 kV shall be designed, sup- | Set | 1 |
| | plied, delivered, installed, tested and commissioned, under this contract, comprise | | |
| | the following: | | |
| C1 | Circuit Breaker 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, vacuum | Set | 4 |
| | type, for outdoor installation with one spring-stored energy operating mechanism | | |
| C2.1 | Disconnector 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre | Set | 7 |
| | break, post type, manually operated | | |
| C2.2 | Disconnector 36 kV, 100 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre | Set | 2 |
| | break, post type, manually operated, with integrated fuse of 10 A | | |
| C3.1 | Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, | Set | 12 |
| | 2000/1/1/1/1 A/A, 4-core, single ratio, post type | | |
| C3.2 | Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 10/1/1/1 | Set | 6 |
| | A/A, 3-core, single ratio, post type | | |
| C4 | Voltage transformer 36 kV, 50Hz, 170/70 kV BIL, single phase, 33/V3 / 110/V3 / | Set | 12 |
| | 110/V3 kV/V/V, 2 secondary windings, inductive type | | |



| No. | Equipment | Unit | Qty. |
|-------|---|------|------|
| C5 | Surge arrester 36 kV, 30 kV continuous operating voltage, 10 kA nominal dis- charge current, 50 Hz, single phase, gapless, metal oxide type | Set | 12 |
| C7.X | Conductors for single busbar system and for connection of the 33 kV switchgear, 36 kV, 2000 A & 630 A, 25 kA | Lot | 1 |
| C8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 33 kV switchgear | Lot | 1 |
| C9.X | Gantry steel structures and equipment supports required for completing 33 kV switchgear | Lot | 1 |
| C10.X | All other necessary material and equipment required for completing 33 kV switchgear. | Lot | 1 |
| D | Transformers | | |
| D2 | Power transformer 132/33 kV three phase 80/120 MVA, Dyn1, ONAN/ONAF | Set | 2 |
| D9 | Water Spray System | Set | 2 |
| D10.X | All other necessary material and equipment required for completing transformers | Lot | 1 |
| F | Earthing / Auxiliary Power Transformers | | |
| F1 | Earthing / Auxiliary Power Transformer 33/0.4 kV, three phase 200 kVA, Dyn11, ONAN | Set | 2 |
| F10.X | All other necessary material and equipment required for completing Earthing / Auxiliary Power transformers. | Lot | 1 |
| G | Control, Protection, SCADA System and Metering | | |
| | One (1) lot of complete equipment for control, protection, SCADA System and me- tering for 132, 33 kV as well as LV AC and LV DC system (for complete substa- tion) shall be designed, calculated, supplied, delivered, installed, tested and com- missioned, under this contract. The control and protection panels shall mirror the switchyard layout. Enough space shall be reserved for future circuits. The system comprise the following: | Lot | 1 |
| G1.1 | Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) | Set | 8 |
| G2.2 | Control, Protection and SAS set for 132/33 kV Power Transformer circuits | Set | 4 |
| G3.2 | Control, Protection and SAS set for Busbar 132 kV | Set | 1 |
| G4.X | Tariff metering panel(s) to accommodate programmable & recordable digital 3- phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for each line and transformer feeder. For each feeder, minimum two (2) meters (main- 1 & main-2) shall be provided | Lot | 1 |
| G5.X | Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders | Lot | 1 |
| G6.X | Tele-control & Tele-protection & Tele-metering facilities , A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut Bhaban, for integration of the complete substation. | Lot | 1 |



| No. | Equipment | Unit | Qty. |
|--------------|---|------------|------|
| | All required electrical signals shall be transmitted to the NLDC and the back-up sta- tion through the industrial gateway of the substation automation system. All HV cir- cuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5- 104 protocol. | | |
| G10.X | All other necessary material and equipment required for completing control, pro- tection, substation automation and metering system. | Lot | 1 |
| н | Fibre Optic Multiplexer Equipment for Teleprotection and Communication | | |
| H1.X H3.X | Fibre Optic Multiplexer Equipment, a complete lot of fibre optic multiplexer equipment for protection & communication at substation shall be designed, supplied, delivered, installed, tested and commissioned, under this contract. Fibre optic multiplexer equipment is to be provided for. Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay SCADA data from switchgear and control system VOIP system (2-IP Phone) 2-W remote subscriber (10 telephone sets) Hot-line telephone system A lot of underground optical fibre (48 cores) cables from terminal box at gantry | Lot Lot | 1 |
| | structure to MDF (Main distribution Frame) shall be designed, supplied, delivered, installed, tested and commissioned, including supply and installation of MDF and digital cables | | |
| I | Multicore Low Voltage Auxiliary Power and Control Cables | | |
| I1.X | A complete lot of multicore low voltage auxiliary power and control cables , in- cluding all other necessary material and equipment, between all items of equip- ment supplied under the contract shall be designed, supplied, delivered, installed, tested and commissioned | Lot | 1 |
| J | LV DC, Batteries, Chargers and DC Distribution | | |
| J1.X | A complete lot consists of two (2) sets of 110 V Ni-Cd batteries, complete with chargers and distribution switchboards, including all other necessary material and equipment, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide complete LV DC 110 V supplies for the substation. The system shall generally be as shown in the bid drawings and shall minimum include the following: (a) Two (2) sets of 100% Ni-Cd batteries, complete, each capacity shall not be less than 400 Ah at the 10-hour rate of discharge. (b) Two (2) sets of battery chargers complete, each float charge shall not be less than 400 A patient. | Lot | 1 |
| | less than 100 A rating. | | |
| J2.X | (c) One (1) set of DC distribution switchboards. A complete lot consists of two (2) sets of 48V Ni-Cd batteries, complete with chargers and distribution switchboards, including all other necessary material and equipment, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide complete LV DC 48 V supplies for fibre optic multiplexer equipment for control, protection metering and communication. | Lot | 1 |



| No. | Equipment | Unit | Qty. |
|-------|---|------|------|
| | The system shall generally be as shown in the bid drawings and shall minimum in- | | |
| | clude the following: | | |
| | (a) Two (2) sets of 100% Ni-Cd batteries, complete, each capacity shall not be less than 250 Ah at the 5-hour rate of discharge. | | |
| | (b) Two (2) sets of battery chargers complete, each float charge shall not be | | |
| | less than 50 A rating. | | |
| | (c) One (1) set of DC distribution switchboard. | | |
| К | LV AC Distribution | | |
| K1.X | A complete lot, including all necessary material and equipment, including a set of | Lot | 1 |
| | LV AC switchboards, shall be designed, supplied, delivered, installed, tested and | | |
| | commissioned, under this contract, to provide the LV AC 400/230V, 50 Hz auxiliary | | |
| | power supplies for the substation | | |
| | The system shall generally be as shown in the bid drawings and shall include one | | |
| | 125A outdoor weatherproof, 3-phase with neutral and earth switched socket outlet | | |
| | close to the power transformers | | |
| L | Civil Works, Control Building and Foundations | | |
| L1.X | One (1) lot of complete land development of complete switchyard area by cutting, | Lot | 1 |
| | land filling, compacting up to a suitable level. | | |
| | The approximate total area of the substation is 3 acres | | |
| L2.X | One (1) lot of complete design, supply and construction of outdoor civil works in- | Lot | 1 |
| | cluding 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment founda- | | |
| | tion, power transformers and auxiliary power transformers foundation, blast wall, | | |
| | substation main gate and guard house, security boundary wall and internal fencing, | | |
| | access road, internal roads and parking, concrete culvert, surface and switchyard | | |
| | drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing | | |
| L3.1X | One (1) lot of complete design, supply and construction of civil works and facilities | Lot | 1 |
| L3.17 | for one new three-storey GIS 132 kV and control building with cable basement, in- | LUI | I |
| | cluding foundation works, super structure works, finishing works like rendering, | | |
| | painting, water supply, sanitary, floor finishing, rain water drainage system, light- | | |
| | ning protection, etc. | | |
| L3.2X | One (1) lot of complete design, supply and construction of civil works and facilities | Lot | 1 |
| | for water supply including deep tube well for drinking water, pump house, pump, | | |
| | water reservoir, water pipe lines, etc., sewage facilities including septic tank, etc. | | |
| L4.X | One (1) lot of complete Pile load test | Lot | 1 |
| М | Building Lighting, Small Power, Air Conditioning and Ventilation | | |
| M1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, | Lot | 1 |
| | tested and commissioned, to provide lighting, LV power supply, air conditioning | | |
| | system, ventilation and emergency DC lighting for the substation control build- | | |
| | ing(s). | | |
| Ν | Switchyard Lighting | | |
| N1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, | Lot | 1 |
| | tested and commissioned, to provide switchyard lighting for security, roadway and | | |
| | switchyard and emergency DC lighting at strategic locations for equipment opera- | | |
| | tions and inspections. | | |



| No. | Equipment | Unit | Qty. |
|-------|---|------|------|
| Р | Earthing and Lightning Protection | | |
| P1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, of earthing system and lightning protection screen in- cluding connections, connectors and clamps, to suit the substation overall ar- rangement and provide supporting design calculations. | Lot | 1 |
| P2 | Two (2) sets of 3-phase portable (maintenance) earthing equipment devices with connectors and telescopic glass fibre operating stick suitable for each voltage | Set | 2 |
| Q | Cable connections | | |
| Q.2.2 | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three single phase XLPE cables with corresponding Cable End Terminals; with all required equipment; 145 kV, 1,000 A, 40 kA / 1 sec, 50 Hz, for connection of one 132 kV bay. Approximate lengths are 100 meters | Lot | 12 |
| Q3.1 | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three phase or three single phase cables and cable end terminal and correspondent equipment 36 kV, 800 A, 25 kA / 1 sec, 50 Hz. Approximate lengths are 20 meters | Lot | 4 |



1.2.2 Renovation / Upgrading of existing 132/33 kV AIS Substation Satkhira

132/33 kV Substation Satkhira is an existing substation.

Capacity upgrading of the substation shall be done by replacing one existing 132/33 kV power transformer (rated power 25/41 MVA) with one new 132/33 kV power transformers with a rated power of 80/120 MVA shall be done.

No new HV and MV equipment is required.

The control room has enough space. Auxiliary power supply is available.

The **scope of work** under this turnkey contract includes design, supply, delivery, installation, testing & commissioning of:

- one (1) three phase power transformers 132/33 kV, 80/120 MVA.
- design, supply, delivery, extension of existing equipment, installation, integration and connection of new equipment with existing equipment, testing & commissioning of associated substation control and monitoring system, relay protection, metering, telecommunication, AC & DC auxiliary power supply, cables, metal structure, earthing and lightning protection
 - extension of existing substation automation system/control & monitoring system
 - extension of existing relay protection
 - extension of existing telecommunication system
 - extension of existing AC & DC power supply
- complete outdoor civil works for the **required switchyard area**, including: power transformer foundation, blast wall and cable trench,
- complete civil works and facilities for **adaptation of existing** control building, **to accommodate the equipment which is in the scope of work**, including finishing works like rendering, painting, floor finishing, etc.,
- De-installation and transport of existing power transformer at the location chosen by PGCB no longer than 100 km
- The equipment to be supplied, installed and commissioned is shown on the bid drawings.

| No | Equipment | Unit | Qty. |
|-------|--|------|------|
| В | 132 kV switchgear, equipment connection and steel structures | | |
| | One (1) set of complete equipment for switchgear 132 kV shall be designed, sup- plied, delivered, installed, tested and commissioned, under this contract, com- prise the following: | Set | 1 |
| B5 | Surge arrester 145 kV, 120 kV continuous operating voltage, 10kA nominal dis- charge current, 50Hz, single phase, heavy duty, station class, gapless, metal ox- ide type | Set | 3 |
| B7.X | Conductors for connection of the 132 kV switchgear, 145 kV, 2000 A, 40 kA | Lot | 1 |
| B8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear | Lot | 1 |
| B9.X | Gantry steel structures and equipment supports required for completing 132 kV switchgear | Lot | 1 |
| B10.X | All other necessary material and equipment required for completing 132 kV switchgear. | Lot | 1 |



| No | Equipment | Unit | Qty. |
|-------|--|------|------|
| С | 33 kV Switchgear, equipment connection and steel structures | | |
| | One (1) set of complete equipment for switchgear 33 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 |
| C5 | Surge arrester 36 kV, 30 kV continuous operating voltage, 10 kA nominal dis- charge current, 50 Hz, single phase, gapless, metal oxide type | Set | 3 |
| C7.X | Conductors for connection of the 33 kV switchgear, 36 kV, 2000 A, 25 kA | Lot | 1 |
| C8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 33 kV switchgear | Lot | 1 |
| C9.X | Gantry steel structures and equipment supports required for completing 33 kV switchgear | Lot | 1 |
| C10.X | All other necessary material and equipment required for completing 33 kV switchgear. | Lot | 1 |
| D | Transformers | | |
| D2 | Power transformer 132/33 kV three phase 80/120 MVA, Dyn1, ONAN/ONAF | Set | 1 |
| D9 | Water Spray System | Set | 1 |
| D10.X | All other necessary material and equipment required for completing trans- formers | Lot | 1 |
| G | Control, Protection, SCADA System and Metering | | |
| | Extension of the existing Control, Protection, SCADA System and Metering | Lot | 1 |
| | New equipment shall be integrated into the existing system. | | |
| | One (1) lot of equipment for extension of the existing control, protection, SCADA System and metering for 132 as well as LV AC and LV DC system, for required part of substation, shall be designed, calculated, supplied, delivered, installed, tested and commissioned and integrated into the existing system , under this contract. | | |
| | The control and protection panels shall mirror the switchyard layout. | | |
| | Enough space shall be reserved for future circuits. | | |
| | The system comprise the following: | | |
| G1.1 | Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) | Set | 0 |
| G2.2 | Control, Protection and SAS set for 132/33 kV Power Transformer circuits | Set | 1 |
| G3.2 | Control, Protection and SAS set for Busbar 132 kV | Set | 0 |
| G4.XE | Extension of the existing Tariff Metering | Lot | 0 |
| | Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for | | |
| | each line and transformer feeder, for required part of substation. For each | | |
| G5.XE | feeder, minimum two (2) meters (main-1 & main-2) shall be provided Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, | Lot | 1 |
| | for required part of substation | | |
| G6.XE | Tele-control & Tele-protection & Tele-metering facilities, | Lot | 1 |
| | A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware | | |
| | and software of the master stations, shall be provided both at the National Load | | |



| No | Equipment | Unit | Qty. |
|-------|---|------|------|
| | Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut | | |
| | Bhaban, for integration of the required part of substation . | | |
| | All required electrical signals shall be transmitted to the NLDC and the back-up | | |
| | station through the industrial gateway of the substation automation system. All | | |
| | HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the | | |
| | NLDC through the gateway of the substation automation system using the IEC | | |
| | 60870-5-104 protocol. | | |
| G10.X | All other necessary material and equipment required for completing control, protection, substation automation and metering system. | Lot | 1 |
| н | Fibre Optic Multiplexer Equipment for Teleprotection and Communication | | |
| H1.XE | Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension | Lot | 1 |
| | of existing fibre optic multiplexer equipment for protection & communication, for | | |
| | required part of substation, shall be designed, supplied, delivered, installed, | | |
| | tested and commissioned and integrated into the existing system, under this | | |
| | contract. Fibre optic multiplexer equipment is to be provided for. | | |
| | Distance relay carrier signal (main and back-up) | | |
| | Bus protection / breaker failure relay | | |
| | SCADA data from switchgear and control system | | |
| | Hot-line telephone system | | |
| H3.XE | A lot of underground optical fibre (48 cores) cables from terminal box at gan- | Lot | 1 |
| | try structure to MDF (Main distribution Frame) shall be designed, supplied, deliv- | | |
| | ered, installed, tested and commissioned, including supply and installation of | | |
| | MDF and digital cables, for required part of substation | | |
| 1 | Multicore Low Voltage Auxiliary Power and Control Cables | | |
| I1.XE | A complete lot of multicore low voltage auxiliary power and control cables, | Lot | 1 |
| | including all other necessary material and equipment, between all items of | | |
| | equipment supplied under the contract, and connection and integration of | | |
| | new equipment with existing equipment, shall be designed, supplied, deliv- | | |
| | ered, installed, tested and commissioned | | |
| J | LV DC, Batteries, Chargers and DC Distribution | | |
| J1.XE | Extension of existing LV DC 110 V Auxiliary Power Supply | Lot | 1 |
| | A complete lot, including all necessary material and equipment, including a set of | | |
| | LV DC distribution switchboards, shall be designed, supplied, delivered, installed, | | |
| | tested and commissioned, under this contract, to provide extension of the exist- | | |
| | ing LV DC 110 V Auxiliary Power Supply and for connection of new equipment | | |
| | and integration with the existing equipment | | |
| J2.XE | Extension of existing LV DC 48 V Auxiliary Power Supply | Lot | 1 |
| | A complete lot, including all necessary material and equipment, including a set of | | |
| | LV DC distribution switchboards, shall be designed, supplied, delivered, installed, | | |
| | tested and commissioned, under this contract, to provide extension of the exist- | | |
| | ing LV DC 48 V auxiliary power supply system for fibre optic multiplexer equip- | | |
| | ment for control, protection metering and communication and for connection of | | |
| | new equipment and integration with the existing equipment | | |



| No | Equipment | Unit | Qty. |
|-------|--|------|------|
| к | LV AC Distribution | | |
| K1.XE | Extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system. | Lot | 1 |
| | A complete lot, including all necessary material and equipment, including a set of LV AC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system and for connection of new equipment and integration with the existing equipment | | |
| L | Civil Works, Control Building and Foundations | | |
| L2.XE | One (1) lot of complete design, supply and construction of outdoor civil works of required switchyard area , including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers foundation, blast wall, internal roads, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing and for connection of new equipment and integration with the existing equipment | Lot | 1 |
| L3.XE | One (1) lot of complete design, supply and construction of civil works and facili- ties for adaptation of the existing control building, including finishing works such as rendering, painting, floor finishing, etc. | Lot | 1 |
| N | Switchyard Lighting | | |
| N1.XE | One (1) lot of complete equipment for required switchyard area , shall be de- signed, supplied, delivered, installed, tested and commissioned, to provide ex- tension of the existing switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections and for connection of new equipment and integration with the existing equipment . | Lot | 1 |
| Р | Earthing and Lightning Protection | | |
| P1.XE | One (1) lot of complete equipment for required switchyard area , shall be de- signed, supplied, delivered, installed, tested and commissioned, to provide ex- tension of the existing earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations and for connection of new equip- ment and integration with the existing equipment . | Lot | 1 |



1.2.3 Renovation / New 132/33 kV GIS Substation Sylhet

The 132/33 kV Substation Sylhet is an existing substation that shall be completely renovated.

Several power plants are connected or will be connected in the near future at the substation.

The substation is also connected to some other substations by several transmission lines 132 kV.

The **scope of work** under this turnkey contract includes design, supply, delivery, installation, testing & commissioning of:

- 132 kV GIS Switchgear with thirteen bays and space for future extension by six bays, with:
 - 132 kV double busbar system
 - eight (8) 132 kV transmission line bays
 - four (4) 132 kV transformer bays
 - one (1) 132 kV bus coupler bay
- 132 kV cable connection of approximately 12 x 50-100 meters
- two (2) three phase power transformers 132/33 kV, 80/120 MVA.
- two (2) existing power transformer 132/33 kV, 80/120 MVA and 132/33 kV, 50/83 MVA shall be also connected to the new 132 kV GIS Switchgear
- Existing 33 kV AIS Switchgear has to be completely renovated with:
 - new 33 kV single busbar, divided at four sections by three disconnectors
 - four (4) 33 kV transformer (132/33 kV) bays
 - two (2) 33 kV auxiliary transformer bays
- two (2) three phase, 33/0.415 kV, 200 kVA, auxiliary power transformers
- 33 kV cable connection of approximately 4 x 20 meters
- SCADA Control for four (4) numbers of 33 kV shed feeders (BCU and panels)
- associated substation control and monitoring system, relay protection, metering, telecommunication, AC & DC auxiliary power supply, cables, metal structure, earthing and lightning protection.
- land development of complete switchyard area by cutting, land filling, compacting up to a suitable level including slope protection. The approximate total required area of the substation is 3 acres.
- complete outdoor civil works, including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformer and auxiliary transformer foundations, blast wall, substation main gate and guard house, internal security boundary wall and internal fencing, internal roads, parking and storage place, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing
- Complete civil works and facilities for new GIS 132 kV and control buildings with cable basement, including foundation works, super structure works, finishing works like rendering, painting, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipe lines, etc., sewage facilities including septic tank, etc.
- **De-installation and transport of existing power transformers** at the location chosen by PGCB no longer than 100 km
- The existing control building shall remain on the same position.
- The existing warehouse and water pump shall be removed and new warehouse and water pump shall be provided under the scope of the project
- The existing Switchgear has to be completely dismantled and stored at the storage place, the area has to be cultivated and not used equipment and material has to be removed



| No | Equipment | Unit | Qty. |
|------|---|------|------|
| В | 132 kV switchgear, equipment connection and steel structures | | |
| | One (1) set of complete equipment for switchgear 132 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 |
| BG.1 | A complete indoor and partly outdoor GIS Line feeder 145 kV, 3150 A busbars / 2000 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: Q0 - One (1) set of three pole, GIS type, SF₆ gas circuit breaker with three spring-stored energy operating mechanism Q1, Q2, Q9 - Three (3) sets of three pole, three positions, motor operated, in-sulated disconnector with earthing switch Q8 - One (1) set of three pole, make-proof, motor operated earthing switch T1-Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1/1 A, GIS type current transformers T5 - Three (3) single-phase, 2-secondary winding, 132/V3 / 110/V3 / 110/V3 kV/V/V, GIS type voltage transformers T6 - One (1) set of three-phase, GIS type, hand operated disconnector link SA - Three (3) single-phase outdoor surge arresters, GIS type Z1 - One (1) set of three phase indoor and outdoor GIB with three outdoor GIS/AIR bushings GIS.X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | Set | 8 |
| BG.2 | A complete indoor and partly outdoor GIS Transformer feeder 145 kV, 3150A busbars / 2000 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: Q0 - One (1) set of three pole, GIS type, SF₆ gas circuit breaker with one spring-stored energy operating mechanism Q1, Q2, Q9 - Three (3) set of three pole, three position, motor operated, insulated disconnector with earthing switch Q8 - One (1) set of three pole, make-proof, motor operated earthing switch T1-Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1/1 A, GIS type current transformers SA - Three (3) single-phase outdoor surge arresters, GIS type Z1 - One (1) set of three phase, GIS type, cable compartment or Z2 - One (1) set of three phase indoor and outdoor GIB with three outdoor GIS/AIR bushings X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | Set | 4 |
| BG.3 | A complete indoor GIS Bus Coupler bay 145 kV, 3150A busbars / 3150 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: Q0 - One (1) set of three pole, GIS type, SF₆ gas circuit breaker with one spring-stored energy operating mechanism Q1, Q2 - Two (2) set of three pole, three position, motor operated, insulated disconnector with earthing switch | Set | 1 |



| No | Equipment | Unit | Qty. |
|--------------|--|------------|------|
| | • T1-Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1/1 A, GIS | | |
| | type current transformers | | |
| | X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | | |
| BG.4 | A complete indoor GIS Metering bay 145 kV, 3150A busbars, 40 kA, 50Hz, | Set | 1 |
| | 650/275 kV BIL, equipped with: | | |
| | • Q21, Q22 - Two (2) set of three pole, three position, motor operated, insulated | | |
| | disconnector | | |
| | T5 - Three (3) single-phase, 2-winding, 132/V3 / 110/V3 / 110/V3 kV/V/V, GIS | | |
| | type voltage transformers X - Control cabinet, cables, metal support structure, grounding, etc. and all | | |
| | accessories for complete bay | | |
| BG.5 | A complete indoor GIS Busbars Earthing bay 145 kV, 3150A busbars, 40 kA, | Set | 1 |
| | 50Hz, 650/275 kV BIL, equipped with: | | |
| | • Q81, Q82 - Two (2) set of three pole, make-proof, motor operated earthing | | |
| | switch | | |
| B6 | Post Insulator 132 kV, 50 Hz, 650/275 kV BIL, 10 kN | Set | 72 |
| B7.X B8.X | Conductors for connection of the 132 kV switchgear, 145 kV, 2000 A, 40 kA Insulators and fittings incl. all necessary clamps and connectors required for | Lot Lot | 1 |
| D0.X | completing 132 kV switchgear | LOI | 1 |
| B9.X | Gantry steel structures and equipment supports required for completing | Lot | 1 |
| | 132 kV switchgear | | |
| B10.X | All other necessary material and equipment required for completing 132 kV | Lot | 1 |
| | switchgear. | | |
| С | 33 kV Switchgear, equipment connection and steel structures | | |
| | One (1) set of complete equipment for switchgear 33 kV shall be designed, sup- | Set | 1 |
| | plied, delivered, installed, tested and commissioned, under this contract, comprise | | |
| | the following: | 0.1 | |
| C1 | Circuit Breaker 36 kV, 2000 A , 25 kA, 50 Hz, 170/70 kV BIL, three pole, vacuum type, for outdoor installation with one spring-stored energy operating mechanism | Set | 4 |
| C2.1 | Disconnector 36 kV, 2000 A , 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre | Set | 7 |
| 02 | break, post type, manually operated | ••• | |
| C2.2 | Disconnector 36 kV, 100 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre | Set | 2 |
| | break, post type, manually operated, with integrated fuse of 10 A | | |
| C3.1 | Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 2000 /1/1/1/1 A/A, 4-core, single ratio, post type | Set | 12 |
| C3.2 | Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 10/1/1/1 | Set | 6 |
| | A/A, 3-core, single ratio, post type | | |
| C4 | Voltage transformer 36 kV, 50Hz, 170/70 kV BIL, single phase, 33/V3 / 110/V3 / | Set | 12 |
| | 110/V3 kV/V/V, 2 secondary windings, inductive type | 0-1 | 40 |
| C5 | Surge arrester 36 kV, 30 kV continuous operating voltage, 10 kA nominal dis- charge current, 50 Hz, single phase, gapless, metal oxide type | Set | 12 |
| C7.X | Conductors for single busbar system and for connection of the 33 kV switchgear, | Lot | 1 |
| 01.7 | 36 kV, 2000 A & 630 A, 25 kA | 201 | |
| C8.X | Insulators and fittings incl. all necessary clamps and connectors required for | Lot | 1 |
| | completing 33 kV switchgear | | |



| No | Equipment | Unit | Qty. |
|-------|--|------|------|
| C9.X | Gantry steel structures and equipment supports required for completing 33 kV switchgear | Lot | 1 |
| C10.X | All other necessary material and equipment required for completing 33 kV switchgear. | Lot | 1 |
| D | Transformers | | |
| D2 | Power transformer 132/33 kV three phase 80/120 MVA, Dyn1, ONAN/ONAF | Set | 2 |
| D9 | Water Spray System | Set | 2 |
| D10.X | All other necessary material and equipment required for completing trans- formers | Lot | 1 |
| F | Earthing / Auxiliary Power Transformers | | |
| F1 | Earthing / Auxiliary Power Transformer 33/0.4 kV, three phase 200 kVA, Dyn11, ONAN | Set | 2 |
| F10.X | All other necessary material and equipment required for completing Earthing / Auxiliary Power transformers. | Lot | 1 |
| G | Control, Protection, SCADA System and Metering | | |
| | One (1) lot of complete equipment for control, protection, SCADA System and metering for 132, 33 kV as well as LV AC and LV DC system (for complete sub- station) shall be designed, calculated, supplied, delivered, installed, tested and commissioned, under this contract. The control and protection panels shall mirror the switchyard layout. | Lot | 1 |
| | Enough space shall be reserved for future circuits. | | |
| | The system comprise the following: | | |
| G1.1 | Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) | Set | 8 |
| G2.2 | Control, Protection and SAS set for 132/33 kV Power Transformer circuits | Set | 4 |
| G3.2 | Control, Protection and SAS set for Busbar 132 kV | Set | 1 |
| G4.X | Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for each line and transformer feeder. For each feeder, minimum two (2) meters (main-1 & main-2) shall be provided | Lot | 1 |
| G5.X | Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders | Lot | 1 |
| G6.X | Tele-control & Tele-protection & Tele-metering facilities, | Lot | 1 |
| | A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut Bhaban, for integration of the complete substation. All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5-104 protocol. | | |
| G10.X | All other necessary material and equipment required for completing control, protection, substation automation and metering system. | Lot | 1 |



| No | Equipment | Unit | Qty. |
|------|---|------|------|
| н | Fibre Optic Multiplexer Equipment for Teleprotection and Communication | | |
| H1.X | Fibre Optic Multiplexer Equipment, a complete lot of fibre optic multiplexer equipment for protection & communication at substation shall be designed, supplied, delivered, installed, tested and commissioned, under this contract. Fibre optic multiplexer equipment is to be provided for. Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay SCADA data from switchgear and control system VOIP system (2-IP Phone) 2-W remote subscriber (10 telephone sets) Hot-line telephone system | Lot | 1 |
| H3.X | A lot of underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame) shall be designed, supplied, delivered, installed, tested and commissioned, including supply and installation of MDF and digital cables | Lot | 1 |
| I | Multicore Low Voltage Auxiliary Power and Control Cables | | |
| I1.X | A complete lot of multicore low voltage auxiliary power and control cables , including all other necessary material and equipment, between all items of equipment supplied under the contract shall be designed, supplied, delivered, in- stalled, tested and commissioned | Lot | 1 |
| J | LV DC, Batteries, Chargers and DC Distribution | | |
| J1.X | A complete lot consists of two (2) sets of 110 V Ni-Cd batteries, complete with chargers and distribution switchboards, including all other necessary material and equipment, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide complete LV DC 110 V supplies for the substation. The system shall generally be as shown in the bid drawings and shall minimum include the following: (a) Two (2) sets of 100% Ni-Cd batteries, complete, each capacity shall not be less than 400 Ah at the 10-hour rate of discharge. | Lot | 1 |
| | (b) Two (2) sets of battery chargers complete, each float charge shall not be less than 100 A rating. | | |
| J2.X | (c) One (1) set of DC distribution switchboards. A complete lot consists of two (2) sets of 48V Ni-Cd batteries, complete with chargers and distribution switchboards, including all other necessary material and equipment, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide complete LV DC 48 V supplies for fibre optic multiplexer equipment for control, protection metering and communication. The system shall generally be as shown in the bid drawings and shall minimum include the following: (a) Two (2) sets of 100% Ni-Cd batteries, complete, each capacity shall not be less than 250 Ah at the 5-hour rate of discharge. (b) Two (2) sets of battery chargers complete, each float charge shall not be less than 50 A rating. | Lot | 1 |



| No | Equipment | Unit | Qty. |
|-------|--|------|------|
| к | LV AC Distribution | | |
| K1.X | A complete lot, including all necessary material and equipment, including a set of LV AC switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide the LV AC 400/230V, 50 Hz auxiliary power supplies for the substation The system shall generally be as shown in the bid drawings and shall include one 125A outdoor weatherproof, 3-phase with neutral and earth switched socket outlet close to the power transformers | Lot | 1 |
| L | Civil Works, Control Building and Foundations | | |
| L1.X | One (1) lot of complete land development of complete switchyard area by cutting, land filling, compacting up to a suitable level. The approximate total area of the substation is 3 acres | Lot | 1 |
| L2.X | One (1) lot of complete design, supply and construction of outdoor civil works in- cluding 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foun- dation, power transformers and auxiliary power transformers foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing | Lot | 1 |
| L3.1X | One (1) lot of complete design, supply and construction of civil works and facili- ties for one new three-storey GIS 132 kV and control building with cable base- ment, including foundation works, super structure works, finishing works like ren- dering, painting, water supply, sanitary, floor finishing, rain water drainage sys- tem, lightning protection, etc. | Lot | 1 |
| L3.2X | One (1) lot of complete design, supply and construction of civil works and facili- ties for one new warehouse, including foundation works, super structure works, finishing works like rendering, painting, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, etc. | Lot | 1 |
| L3.3X | One (1) lot of complete design, supply and construction of civil works and facili- ties for water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipe lines, etc., sewage facilities including septic tank, etc. | Lot | 1 |
| L4.X | One (1) lot of complete Pile load test | Lot | 1 |
| м | Building Lighting, Small Power, Air Conditioning and Ventilation | | |
| M1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, in- stalled, tested and commissioned, to provide lighting, LV power supply, air condi- tioning system, ventilation and emergency DC lighting for the substation control building(s). | Lot | 1 |
| Ν | Switchyard Lighting | | |
| N1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, in- stalled, tested and commissioned, to provide switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections. | Lot | 1 |



| No | Equipment | Unit | Qty. |
|-------|---|------|------|
| Р | Earthing and Lightning Protection | | |
| P1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, in- stalled, tested and commissioned, of earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation over- all arrangement and provide supporting design calculations. | Lot | 1 |
| P2 | Two (2) sets of 3-phase portable (maintenance) earthing equipment devices with connectors and telescopic glass fibre operating stick suitable for each voltage | Set | 2 |
| Q | Cable connections | | |
| Q.2.2 | One (1) lot of complete equipment shall be designed, supplied, delivered, in- stalled, tested and commissioned of three single phase XLPE cables with corre- sponding Cable End Terminals; with all required equipment; 145 kV, 1,000 A, 40 kA / 1 sec, 50 Hz, for connection of one 132 kV bay. Approximate lengths are 50 to 100 meters | Lot | 12 |
| Q3.1 | One (1) lot of complete equipment shall be designed, supplied, delivered, in- stalled, tested and commissioned of three phase or three single phase cables and cable end terminal and correspondent equipment 36 kV, 800 A, 25 kA / 1 sec, 50 Hz. Approximate lengths are 20 meters | Lot | 4 |



1.2.4 Extension of Existing 132/33 kV AIS Substation Bhandaria

The existing 132/33 kV AIS Substation Bhandaria shall be connected by a new 132 kV double-circuit transmission line to the existing 230/132 kV AIS Substation Barisal North (Approximate distance between the two substations is 45.000 m).

The **scope of work** under this turnkey contract includes design, supply, delivery, installation, testing & commissioning of:

Extension of the existing 132/33 kV AIS Substation Bhandaria for two new 132 kV AIS transmission line bays.

The control room has enough space. Auxiliary power supply is available.

The **scope of work** under this turnkey contract is design, supply, delivery, installation, testing & commissioning of:

- two (2) 132 kV AIS transmission line bays
- 132 kV cable connection of approximately 2 x 100 meters
 - Because of limited space, two new transmission lines shall be connected at the two new gantries on opposite side of the existing power transformers bays.
 - First part of two new transmission line bays shall be installed on that place (Surge Arresters, Voltage transformers and Outgoing Disconnectors).
 - After that, both new transmission line bays shall be transferred by 132 kV cables on other side of the switchyard, on two new transmission line bays. Second part of the two new transmission line bays shall be installed there.
 - Two new transmission line bays shall be connected to the main busbars on the same place where two existing transmission lines are already connected
 - Two new transmission line bays shall be connected to the new part of Auxiliary busbars, which shall be installed on opposite side
 - Finally, existing Auxiliary busbars and new Auxiliary busbars shall be connected by 132 kV cable.
- design, supply, delivery, extension of existing equipment, installation, integration and connection of new equipment with existing equipment, testing & commissioning of associated substation control and monitoring system, relay protection, metering, telecommunication, AC & DC auxiliary power supply, cables, metal structure, earthing and lightning protection
 - extension of existing substation automation system/control & monitoring system
 - extension of existing relay protection
 - extension of existing telecommunication system
 - extension of existing AC & DC power supply
- land development of the complete **required switchyard area** by cutting, land filling, compacting up to a suitable level.
- complete outdoor civil works for the **required switchyard area**, including 132 kV gantry foundation, 132 kV equipment foundation, internal roads, concrete culvert, surface and switchyard drainage system, cable trench, PVC pipes etc., switchyard surface finishing and gravel surfacing,
- complete civil works and facilities for adaptation of existing control building, to accommodate the equipment, which is in the scope of work, including finishing works like rendering, painting, floor finishing, etc.



| No | Equipment | Unit | Qty. |
|------|---|------|------|
| в | 132 kV switchgear, equipment connection and steel structures | | |
| | One (1) set of complete equipment for switchgear 132 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 |
| B1.1 | Circuit Breaker 145 kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF ₆ gas, with three spring-stored energy operating mechanism | Set | 0 |
| B1.2 | Circuit Breaker 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF ₆ gas, with three spring-stored energy operating mechanism | Set | 2 |
| B1.3 | Circuit Breaker 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF ₆ gas, with three spring-stored energy operating mechanism | Set | 0 |
| B1.4 | Circuit Breaker 145 kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 |
| B1.5 | Circuit Breaker 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 |
| B1.6 | Circuit Breaker 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 |
| B2.1 | Disconnector with Earthing Switch 145 kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor- operated earthing switch | Set | 0 |
| B2.2 | Disconnector with Earthing Switch 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor- operated earthing switch | Set | 2 |
| B2.3 | Disconnector with Earthing Switch 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor- operated earthing switch | Set | 0 |
| B2.4 | Disconnector 145 kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 0 |
| B2.5 | Disconnector 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 6 |
| B2.6 | Disconnector 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 0 |
| B3.1 | Current transformer 145 kV, 40kA, 50Hz, 650/275 kV BIL, single phase, 4000- 2000/1/1/1/1/1 A/A, 5-core, multi ratio, post type | Set | 0 |
| B3.2 | Current transformer 145 kV, 40kA, 50Hz, 650/275 kV BIL, single phase, 2000- 1000/1/1/1/1/1 A/A, 5-core, multi ratio, post type | Set | 6 |
| B4 | Voltage transformer 145 kV, 50Hz, 650/275 kV BIL, single phase, 132/V3 / 110/V3 / 110/V3 kV/V/V, 2 secondary windings, capacitor type | Set | 6 |
| B5 | Surge arrester 145 kV, 120 kV continuous operating voltage, 10kA nominal dis- charge current, 50Hz, single phase, heavy duty, station class, gapless, metal ox- ide type | Set | 6 |
| B7.X | Conductors for busbar system and for connection of the 132 kV switchgear, 145 kV, 3150 & 2000 A, 40 kA | Lot | 1 |
| B8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear | Lot | 1 |
| B9.X | Gantry steel structures and equipment supports required for completing 132 kV switchgear | Lot | 1 |



| No | Equipment | Unit | Qty. |
|-------|---|------|------|
| B10.X | All other necessary material and equipment required for completing 132 kV switchgear. | Lot | 1 |
| G | Control, Protection, SCADA System and Metering | | |
| | Extension of the existing Control, Protection, SCADA System and Metering | Lot | 1 |
| | New equipment shall be integrated into the existing system. | | |
| | One (1) lot of equipment for extension of the existing control, protection, | | |
| | SCADA System and metering for 132 as well as LV AC and LV DC system, for | | |
| | required part of substation, shall be designed, calculated, supplied, delivered, | | |
| | installed, tested and commissioned and integrated into the existing system, | | |
| | under this contract. | | |
| | The control and protection panels shall mirror the switchyard layout. | | |
| | Enough space shall be reserved for future circuits. | | |
| | The system comprise the following: | | |
| G1.1 | Control, Protection and SAS set for 132 kV Overhead Line circuit, (including | Set | 2 |
| | the other end) | | |
| G2.2 | Control, Protection and SAS set for 132/33 kV Power Transformer circuits | Set | 0 |
| G3.2 | Control, Protection and SAS set for Busbar 132 kV | Set | 0 |
| G4.XE | Extension of the existing Tariff Metering | Lot | 1 |
| | Tariff metering panel(s) to accommodate programmable & recordable digital 3- | | |
| | phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for | | |
| | each line and transformer feeder, for required part of substation. For each | | |
| | feeder, minimum two (2) meters (main-1 & main-2) shall be provided | | |
| G5.XE | Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, | Lot | 1 |
| | for required part of substation | | |
| G6.XE | Tele-control & Tele-protection & Tele-metering facilities, | Lot | 1 |
| | A complete lot of hardware and software, extension of the existing equipment, | | |
| | necessary adjustment, adaptation, modification, integration and configuration of | | |
| | new and existing equipment, all necessary modification works in the hardware | | |
| | and software of the master stations, shall be provided both at the National Load | | |
| | Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut | | |
| | Bhaban, for integration of the required part of substation. | | |
| | All required electrical signals shall be transmitted to the NLDC and the back-up | | |
| | station through the industrial gateway of the substation automation system. All | | |
| | HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the | | |
| | NLDC through the gateway of the substation automation system using the IEC | | |
| | 60870-5-104 protocol. | | |
| G10.X | All other necessary material and equipment required for completing control, | Lot | 1 |
| | protection, substation automation and metering system. | | |
| н | Fibre Optic Multiplexer Equipment for Teleprotection and Communication | | |
| H1.XE | Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension | Lot | 1 |
| | of existing fibre optic multiplexer equipment for protection & communication, for | | • |
| | required part of substation, shall be designed, supplied, delivered, installed, | | |
| | tested and commissioned and integrated into the existing system, under this | | |
| | contract. Fibre optic multiplexer equipment is to be provided for. | | |
| | Distance relay carrier signal (main and back-up) | | |
| | Bus protection / breaker failure relay | | |



| No | Equipment | Unit | Qty. |
|-------|---|------|------|
| | SCADA data from switchgear and control system | | |
| | Hot-line telephone system | | |
| H3.XE | A lot of underground optical fibre (48 cores) cables from terminal box at gan- | Lot | 1 |
| | try structure to MDF (Main distribution Frame) shall be designed, supplied, deliv- | | |
| | ered, installed, tested and commissioned, including supply and installation of | | |
| | MDF and digital cables, for required part of substation | | |
| I. | Multicore Low Voltage Auxiliary Power and Control Cables | | |
| I1.XE | A complete lot of multicore low voltage auxiliary power and control cables, | Lot | 1 |
| | including all other necessary material and equipment, between all items of | | |
| | equipment supplied under the contract, and connection and integration of | | |
| | new equipment with existing equipment, shall be designed, supplied, deliv- | | |
| | ered, installed, tested and commissioned | | |
| J | LV DC, Batteries, Chargers and DC Distribution | | |
| J1.XE | Extension of existing LV DC 110 V Auxiliary Power Supply | Lot | 1 |
| | A complete lot, including all necessary material and equipment, including a set of | | |
| | LV DC distribution switchboards, shall be designed, supplied, delivered, in- | | |
| | stalled, tested and commissioned, under this contract, to provide extension of | | |
| | the existing LV DC 110 V Auxiliary Power Supply and for connection of new | | |
| | equipment and integration with the existing equipment | | |
| J2.XE | Extension of existing LV DC 48 V Auxiliary Power Supply | Lot | 1 |
| | A complete lot, including all necessary material and equipment, including a set of | | |
| | LV DC distribution switchboards, shall be designed, supplied, delivered, in- | | |
| | stalled, tested and commissioned, under this contract, to provide extension of the existing LV DC 48 V auxiliary power supply system for fibre optic multiplexer | | |
| | equipment for control, protection metering and communication and for connec- | | |
| | tion of new equipment and integration with the existing equipment | | |
| к | LV AC Distribution | | |
| K1.XE | Extension of the existing LV AC 400/230 V 50 Hz auxiliary power | Lot | 1 |
| | supply system. | | |
| | A complete lot, including all necessary material and equipment, including a set of | | |
| | LV AC distribution switchboards, shall be designed, supplied, delivered, installed, | | |
| | tested and commissioned, under this contract, to provide extension of the exist- | | |
| | ing LV AC 400/230 V 50 Hz auxiliary power supply system and for connection | | |
| | of new equipment and integration with the existing equipment | | |
| L | Civil Works, Control Building and Foundations | | |
| L2.XE | One (1) lot of complete design, supply and construction of outdoor civil works of | Lot | 1 |
| | required switchyard area, including 132 kV gantry foundation, 132 kV equip- | | |
| | ment foundation, internal roads, surface and switchyard drainage system includ- | | |
| | ing outfall, cable trench including soak pit, PVC pipes etc., switchyard surface | | |
| | finishing and gravel surfacing and for connection of new equipment and inte- | | |
| | gration with the existing equipment | | |
| L3.XE | One (1) lot of complete design, supply and construction of civil works and facili- | Lot | 1 |
| | ties for adaptation of the existing control building, including finishing works | | |
| | such as rendering, painting, floor finishing, etc. | | |



| No | Equipment | Unit | Qty. |
|-------|---|------|------|
| N | Switchyard Lighting | | |
| N1.XE | One (1) lot of complete equipment for required switchyard area , shall be de- signed, supplied, delivered, installed, tested and commissioned, to provide ex- tension of the existing switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections and for connection of new equipment and integration with the existing equipment . | Lot | 1 |
| Р | Earthing and Lightning Protection | | |
| P1.XE | One (1) lot of complete equipment for required switchyard area , shall be de- signed, supplied, delivered, installed, tested and commissioned, to provide ex- tension of the existing earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations and for connection of new equip- ment and integration with the existing equipment . | Lot | 1 |
| Q | Cable connections | | |
| Q.2.2 | One (1) lot of complete equipment shall be designed, supplied, delivered, in- stalled, tested and commissioned of three single phase XLPE cables with corre- sponding Cable End Terminals; with all required equipment; 145 kV, 1,000 A, 40 kA / 1 sec, 50 Hz, for connection of one 132 kV bay. Approximate lengths are 100 meters | Lot | 2 |



The existing 230/132 kV Substation Barisal North shall be connected by a new 132 kV double-circuit transmission line to the existing 132/33 kV AIS Substation Bhandaria (approximate distance between the two substations is 45.000 m).

The **scope of work** under this turnkey contract includes design, supply, delivery, installation, testing & commissioning of:

Extension of the existing 230/132 kV Substation Barisal North for two new 132 kV AIS transmission line bays.

The control room has enough space. Auxiliary power supply is available.

The **scope of work** under this turnkey contract is design, supply, delivery, installation, testing & commissioning of:

- two (2) 132 kV AIS transmission line bays
- design, supply, delivery, extension of existing equipment, installation, integration and connection of new equipment with existing equipment, testing & commissioning of associated substation control and monitoring system, relay protection, metering, telecommunication, AC & DC auxiliary power supply, cables, metal structure, earthing and lightning protection
 - extension of existing substation automation system/control & monitoring system
 - extension of existing relay protection
 - extension of existing telecommunication system
 - extension of existing AC & DC power supply
- land development of the complete **required switchyard area** by cutting, land filling, compacting up to a suitable level.
- complete outdoor civil works for the **required switchyard area**, including 132 kV gantry foundation, 132 kV equipment foundation, internal roads, concrete culvert, surface and switchyard drainage system, cable trench, PVC pipes etc., switchyard surface finishing and gravel surfacing,
- complete civil works and facilities for adaptation of existing control building, to accommodate the equipment, which is in the scope of work, including finishing works like rendering, painting, floor finishing, etc.

| No | Equipment | Unit | Qty. |
|------|--|------|------|
| В | 132 kV switchgear, equipment connection and steel structures | | |
| | One (1) set of complete equipment for switchgear 132 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 |
| B1.1 | Circuit Breaker 145 kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF_6 gas, with three spring-stored energy operating mechanism | Set | 0 |
| B1.2 | Circuit Breaker 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF ₆ gas, with three spring-stored energy operating mechanism | Set | 2 |
| B1.3 | Circuit Breaker 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF_6 gas, with three spring-stored energy operating mechanism | Set | 0 |



| No | Equipment | Unit | Qty. |
|-------|--|------|------|
| B1.4 | Circuit Breaker 145 kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 |
| B1.5 | Circuit Breaker 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 |
| B1.6 | Circuit Breaker 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 |
| B2.1 | Disconnector with Earthing Switch 145 kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch | Set | 0 |
| B2.2 | Disconnector with Earthing Switch 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch | Set | 2 |
| B2.3 | Disconnector with Earthing Switch 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with mo- tor-operated earthing switch | Set | 0 |
| B2.4 | Disconnector 145 kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 0 |
| B2.5 | Disconnector 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 4 |
| B2.6 | Disconnector 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 0 |
| B3.1 | Current transformer 145 kV, 40kA, 50Hz, 650/275 kV BIL, single phase, 4000-2000/1/1/1/1 A/A, 5-core, multi ratio, post type | Set | 0 |
| B3.2 | Current transformer 145 kV, 40kA, 50Hz, 650/275 kV BIL, single phase, 2000- 1000/1/1/1/1 A/A, 5-core, multi ratio, post type | Set | 6 |
| B4 | Voltage transformer 145 kV, 50Hz, 650/275 kV BIL, single phase, 132/V3 / 110/V3 / 110/V3 kV/V/V, 2 secondary windings, capacitor type | Set | 6 |
| B5 | Surge arrester 145 kV, 120 kV continuous operating voltage, 10kA nominal dis- charge current, 50Hz, single phase, heavy duty, station class, gapless, metal ox- ide type | Set | 6 |
| B7.X | Conductors for busbar system and for connection of the 132 kV switchgear, 145 kV, 3150 & 2000 A, 40 kA | Lot | 1 |
| B8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear | Lot | 1 |
| B9.X | Gantry steel structures and equipment supports required for completing 132 kV switchgear | Lot | 1 |
| B10.X | All other necessary material and equipment required for completing 132 kV switchgear. | Lot | 1 |
| G | Control, Protection, SCADA System and Metering | | |
| | Extension of the existing Control, Protection, SCADA System and MeteringNew equipment shall be integrated into the existing system.One (1) lot of equipment for extension of the existing control, protection, SCADA System and metering for 132 as well as LV AC and LV DC system, for required part of substation, shall be designed, calculated, supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract.The control and protection panels shall mirror the switchyard layout. | Lot | 1 |



| No | Equipment | Unit | Qty. |
|-------|---|------|------|
| | Enough space shall be reserved for future circuits. | | |
| | The system comprise the following: | | |
| G1.1 | Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) | Set | 2 |
| G2.2 | Control, Protection and SAS set for 132/33 kV Power Transformer circuits | Set | 0 |
| G3.2 | Control, Protection and SAS set for Busbar 132 kV | Set | 0 |
| G4.XE | Extension of the existing Tariff Metering | Lot | 1 |
| | Tariff metering panel(s) to accommodate programmable & recordable digital 3- | | |
| | phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) | | |
| | for each line and transformer feeder, for required part of substation. For each | | |
| | feeder, minimum two (2) meters (main-1 & main-2) shall be provided | | |
| G5.XE | Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, for required part of substation | Lot | 1 |
| G6.XE | Tele-control & Tele-protection & Tele-metering facilities, | Lot | 1 |
| | A complete lot of hardware and software, extension of the existing equipment, | | |
| | necessary adjustment, adaptation, modification, integration and configuration of | | |
| | new and existing equipment, all necessary modification works in the hardware | | |
| | and software of the master stations, shall be provided both at the National Load | | |
| | Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut | | |
| | Bhaban, for integration of the required part of substation. | | |
| | All required electrical signals shall be transmitted to the NLDC and the back-up | | |
| | station through the industrial gateway of the substation automation system. All | | |
| | HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from | | |
| | the NLDC through the gateway of the substation automation system using the | | |
| | IEC 60870-5-104 protocol. | | |
| G10.X | All other necessary material and equipment required for completing control, protection, substation automation and metering system. | Lot | 1 |
| н | Fibre Optic Multiplexer Equipment for Teleprotection and Communication | | |
| H1.XE | Fibre Optic Multiplexer Equipment, a complete lot of equipment for exten- | Lot | 1 |
| | sion of existing fibre optic multiplexer equipment for protection & communica- | | |
| | tion, for required part of substation, shall be designed, supplied, delivered, in- | | |
| | stalled, tested and commissioned and integrated into the existing system, | | |
| | under this contract. Fibre optic multiplexer equipment is to be provided for. | | |
| | Distance relay carrier signal (main and back-up) | | |
| | Bus protection / breaker failure relay | | |
| | SCADA data from switchgear and control system | | |
| | Hot-line telephone system | | |
| H3.XE | A lot of underground optical fibre (48 cores) cables from terminal box at gan- | Lot | 1 |
| | try structure to MDF (Main distribution Frame) shall be designed, supplied, de- | | |
| | livered, installed, tested and commissioned, including supply and installation of | | |
| | MDF and digital cables, for required part of substation Multicore Low Voltage Auxiliary Power and Control Cables | | |
| | A complete lot of multicore low voltage auxiliary power and control cables, | Lot | 1 |
| I1.XE | including all other necessary material and equipment, between all items of | Lot | |
| | equipment supplied under the contract, and connection and integration of | | |
| | new equipment with existing equipment, shall be designed, supplied, deliv- | | |
| | ered, installed, tested and commissioned | | |



| No | Equipment | Unit | Qty. |
|-------|---|------|------|
| J | LV DC, Batteries, Chargers and DC Distribution | | |
| J1.XE | Extension of existing LV DC 110 V Auxiliary Power Supply A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, in- stalled, tested and commissioned, under this contract, to provide extension of the existing LV DC 110 V Auxiliary Power Supply and for connection of new equipment and integration with the existing equipment | Lot | 1 |
| J2.XE | Extension of existing LV DC 48 V Auxiliary Power Supply A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV DC 48 V auxiliary power supply system for fibre optic multiplexer equipment for control, protection metering and communication and for connection of new equipment and integration with the existing equipment | Lot | 1 |
| к | LV AC Distribution | | |
| K1.XE | Extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system. A complete lot, including all necessary material and equipment, including a set of LV AC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system and for connection of new equipment and integration with the existing equipment | Lot | 1 |
| L | Civil Works, Control Building and Foundations | | |
| L2.XE | One (1) lot of complete design, supply and construction of outdoor civil works of required switchyard area , including 132 kV gantry foundation, 132 kV equipment foundation, internal roads, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing and for connection of new equipment and integration with the existing equipment | Lot | 1 |
| L3.XE | One (1) lot of complete design, supply and construction of civil works and facili- ties for adaptation of the existing control building, including finishing works such as rendering, painting, floor finishing, etc. | Lot | 1 |
| Ν | Switchyard Lighting | | |
| N1.XE | One (1) lot of complete equipment for required switchyard area , shall be de- signed, supplied, delivered, installed, tested and commissioned, to provide ex- tension of the existing switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections and for connection of new equipment and integration with the existing equipment . | Lot | 1 |
| Р | Earthing and Lightning Protection | | |
| P1.XE | One (1) lot of complete equipment for required switchyard area , shall be de- signed, supplied, delivered, installed, tested and commissioned, to provide ex- tension of the existing earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement | Lot | 1 |



| No | Equipment | Unit | Qty. |
|----|---|------|------|
| | and provide supporting design calculations and for connection of new equip- | | |
| | ment and integration with the existing equipment. | | |



1.3 Detailed Description of the Scope of Supply for SCADA, Control & Monitoring System

1.3.1 Overall Scope of Work and Supply

The SCADA system will be based on:

- The communication with the NLDC shall be via the supplied gateway for Control and Monitoring System of the substation.
- Industrial gateway shall be implemented at each involved substation for remote monitoring & control from the National Despatch Centre. It shall provide all the necessary control and monitoring facilities for 132 kV level and auxiliaries.
- At existing substation, monitoring shall be provided through existing RTU. Contractor shall supply & install of necessary equipment such as sub rack, IED/relay, transducers, DI, DO card etc. for integrating new bays through existing RTU.
- Contractor shall supply, install 2 (two) numbers of Industrial gateway and will be configured as master - hot standby mode or one gateway will report to main station & another will report to backup station. Gateway shall be capable report to both Main master station at Rampura (through VLAN network) & Standby Master Station at Bidyut Bhaban (through routed network) simultaneously. It will be configured according to the signal list, communication parameter, IP address, station address etc. provided by PGCB. The Gateway shall have adequate capacity (minimum 25% additional spare point with license) to meet to the future extensions of substation.
- In case of windows operating system based gateway there should be USB port, VGA port, HDD/flash memory with one spare parts, TFT monitor with mouse and key board etc. Hard disk should be 50% free and CPU loading maximum of 30% at normal condition. If gateway is firmware based then 02(two) nos. of control card is required. Gateways also have minimum 06 nos. LAN port & redundant power supply. There should be GPS facilities for time synchronization. In addition, cyber security has to be ensured at field level with firewall. Supported Protocol shall be IEC 60870-5-104, 61850 & MOD Bus etc.
- One laptop for each vendor & same software version is required with Acronis True image or Ghost or similar software for system back up & restoration.
- All necessary adaptation work and configuration of the existing SCADA platform of the NLDC to integrate the Substations and the new bays shall be provided.
- Minimum of four (4) numbers of 33 kV load shed feeders shall be controlled from the SCADA system at each substation. All necessary equipment, including required number of BCU and panels shall be provided under the scope of the project

A scheme of the **Substation Automation System** is attached.



1.3.2 Adaptation and Configuration of the NLDC

Integrating Gateway with NLDC, the following work shall be done at Master Station and Standby Master Station.

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Scope of work includes following:

Pre Database Work

- a) Collection of network data for EMS application
- b) Modelling, database creation, verification and update should be done at both NLDC
- c) Modification and update of database for far end substation related to the 230kv Sub Station
- d) The following work should be done at Master station and Backup station
 - 1. SCADA Database Modelling
 - 2. Substation Display
 - 3. Network database Modelling
 - 4. DTS Database Modelling
 - 5. Alarm database Modelling
 - 6. Validation
 - Cross validation of all databases and create update copy of those databases.
 - On-lining of databases in DTS (Simulator) server
 - Checking and modifying (if require) topology of Substations, Devices, Network etc.
 - Gateway configuration Configuring the Gateway according to requirements/ signals, mapping address, data communication Parameters, Source IP, Destination IP etc.
 - 8. Local Test

The following test will be carried out at site using e-terracontrol software

- Verification of all Analog Measurement and checking of Limit, Deadband , Polling Time
- Verification of Digital signals status (OPEN, CLOSE, BETWEEN, INVALID)
- Verification of ALARMS, EVENTS etc.
- Verification of Control and Interlock
- 9. Database Update

The following activities will be carried out in Master NLDC and Backup NLDC after successful site Test.

- On-lining of all databases in Running Servers
- IP/VLAN Configuration on Polling servers and switch
- Compilation & On-lining of all the displays on WEB servers
- 10. Tuning of Power System Application
 - Tuning will be done for all available Network applications in SCADA/EMS server DTS (Dispatcher Training Simulator).
- End to End Test The following activities will be carried out in NLDC Master Station and Standby Master Station
 - Verification of all Analog Measurement,
 - Verification of Digital signals and Controls
 - Verification of displays including Single line, Pop up, alarms etc.
 - Verification of communication line for Redundancy
 - Verification of continuous and complete reporting of the Gateway to NLDC.

Notes:

- Data communication path creation for both NLDC Master Station and Standby master Station is scope of Integration
- Collection of Network parameter value required for modelling network database is in Contractor's scope of work
- Contractor will conduct necessary work for both at NLDC & Substation (if required)

Requirements / Signals

• Indications: Digital Input (Double Point)

The following indications shall be provided

- Circuit Breaker, Isolator & Earth Switch Open/ Close for line, transformer, bus coupler
- Circuit Breaker for Reactor/Capacitor bank & 33kv Loadshed feeder
- Load Flows, System Voltage and frequency

Electrical quantities shall be provided to enable the following measurements

- Voltage (kV), Frequency (Hz) for Busbar
- Megawatt (MW), MegaVar (MVAR), Amperes (AMP), Voltage (kV) for Line
- MW, MVAR, Amperes, kV at both sides, Tap Position Indication (TPI) for Transformer
- MegaVar for reactor/capacitor bank

• Alarms: Digital Input (Single Point):

- Remote/ Local Switch for all Circuit Breakers.
- Bay Fault (DC Fail for Transformer Panel).
- Breaker Fault (OR gate Spring Charge, SF6 Low).
- Protection Class-1 (Distance, Differential).
- Protection Class-2 (Over current, Earth fault).
- Protection Class-3 (bus bar).
- Transformer Alarm (Buchholz Alarm, Oil Level Low).
- Transformer Trip (Buchholz Trip, PRD Trip)
- Transformer Temperature Alarm (Oil Temp Alarm, Winding Temperature).
- Transformer Temperature Trip (Oil Temp trip, Winding Temperature trip).
- Tap Changer Alarm.
- Tap changer trip.
- Tap changer high limit.
- Tap changer low limit.
- Auto recloses operated
- DC fail
- AC fail

Controls-Digital Output (Double point)

The following facilities shall be controlled from the NLDC

- Circuit Breaker and Motorized Isolator Open/ Close for Line, Transformer bay & bus coupler,
- Circuit Breaker Open/ Close for 33kV load shed feeder
- Tap Changer Raise/ Lower for Transformer

Network modelling parameters

Line length, line conductor type, short circuit data for zero sequence (%R, %X, % of full charging susceptance) etc.



The SCADA system of the National Load Despatch Centre is based on ALSTOM platform. The communication protocol to be used for data exchange between the NLDC and the substations shall be IEC 60870-5-104 for the data transmission from Aminbazar substation.

Adaptation work and configuration of the NLDC will mainly consist of:

- Modelling the new substations and new bays.
- Database update of NLDC (ABB Network Manager Platform).
- Configuration of ABB Network Manager Platform to display the single line diagrams, statuses, alarms, measurements of the new substations and new bays.
- Database creation / modification & update at respective SCADA/EMS servers at all master station.
- Creation of associate display and modification of existing displays wherever required.
- Point to point test.

1.3.3 General Principle and Description of SCMS

The substation control and monitoring system shall have distributed client/server architecture. It shall consist of:

- The BCU equipment, which will be installed at the bay level,
- The substation level equipment, to be installed in the control room,
- A redundant communication network between station level and bay level for data exchange to limit the number of cables and ensure extension of the system. The exchange of information between distributed single bay unit and central substation control level shall be performed through redundant fibre optic wires. The communication network shall be based on the following architecture:
 - One optical double-ring LAN with protection and BCU,
 - One UPT CAT 5 redundant LAN at substation level.

The station level equipment will be power supplied from the two independent AC sources:

- One from the AC station auxiliaries 230 V AC 50 Hz,
- The second one from a UPS,
- An automatic change over shall prevent supply interruption.

In the event of loss of supply or disconnection for any reason, the system shall reboot automatically (without loss of stored information) and will update statuses of all devices when the power supply recovers. The updating process shall not inhibit control functions.

The substation control level must support future expansion of substation control system, having a 25% of resources as minimum.

At bay level, all control functions, data acquisition interlocking functions shall be done in the bay control devices within the bay level equipment. Each feeder shall be equipped with an individual bay control device.

For the data acquisition of substation auxiliaries, information (LV/MV switchgear, station battery, charger, UPS etc.,) a local RTU (or BCPU) shall be provided and installed in the control building. The bay control devices shall be connected to the station level via a redundant optical fibre communication link.



The bay level equipment shall comprise at least the following elements:

- Bay control unit (BCU). Bay computer shall be separate unit (not incorporated in the protection unit).
- Input / output modules for digital and analogue signals,
- Communication with protection equipment and analogue signals,
- Redundant optical fibre communication with substation level or ring bus communication,
- Backup mimic panel for maintenance control and measurements. One two position switch shall be provided on control panel:
 - Local: Only local control is enabled, the interlocking function is on bay level only, no synchronization,
 - Remote: Only remote control is enabled.
 - In both cases, all the data must be transmitted to the higher level (NLDC),
- Communication port for operation / maintenance from a laptop computer.

Bay control units shall be supplied from 110 V DC.

In the event of loss of supply or disconnection for any reason, the system shall reboot automatically (without loss of stored information) and will update statuses of all devices when the power supply recovers. The updating process shall not inhibit control functions. There should not be any loss of data due to the loss of auxiliary supply.

It shall be taken into consideration that additional bay control units can be added to the system, without disturbance of the system, for future expansion. A provision of 20% in bay units' expansion is required, as well as a provision of 10% in I/O signals, within each bay.

Control and supervision of the system will be possible from different levels:

- NLDC,
- Substation control level from the operator workstation,
- Bay control level.

On all levels, a correct interlocking will be ensured which provides the highest safety for staff and equipment. On the substation control level, the interlocking is managed by the microprocessor-based system, on the bay level it is performed by hard wiring.

The substation control system shall follow the specifications of IEC family 61850, 60870-5-101/104, 60870-5-102 and 60870-5-103. It is an obligatory requirement that the same Manufacturer supplies equipment and software for both the substation control and supervision system and the protection system.

List of Signals

The list below states the types of signals for the different configurations of bay types to assist in the determination of needs and possibilities for each of analysed systems of the future substation. The estimated signals are shown in the tables and include but not limited to:

Signalling:

- Protection (start, tripping, zones/phases, AR, communication send/receive),
- Automatic systems (start, tripping, operation, working mode)



- Central systems (backup trips, trip during long power swing, busbar protection and breaker failure, protection off, remote control off, feeder maintenance off),
- Switching equipment (manual control, emergency trip),
- Mode of operation: Local / Remote.

Warning:

- Protection (faults),
- Automatic systems (faults),
- Fault locator (faults),
- Event recorder (faults),
- Control systems (voltage control),
- Breaker (control blocking from a gas pressure low, a gas pressure low, AR inhibit from driver fault, driver supply voltage loss, driver fault, pole discordance).
- High voltage switch position:
- Breaker (separate pole each 2 bits),
- Disconnectors (separate pole each 2 bits),
- Earth switches (separate pole each 2 bits).

Control:

- Breaker (close, open),
- Disconnectors (close, open),
- Line earth switch (close, open),
- Automatic systems (off, on,)
- Voltage regulation systems (choice of voltage level, regulation mode, tap changer control).

Series interfaces:

- From digital protections and disturbance recorder,
- From diagnostic system of primary equipment,
- From monitoring system (transformer, etc.).

Measurements:

- Phase currents,
- Phase voltages
- Real power and energy for both directions,
- Reactive power and energy for both directions,
- Frequency, power factor,
- Device switching statistics.

Metering (for planning / operation not for commercial purpose):

- Real energy for both directions,
- Reactive energy for both directions.

Auxiliary systems:

- Aux 33 kV AC,
- Aux.400/230 V AC,
- Aux.110V DC,
- Aux.220V AC UPS,
- Aux.48 V DC,
- Fire protection,
- Security light,
- Alarm system,



- HVAC,
- Telecommunication alarms,
- GPS time synchronizing input (NTP Protocol).

1.3.4 Scope of Work and Supply at New Substations

The substation control system refers to the station level and bay level controls. The station level control equipment shall include the following:

Station Level

- Arrangement of the all bays
- 2 (two) independent station computers operating on a main and hot standby basis,
- 2 (two) operator workstations including 2 x 21" colour monitors (complete with appropriate desk and chair).
- The second operator workstation shall have the capability to be used as Employer's Representative workstation,
- Two (2) numbers of independent SCADA Gateways
- Black & white A 4 laser printer,
- Colour A 3 laser printer,
- Common bay control unit for monitoring auxiliary power supply and all other equipment on a substation level (telemetry, telecommunication, HVAC, fire protection, etc.),
- Satellite clock, which should run on SNTP protocols. The satellite clock will provide the reference time to the comprehensive Substation Control and Monitoring System and protection relays through IEC61850 substation LAN., The satellite clock system will be complete with GPS receiver, antenna and time synchronisation ports.
- Interface for laptop computer for maintenance, information transfer and emergency HMI,
- Non-fail power supply system,
- Communication network equipment (substation local area network, field communication network, optical couplers, etc.),
- Optical connection for data exchange with the NLDC.
- Configuration of the new/existing gateway.

The station computers in the substation must be separate machines from the station HMI (operator workstation) and should be located in the control panels, and not on the control desk with the HMI.

Bay Level

The control system of the bay level at substation shall be carried out with microprocessor based Bay Control Unit (BCU) control system. All BCUs shall be provided with IEC 61850 Edition 2 communication ports.

The connections between BCUs and the station level shall be based on redundant fibre optic links. These communication ports will be used for control, indication and alarm systems to the substation automation system and SCADA. The BCU shall be provided for all:

- 132 kV transmission line bays,
- 132/33 kV power transformers,
- 132 kV busbars
- Four (4) numbers of 33 kV load shed feeders (BCU and panels) and



• Auxiliaries.

A bay control unit (BCU) shall provide the following:

- Control for each individual circuit / bay with a LCD mimic and user interface for control and monitoring of the circuit / bay,
- Interface for protection devices that cannot directly interface with the substation control system local area network,
- Interface for laptop computer for maintenance, information transfer and emergency HMI,
- Interlocking functions (soft and hard wired).

Station level control functions shall include the following:

- Control of all switching devices,
- Real-time indication of events and alarms,
- Display of analogue values and high / low limit checking,
- Display of historical values,
- Data archiving,
- Disturbance monitoring and analysis,
- Trend display,
- Protection and control relay setting information,
- Protection relay fault and disturbance records,
- Time synchronization,
- Interlocking function to prevent unsafe operator action (display message if operator attempts an inappropriate action),
- Self-check and diagnostic,
- Manual data setting by the operator, including:
- Hand dressed data entry,
- Control inhibit setting,
- Alarm inhibit setting,
- Maintenance tag setting,
- High / low limit setting.
- Remote access to substation control system from SCADA system using a TCP / IP link.

All peripheral devices that constitute the substation automation system should be supervised and monitored by Control through IEC 61850 or any other compatible protocol.

1.3.5 Scope of Work and Supply at Existing Substations

The existing SCMS shall be extended to integrate the new feeders.

The BCU shall be provided, with IEC 61850 Edition 2 communication ports, for each feeder.

The connections between BCUs and the station level shall be based on redundant fibre optic links. These communication ports will be used for control, indication and alarm systems to the substation automation system and SCADA.

A bay control unit (BCU) shall provide the following:



- Control for each individual circuit / bay with a LCD mimic and user interface for control and monitoring of the circuit / bay,
- Interface for protection devices that cannot directly interface with the substation control system local area network,
- Interface for laptop computer for maintenance, information transfer and emergency HMI, Interlocking functions (soft and hard-wired).

All necessary optical/Ethernet switches shall be provided to connect the new BCUs to the station level of SMS.

All necessary adaptation work shall be provided.

The signal list will follow the same rules as for new substations.

1.3.6 Engineering Services

General

The Engineering services shall be provided by the Contractor to the extent and detail necessary for a turnkey project. They shall include drawings, instructions and all other technical documents required allow the Contractor to build, erect, commission, operate and maintain the substation systems, even if these are not specifically mentioned in these Technical Requirements.

Design Services

The Contractor shall design in detail the general layout of the SCADA and substation control system, based on the preliminary design and modifications agreed. This general layout shall be submitted to the Employer / Employer's Representative for approval and comments. It shall also include all detailed structural drawings, detailed descriptions and reports required to permit an exact understanding of the solution adopted.

Once the general layout is approved, the Contractor shall include the following as a minimum requirement:

- Design of all works required for the implementation and extension of the SCADA and substation control system,
- General layouts for the SCADA and substation control system,
- Engineering of SCADA and substation control system,
- All necessary calculations.
- These Engineering services shall also include:
- Design reports,
- Complete drawings of all systems,
- Integration in existing SCADA system.



1.4 Detailed Description of the Scope of Supply for the Telecommunication System

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The communication part of the project shall provide the interconnection between all substations involved in the Project:

- New 132/33 kV AIS Substation Ullapara
- New 132/33 kV AIS Substation Bajitpur
- New 132/33 kV AIS Substation Ghatail
- New 132/33 kV GIS Substation Pubail
- New 132/33 kV GIS Substation Arihazar
- Extension of existing 132/33 kV GIS Substation Sreepur for 2 132 kV bays

and

- Existing 132/33 kV Substation Sirajganj,
- Existing 132/33 kV Substation Shahzadpur,
- Existing 132/33 kV Substation Ashuganj,
- Existing 132/33 kV Substation Kishorganj,
- Existing 132/33 kV Substation RPCL,
- Existing 132/33 kV Substation Tangail,
- Existing 132/33 kV Substation Joydevpur and
- Existing 132/33 kV Substation Ghorasal
- Existing 132/33 kV Substation Rajendropur

The purpose of the telecommunication system is to provide all the necessary telecommunication channels for the following sub-systems:

- SCADA for data exchange between the substations and the National Load Despatch Centre (NLDC) by two communication technologies i.e. LAN & WAN
- Tele-protection to enable the communication between line differential protection relays and between distance protection relays,
- Telephone to enable telephone communication between the substations and NLDC,
- Metering: Data transfer between meters and the entity in charge of collecting and processing metering data,
- Any other telecommunication channels.

1.4.1 Recommendation of Communication System

Telecom Equipment (Optical Transmission and ADD/DROP MUX)

- STM-16/64 / 10G or 100G / DWDM
 MPLS (Layer-3)
- ADD/DROP Multiplexer (PDH)

Services:

- LAN Service (IP Phone, RTU/SAS, Office LAN etc.)
- WAN Services (RTU, CC camera, DFDR, etc.)
- E1/TDM/Tributary Services (PABX, etc.)

- NMS:End-to-End Trail management
- Protection management (I+I MPS, MSSP RING, SNCP, SNCPM)
- Clock management
- DCN Channel management

Existing equipment and facilities in PGCB Telecommunication Network

- STM-1/4
 - FOX-515/615
 - MSE-5010 (OSN-1500B)
 - MSE-5001 (Metro)
- ADD/DROP Multiplexer (PDH)
- DXC-5000
 - FOX-515/615

Services:

- LAN Service (IP Phone, RTU/SAS etc.)
- WAN Services (RTU, CC camera, DFDR, etc.)
- TDM/Tributary Services (PABX, etc.)

NMS:

- FOXMAN-UN/U-2000
 - End-to-End Trail management
 - Protection management (I+I MPS, MSSP RING, SNCP, SNCPM)
 - Clock management
 - DCN Channel management

1.4.2 Architecture of the Overall Telecommunication System

- Two (2) new SDH & PDH multiplexers (and with two (2) optical boosters only if it is required) and one (1) 48 cores Optical Distribution Frames (ODF).
- Two (2) digital PLC and two (2) Line Matching Units (LMU).

The length of the communication links is indicated in the provided drawing:

Map of Bangladeshi telecommunication system

A scheme of the overall telecommunication system is attached at following drawings:

- SDH telecommunication system and
- Digital PLC system

1.4.3 Scope of Work and Supply

The scope of work and supply of the telecommunication system:

 One (1) optical fibre cable from the gantry of each of 230 kV and/or 132 kV OHL to the substation communication room, including 48 cores and non-metallic (underground/armoured) but with the



same optical characteristics with the OPGW (compliant to ITU-T-G 655 recommendation), shall be provided, for each of 230 kV and/or 132 kV OHL at every involved Substation

- One (1) Optical Distribution Frames (ODF), of 48 cores capacity each, shall be provided, for each
 of 230 kV and/or 132 kV OHL at every involved Substation. ODF shall be installed in the telecommunication / control room to facilitate the termination of fibres, testing and isolating of both the optical fibre cable and fibre optic terminal equipment.
- Two (2) Optical SDH / PDH multiplexers, shall be provided, for each involved Substation, including:
 Duplicate CPU
 - Duplicate power supply
 - One optical STM-16 ports for each 230 kV transmission line
 - One optical STM-4 ports for each 132 kV transmission line
 - One 16x2 Mbps (E1) drop card
 - One 8x2 Mbps (E1) elect. Card
 - One card with four ports 10/100 Base T LAN
 - One card with four ports 10/100 Base T Router
 - One card with 10x2-w voice for FXS
 - Required no. of cards with 4x4 commands for distance protection after detail design
- The optical SDH / PDH multiplexer shall be preferably of ABB FOX 515/FOX 615 type to ensure fully integration with existing FOX 515/FOX 615.
- Depending of the length of each 230 kV and/or 132 kV one or two optical boosters may be required.
- Two (2) digital PLC with Ethernet facilities and two LMU (phase-to-phase coupling) shall be provided, for each of 230 kV OHL at every involved Substation, together with the coaxial cable for connecting PLCs to LMUs.

1.4.4 Engineering Services

General

The Engineering services shall be provided by the Contractor to the necessary extent and detail of a turnkey project. They shall include drawings, instructions and all other technical documents required to allow the Contractor to build, erect, commission, operate and maintain the telecommunication system, even if these are not specifically mentioned in these Technical Requirements.

Design Services

The Contractor shall design in detail the general layout of the telecommunication system, based on the preliminary design and modifications agreed. This general layout shall be submitted to the Employer / Employer's Representative for approval and comments. It shall also include all detailed structural drawings, detailed descriptions and reports required to permit an exact understanding of the solution adopted.

Once the general layout is approved, the Contractor shall include following as a minimum requirement:

 design of all works required for the implementation and extension of the telecommunication system, general layouts of the telecommunication system, Engineering of telecommunication system, all necessary calculations.

These Engineering services shall also include:

• design reports,



- complete drawings of all system,
- integration in the existing telecommunication system.

1.5 Terminal Points

1.5.1 Transmission Line Circuit Connections

The slack spans including overhead earth wires between the 230 kV and 132 kV overhead line terminal towers and the substation gantry structures shall be supplied and terminated by the overhead line contractors. All required insulators and hardwires shall also be supplied by the overhead line contractors.

Eyebolts/U-bolts or other suitable fixtures for terminating the slack spans on the switchyard gantry shall be provided under this substation Contract.

The overhead line Contractor shall provide a jumper from the slack span of sufficient length to terminate on the substation entry equipment. The supply of appropriate clamps and the actual termination of the jumper to the substation equipment shall be carried out under this contract.

PLC facilities such as line trap and coupling capacitor, new or currently used in existing substations shall be carried out under this contract.

Bonding of the incoming earth wire to the station earthing screen and supply of earthing conductor and connection of the terminal tower earth electrode into the substation earth grid shall be carried out under this contract.

The overhead line Contractor shall terminate the OPGW at the substation gantry in the terminal joint boxes provided by the overhead line contractors. The connection between OPGW joint boxes at the substation gantry and control room building via underground optical fibre cables shall be carried out under this contract that include supply & installation of fibre optic cable of size similar to the OPGW.

1.5.2 Communication and SCADA Equipment

The voice communication, tele-protection signalling and main distribution frame (MDF) for optical fibre cable will be supplied and installed under this contract.

Necessary equipment for incorporating new & existing equipment system into the existing SCADA system shall also be supplied and installed under this contract:

Complete design, supply, delivery, installation, testing & commissioning of hardware and software shall be provided for the tele-control & tele-metering facilities required at the existing National Load Despatch Centre (NLDC) at Rampura for integration of the scope of the work.

In order to provide the tele-control & tele-metering facilities required at the existing NLDC, all plant supplied under this contract shall be equipped with potential free auxiliary contacts for indications and alarms. CT and VT circuits shall be fitted, where required, with the appropriate shorting and fused terminals.



All required electrical signals for signalization and control shall be transmitted to the NLDC through the Industrial Gateway of the substation automation system **or RTU**. All HV breakers, motorized disconnectors, tap changer, etc. shall be controlled form NLDC through the Gateway or RTU of the substation automation system using IEC 60870-5-104 protocol. Necessary transducer, control & interposing relays, RTUs, etc. shall be used. Necessary interfacing between the Substation Automation gateway and the communication equipment is to be carried out.

Sufficient investigations shall be made on the existing telecommunication and SCADA system for new and existing transmission lines and associated new and existing substations so that the necessary equipment shall be provided for complete telecommunication system after the new and existing transmission lines and substations are connected/reconnected.

All and complete connection between the new equipment and the existing equipment for control & protection system, SCADA, communication system, and low voltage supply system shall be provided.

The other ends of Transmission Lines have to be covered from the tele-communication point of view under the scope of this contract. All equipment and services have to be provided

In addition, to implement the complete SCADA system after completion of the project, modification of the existing software in the master and back-up computer of the national control centre, and modification / extension / renovation of hardware (installing additional printed circuit cards or other equipment, etc. if required) shall be made under this contract.

2. Schedule B: Bid Prices & Schedules

The attached price schedules shall be filled by the Bidder, signed and stamped, and shall be attached to the bid.

Please use the attached excel file.



No

В

BG.1

BG.2

BG.3

or

with:

| | | Quantity | | Foreign Currer Unit Price | ncy (in) Total Price |
|--|-------|----------|------|------------------------------|-------------------------|
| Equipment | Unit | | Code | CIP | CIP |
| | | (1) | | (2) | $(3) = (1) \times (2)$ |
| Renovation/New 132/33/11 kV GIS Substation | n SHA | HJIBA | ZAR | | |
| 132 kV switchgear, equipment connection and steel structures | | | | | |
| One (1) set of complete equipment for switchgear 132 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | |
| A complete indoor and partly outdoor GIS Line feeder 145 kV, 3150 A busbars / 2000 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | | | | | |
| Q0 - One (1) set of three pole, GIS type, SF6 gas circuit breaker with three spring-stored energy operating mechanism | | | | | |
| Q1, Q2, Q9 - Three (3) sets of three pole, three positions, motor operated, insulated disconnector with earthing switch | | | | | |
| Q8 - One (1) set of three pole, make-proof, motor operated earthing switch | | | | | |
| T1 - Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1 A, GIS type current transformers | | | | | |
| T5 - Three (3) single-phase, 2-secondary winding, 132/V3 / 110/V3 / 110/V3 kV/V/V, GIS type voltage transformers | Set | 8 | | | |
| T6 - One (1) set of three-phase, GIS type, hand operated disconnector link | | | | | |
| SA - Three (3) single-phase outdoor surge arresters, GIS type | | | | | |
| Z1 - One (1) set of three-phase, GIS type, cable compartment | | | | | |
| n | | | | | |
| Z2 - One (1) set of three phase indoor and outdoor GIB with three outdoor GIS/AIR bushings | | | | | |
| GIS.X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | | | | | |
| A complete indoor and partly outdoor GIS Transformer feeder 145 kV, 3150A busbars / 2000 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | | | | | |
| Q0 - One (1) set of three pole, GIS type, SF6 gas circuit breaker with one spring-stored energy operating mechanism | | | | | |
| Q1, Q2, Q9 - Three (3) set of three pole, three position, motor operated, insulated disconnector with earthing switch | | | | | |
| Q8 - One (1) set of three pole, make-proof, motor operated earthing switch | | | | | |
| T1 - Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1 A, GIS type current transformers | Set | 4 | | | |
| SA - Three (3) single-phase outdoor surge arresters, GIS type | | | | | |
| | | | | | |

Schedule 1: Plant & Equipment supplied from Abroad

Name of Bidder:

Set

1

Signature of Bidder:

Z1 - One (1) set of three-phase, GIS type, cable compartment

Z2 - One (1) set of three phase indoor and outdoor GIB with three outdoor GIS/AIR bushings

X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay

A complete indoor GIS Bus Coupler bay 145 kV, 3150A busbars / 3150 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped

Q0 - One (1) set of three pole, GIS type, SF6 gas circuit breaker with one spring-stored energy operating mechanism

Q1, Q2 - Two (2) set of three pole, three position, motor operated, insulated disconnector with earthing switch T1 - Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1 A, GIS type current transformers X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay

| No Equipment Unit Ocash Unit Price (1) Code (2) Unit Price (2) Total Price (2) Bd.4 A complete indoor OIS Metering bay 145 KV, 3150A busbas, 40 kA, 50Hz, 650/275 kV BIL, equipped with: 021, 022 - Two (2) set of three position, motor operated, insulated disconnector TS - Three (3) single-phase, 2-winding, 132/37 / 100/37 / 100/37 MV/W/W, GIS type value transformers X - Control cabinet, eachs, metal support structure, grounding, etc. and all accessities for complete bay Set 1 I | | | | | | Foreign Currency (in) | | |
|--|-------|---|------|-----|------|-----------------------|------------------------|--|
| A complete indoor GIS Metering bay 145 kV, 315Ab bashars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: Set 1 BG.4. T5 - Three (3) single-phase, 2-winding, 132/37 / 110/37 kV/VV, GIS type voltage transformers Set 1 BG.5. Control cables, metal support structure, grounding, etc. and all accessories for complete bay Set 1 BG.6. Control cables, metal support structure, grounding, etc. and all accessories for complete bay Set 1 BG.6. Complete indoor GIS Bushars Earthing pay 164 kV, 315Ab bushars, 40 kA, 60Hz, 650/275 kV BIL, spingle phase, heavy Set 1 BG.7. Conductors for connection of the 132 kV switchgear, 145 kV, 2000 A, 40 kA Lot 1 1 B7.X Conductors for connection of the 132 kV switchgear, 145 kV, 2000 A, 40 kA Lot 1 1 B8.4. Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear Lot 1 1 B9.4. Garty setel structures and equipment supports required for completing 132 kV switchgear. Lot 1 1 B1.4. All other necessary material and equipment consulter is constructures Set 1 1 Conductors for complete equipment consulter is constructures Set 1 1 1 | No | Equipment | Unit | - | Code | Unit Price CIP | Total Price CIP | |
| B6.4 221, 022 - Two (2) set of three pole, three position, motor operated, insulated disconnector Set 1 1 F5 - Three (3) single-phase, 2-winding, 132V3 / 110V3 / 110V3 / KV/V, GIS type voltage transformers x - Control cabine, cables, metal support structure, grounding, etc. and all accessories to complete bay 1 1 B6.5 081, 082 - Two (2) set of three pole, make-proof. motor operated antihy accessories to complete bay Set 1 1 B6 081, 082 - Two (2) set of three pole, make-proof. motor operated antihy switch Set 72 1 1 B7 Conductors for connection of the 132 kV witchgear, 145 kV, 2000 A, 40 kA Set 72 1 1 B7. Conductors for connection of the 132 kV witchgear, 145 kV, 2000 A, 40 kA Lot 1 1 1 B8.1 Installors and fittings line. all necessary clamps and connectors required for completing 132 kV switchgear Lot 1 1 1 B10.X All other necessary material and equipment required for completing 132 kV switchgear Lot 1 1 1 C1 of 19 sof complete equipment for set or completing 132 kV switchgear Lot 1 1 1 B10.X All other necessary material and equipment required for completing 132 kV switchgear. L | | A complete indoor GIS Metering bay 145 kV 3150A busbars 40 kA 50Hz 650/275 kV BIL equipped with: | | (1) | | (2) | $(3) = (1) \times (2)$ | |
| B64 T5 - Three (3) single-phase, 2-winding, 132/V3 / 110/V3 / 110/V3 W//V, (GI type voltage transformers Set 1 Image: Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay B6.4 A complete indoor GIS Busbars Earthing bay 145 IV, 3150A busbars, 40 kA, 50Hz, 500/275 IV BIL, equipped with: Ca81, 082 - Two (2) set of three pole, make-proof, motor operated earthing switch Set 1 Image: Cabinet, | | | | | | | | |
| K - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay Image: Cables, metal support structure, grounding, etc. and all accessories for complete bay BG.5 A complete induor GIS Busins Earthing bay 145 kV, 3150A busbars, 40 kA, 50Hz, 650275 kV BL, equipped with: Set 1 Image: Cables, Cables, Cables, Cables, Cables, 650275 kV BL, equipped with: Set 72 Image: Cables, Cable | BG.4 | | Set | 1 | | | | |
| BG.5 A complete indoor GIS Bushars Earthing bay 146 KV, 3150A bushars, 40 KA, 50Hz, 650/275 KV BIL, equipped with: (B1, Q82 - Two (2) set of three pole, make-proof, motor operated earthing switch Bs Set 1 BS Surge arrester 145KV, 120 KV continuous operating voltage, 10KA nominal discharge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide type Set 72 B6 Post insulator 132KV, 50Hz, 650/275 KV BLI, 10 kN Set 72 B7.X Conductors for connection of the 132 KV switchgeer, 145 KV, 2000 A, 40 kA Lot 1 B8.X Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear Lot 1 B1.X All other necessary material and equipment required for completing 132 kV switchgear Lot 1 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<> | | | | | | | | |
| B3:5 QB1, QB2 - Two (2) set of three pole, make-proof, motor operated earthing switch Set 1 Image: Control of the pole in the pole, make-proof, motor operated earthing switch B5 dW; station class, papeless, metal coal de type Set 72 Image: Control of the pole, make-proof, motor operated earthing switch Set 72 Image: Control of the pole, make-proof, motor operated earthing switch Set 72 Image: Control of the pole, make-proof, motor operated earthing switch Set 72 Image: Control of the pole, make-proof, motor operated earthing switch Set 72 Image: Control of the pole, make-proof, motor operated earthing switch Set 72 Image: Control of the pole, make-proof, motor operated earthing switch Image: Control of the pole, make-proof, motor operated earthing switch Image: Control of the pole, make-proof, motor operated earthing switch Image: Control of the pole, switch part operated for completing 132 kV switch paer Lot 1 Image: Control of the pole, pole, denore break, switch paer Lot 1 Image: Control of the pole, po | | | | | | | | |
| B5 Surge arrester 145W, 120 W continuous operating voltage, 10KA nominal discharge current, 50Hz, single phase, heavy duy, station class, gaplass, metal oxide type Set 72 B6 Post insulator 132kV, 50 Hz, 560/275 KV Bill, 10 KN Set 72 B7.X Conductors for connection of the 132 kV switchgear, 145 KV, 2000 A, 40 KA Lot 1 B3.X Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear Lot 1 B3.X Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear Lot 1 B10.X All other necessary material and equipment required for completing 132 kV switchgear Lot 1 C 33 kV switchgear, cupromet connection and stead structures Set 1 C1 Circuit Breaker 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated Set 7 C2.1 Disconnector 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, single phase, 200/11/11/1 A/A, 4-core, single ratio, post type Set 12 C3.1 Current transformer 36 kV, 25 kA, 50 Hz, 170/70 kV | BG.5 | | Set | 1 | | | | |
| Instruction Set 72 72 B6 Post Insulator 132kV, 50 Hz, 550/25 kV BIL, 10 kN Set 72 1 B7.X Conductors for connection of the 132 kV switchgear, 145 kV, 2000 A, 40 kA Lot 1 1 1 B8.X Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear Lot 1 1 1 B9.X Garity steel structures and equipment required for completing 132 kV switchgear. Lot 1 1 1 C 33 kV Switchgear, equipment connection and steel structures Lot 1 1 1 1 C 33 kV Switchgear, equipment connection and steel structures Lot 1 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<> | | | | | | | | |
| B6 Post Insulator 132kV, 50 Hz, 650/275 kV BIL, 10 kN Set 72 Image: Conductors for connection of the 132 kV switchgear, 145 kV, 2000 A, 40 kA B7.X Conductors for connection of the 132 kV switchgear, 145 kV, 2000 A, 40 kA Lot 1 Image: Conductors for connection of the 132 kV switchgear Lot 1 Image: Conductors for connection of the 132 kV switchgear Lot 1 Image: Conductors for connection of the 132 kV switchgear Lot 1 Image: Conductors for connection of the 132 kV switchgear Lot 1 Image: Conductors for connection of the 132 kV switchgear Lot 1 Image: Conductors for connection of the 132 kV switchgear Lot 1 Image: Conductors for connection of the 132 kV switchgear Lot 1 Image: Conductors for connection and steel structures C C3 31 KV Switchgear, equipment connection and steel structures Conductors for connection and steel structures Set 7 Image: Conductor for KV, 2000 A, 25 kA, 50 Hz, 17070 kV BIL, three pole, centre break, post type, manually operated Set 7 Image: Conductor for connection and steel structures Conductor for connection af kV, 100 A, 25 kA, 50 Hz, 17070 kV BIL, single phase, 2000/11/11 A/A, 4-core, single ratio, post type Set 12 Image: Conductor for for single steel structures Conductor for for single steel structures Conductors for single structures Condu | B5 | | Set | 72 | | | | |
| B7.X Conductors for connection of the 132 kV switchgear, 145 kV, 2000 A, 40 kA Lot 1 Image: Conductors for connection and text structures and equipment sequired for completing 132 kV switchgear Lot 1 Image: Conductors for connection and steel structures and equipment required for completing 132 kV switchgear Lot 1 Image: Conductors for connection and steel structures Conductors for connection and steel structures Set 1 Image: Conductors for connection and steel structures Conductors for complete equipment connection and steel structures Set 1 Image: Conductors for completing for switchgear 33 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: Set 1 Image: Conductor for for switchgear 33 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: Set 1 Image: Conductor for for switchgear 33 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: Set 1 Image: Conductor for for switchgear 33 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: Set 1 Image: Conductor for for switchgear 34 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: Set 2 Image: Conductor for switchgear 2, for 70 kV BIL, three pole, centre break, | | | - | | | | | |
| B8.X Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear Lot 1 Image: Complete equipment supports required for completing 132 kV switchgear B9.X Gartry steel structures and equipment required for completing 132 kV switchgear Lot 1 Image: Complete equipment connection and steel structures C 33 kV Switchgear, equipment connection and steel structures Set 1 Image: Complete equipment connection and steel structures C1 Circuit Breaker 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated Set 4 Image: Complete equipment connection and steel structures C2.1 Disconnector 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated Set 7 Image: Complete equipment connection and steel structures C2.1 Disconnector 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated Set 7 Image: Complete equipment connection and steel structures C3.1 Current transformer 36 kV, 25kA, 50 Hz, 170/70 kV BIL, single phase, 2000/1/1/1/1 A/A, 4-core, single ratio, post type Set 12 Image: Complete equipment equired for completing 31 kV/V/V, 2 secondary windings, inductive type Set 12 Image: Complete equipment equipment equipment equipment equipment equipment equipment equipment | | | | | | | | |
| B9.X Gantry steel structures and equipment supports required for completing 132 kV switchgear Lot 1 Image: Complete equipment commetcing 132 kV switchgear B10.X All other necessary material and equipment required for completing 132 kV switchgear. Lot 1 Image: Complete equipment for switchgear 33 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: Set 1 Image: Commissioned, under this contract, comprise the following: C1 Circuit Breaker 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, eartre break, post type, manually operated Set 7 Image: Commissioned, under this contract, comprise the following: C2.1 Disconnector 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated Set 7 Image: Commissioned, under this contract, comprise the pole, centre break, post type, manually operated, with integrated fuse of 10 A Set 12 Image: Commissioned, under this contract, completence, post type, manually operated, with integrated fuse of 10 A Image: Commissioned, under this contract, completence, post type, transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 2000/1/1/1 AA, 4-core, single ratio, post type Set 12 Image: Commissioned, under this contract, completence, post type, transformer 36 kV, 30 kV continuous operating voltage, not kA nominal discharge current, 50 Hz, single phase, gapless, inductive type Set 12 Image: Commissioned, under thi | | | | | | | | |
| B10.X All other necessary material and equipment required for completing 132 kV switchgear. Lot 1 Image: Complete equipment connection and steel structures Conc (1) set of complete equipment for switchgear 33 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: Set 1 Image: Complete equipment for switchgear 33 kV shall be designed, supplied, delivered, installation with one complete equipment for switchgear 33 kV switchgear 32 kV switchgear 42 kV stage 12 kV switchgear 42 kV stage 10 kV stage 10 kA so Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated, with instructures 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 101/11/1 A/A, 4-core, single ratio, post type 5 kt 12 12 12 C3.1 Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 101/11/1 A/A, 3-core, single ratio, post type 5 kt 6 12 12 12 C4 Voltage transformer 36 kV, 30 kV continuous operating voltage, 10 kA nominal discharge current, 50 Hz, single phase, gapless, inductive type Set 12 12 | | | | | | | | |
| C 33 kV Switchgear, equipment connection and steel structures Set 1 One (1) set of complete equipment for switchgear 33 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: Set 1 Image: Compressioned under this contract, compressioned under this contract, compressioned under this contract, compressioned the designed, supplied, delivered, installation with one spring-stored energy operating mechanism Set 1 Image: Compressioned under this contract, compressioned under the contract, compressioned under the contract, compressioned under this contract, compressioned under this contract, compressioned under the contract, compressioned under the contract, compressioned under the contract, compressioned under the contract, contract, compressioned under the contract, compressing, contract, contract, contreth, contract, contract, co | | | | | | | | |
| One (1) set of complete equipment for switchgear 33 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: I C1 Circuit Breaker 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, vacuum type, for outdoor installation with one spring-stored energy operating mechanism Set 4 C2.1 Disconnector 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated Set 7 C2.2 Disconnector 36 kV, 100 A, 25 kA, 50 Hz, 170/70 kV BIL, single phase, 2000/1/1/1/1 A/A, 4-core, single ratio, post type Set 12 C3.1 Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 2000/1/1/1/1 A/A, 4-core, single ratio, post type Set 12 C3.2 Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 2000/1/1/1/1 A/A, 3-core, single ratio, post type Set 12 C4 Voltage transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 33/V3 / 110/V3 / VI/V/V, 2 secondary windings, inductive type Set 12 C5 Surge arrester 36 kV, 30 kV continuous operating voltage, 10 kA nominal discharge current, 50 Hz, single phase, gapless, metal oxide type Set 12 C7.X Conductors for single busbar system and for connectors required for completing 33 kV switchgear Lot 1 C8.X Insulators and fittings incl. all necessary clamps and co | - | | Lot | 1 | | | | |
| commissioned, under this contract, comprise the following:SetII | С | | | | | • | | |
| C1spring-stored energy operating mechanismSet44666C2.1Disconnector 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operatedSet7666C2.2Disconnector 36 kV, 100 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated, with integrated fuse of 10 ASet2666 | | | Set | 1 | | | | |
| C2.1Disconnector 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operatedSet7Image: Constraint of the constraint of | C1 | | Set | 4 | | | | |
| C2.2Disconnector 36 kV, 100 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated, with integrated fuse of 10 ASet22C3.1Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 2000/1/1/1/1 A/A, 4-core, single ratio, post typeSet1200C3.2Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 10/1/1/1 A/A, 3-core, single ratio, post typeSet600C4Voltage transformer 36 kV, 30 Hz, 170/70 kV BIL, single phase, 33/V3 / 110/V3 / 110/V3 / V10/V, 2 secondary windings, inductive typeSet1200C5Surge arrester 36 kV, 30 kV continuous operating voltage, 10 kA nominal discharge current, 50 Hz, single phase, gapless, metal oxide typeSet1210C7.XConductors for single busbar system and for connection of the 33 kV switchgear, 36 kV, 2000 A, 25 kALot100C8.XInsulators and fittings incl. all necessary clamps and connectors required for completing 33 kV switchgearLot100C9.XGantry steel structures and equipment required for completing 33 kV switchgear.Lot100C10.XAll other necessary material and equipment required for completing 33 kV switchgear.Lot100DTransformer 5U1000DPower transformer 132/33 kV three phase 80/120 MVA, Dyn1, ONAN/ONAFSet2000DWater Spray SystemSet2000 | C2.1 | | Set | 7 | | | | |
| C3.1Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 2000/1/1/1/1 A/A, 4-core, single ratio, post typeSet1212C3.2Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 10/1/1/1 A/A, 3-core, single ratio, post typeSet6C4Voltage transformer 36 kV, 50Hz, 170/70 kV BIL, single phase, 33/V3 / 110/V3 / 110/V3 kV/V/V, 2 secondary windings, inductive typeSet1212C5Surge arrester 36 kV, 30 kV continuous operating voltage, 10 kA nominal discharge current, 50 Hz, single phase, gapless, metal oxide typeSet1212C7.XConductors for single busbar system and for connection of the 33 kV switchgear, 36 kV, 2000 A, 25 kALot1C9.XGantry steel structures and equipment supports required for completing 33 kV switchgearLot1 </td <td>C2.2</td> <td>Disconnector 36 kV, 100 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated, with</td> <td>Set</td> <td>2</td> <td></td> <td></td> <td></td> | C2.2 | Disconnector 36 kV, 100 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated, with | Set | 2 | | | | |
| C4Voltage transformer 36kV, 50Hz, 170/70 kV BIL, single phase, 33/V3 / 110/V3 / 110/V3 kV/V/V, 2 secondary windings, inductive typeSet1212C5Surge arrester 36 kV, 30 kV continuous operating voltage, 10 kA nominal discharge current, 50 Hz, single phase, gapless, metal oxide typeSet1212C7.XConductors for single busbar system and for connection of the 33 kV switchgear, 36 kV, 2000 A, 25 kALot100C8.XInsulators and fittings incl. all necessary clamps and connectors required for completing 33 kV switchgearLot100C9.XGantry steel structures and equipment supports required for completing 33 kV switchgearLot100C10.XAll other necessary material and equipment required for completing 33 kV switchgear.Lot100D2Power transformer 132/33 kV three phase 80/120 MVA, Dyn1, ONAN/ONAFSet2000D9Water Spray SystemSet2000 | C3.1 | Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 2000/1/1/1/1 A/A, 4-core, single ratio, post type | Set | 12 | | | | |
| C4inductive typeSet12Image: C4Set12Image: C4Set12Image: C4Set12Image: C4Set12SetC4< | C3.2 | Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 10/1/1/1 A/A, 3-core, single ratio, post type | Set | 6 | | | | |
| C5metal oxide typeSet12Image: Constraint of the co | C4 | | Set | 12 | | | | |
| C8.XInsulators and fittings incl. all necessary clamps and connectors required for completing 33 kV switchgearLot1111C9.XGantry steel structures and equipment supports required for completing 33 kV switchgearLot11 | C5 | | Set | 12 | | | | |
| C9.XGantry steel structures and equipment supports required for completing 33 kV switchgearLot1111C10.XAll other necessary material and equipment required for completing 33 kV switchgear.Lot11111DTransformersD2Power transformer 132/33 kV three phase 80/120 MVA, Dyn1, ONAN/ONAFSet21111D9Water Spray SystemSet21111111 | C7.X | Conductors for single busbar system and for connection of the 33 kV switchgear, 36 kV, 2000 A, 25 kA | Lot | 1 | | | | |
| C9.XGantry steel structures and equipment supports required for completing 33 kV switchgearLot111C10.XAll other necessary material and equipment required for completing 33 kV switchgear.Lot1111DTransformersD2Power transformer 132/33 kV three phase 80/120 MVA, Dyn1, ONAN/ONAFSet2111D9Water Spray SystemSet2111 | C8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 33 kV switchgear | Lot | 1 | | | | |
| C10.X All other necessary material and equipment required for completing 33 kV switchgear. Lot 1 I I I I D Transformers Set 2 I | C9.X | | Lot | 1 | | | | |
| D Transformers D2 Power transformer 132/33 kV three phase 80/120 MVA, Dyn1, ONAN/ONAF Set 2 D9 Water Spray System Set 2 | C10.X | · · · · · · · | Lot | 1 | | | 1 | |
| D9 Water Spray System Set 2 | | | | | | <u> </u> | <u>.</u> | |
| D9 Water Spray System Set 2 | D2 | Power transformer 132/33 kV three phase 80/120 MVA, Dyn1, ONAN/ONAF | Set | 2 | | | | |
| | D9 | | Set | 2 | | | | |
| | D10.X | All other necessary material and equipment required for completing transformers | | | | | | |

Name of Bidder:

| Schedule 1: Plant & Equipment supplied from Abroad | | | | | | | |
|---|------|------------------------|------|---|---|--|--|
| | Unit | Quantity <i>(1)</i> | Code | Foreign Curre Unit Price CIP (2) | ncy (in) Total Price CIP (3) = (1) x (2) | | |
| uxiliary Power Transformers | | | | | | | |
| uxiliary Power Transformer 33/0.4 kV, three phase 200 kVA, Dyn11, ONAN | Set | 2 | | | | | |
| cessary material and equipment required for completing Earthing / Auxiliary Power transformers. | Lot | 1 | | | | | |

Diant ⁹ Equipment outputs of from Abroad Cabadula 4

| No | Equipment | Unit | Quantity | Code | Unit Price CIP | Total Price CIP |
|-------|---|------|----------|------|-------------------|------------------------|
| | | | (1) | | (2) | $(3) = (1) \times (2)$ |
| F | Earthing / Auxiliary Power Transformers | | | | | |
| F1 | Earthing / Auxiliary Power Transformer 33/0.4 kV, three phase 200 kVA, Dyn11, ONAN | Set | 2 | | | |
| F10.X | All other necessary material and equipment required for completing Earthing / Auxiliary Power transformers. | Lot | 1 | | | |
| G | Control, Protection, SCADA System and Metering | | | | | |
| | One (1) lot of complete equipment for control, protection, SCADA System and metering for 230, 132, 33 kV as well as LV AC and LV DC system (for complete substation) shall be designed, calculated, supplied, delivered, installed, tested and commissioned, under this contract. The control and protection panels shall mirror the switchyard layout. Enough space shall be reserved for future circuits. The system comprise the following: | Lot | 1 | | | |
| G1 | Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) | Set | 8 | | | |
| G2 | Control, Protection and SAS set for 132/33 kV Power Transformer circuits | Set | 4 | | | |
| G3 | Control, Protection and SAS set for Busbar 132 kV | Set | 1 | | | |
| G4.X | Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for each line and transformer feeder. For each feeder, minimum two (2) meters (main-1 & main-2) shall be provided | Lot | 1 | | | |
| G5.X | Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders | Lot | 1 | | | |
| G6.X | Tele-control & Tele-protection & Tele-metering facilities,A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut Bhaban, for integration of the complete substation.All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC | Lot | 1 | | | |
| G10.X | through the gateway of the substation automation system using the IEC 60870-5-104 protocol. All other necessary material and equipment required for completing control, protection, substation automation and metering system. | Lot | 1 | | | |
| Н | Fibre Optic Multiplexer Equipment for Tele-protection and Communication | | | | | |
| H1.X | Fibre Optic Multiplexer Equipment, a complete lot of fibre optic multiplexer equipment for protection & communication at substation shall be designed, supplied, delivered, installed, tested and commissioned, under this contract. Fibre optic multiplexer equipment is to be provided for. Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay SCADA data from switchgear and control system VOIP system (2-IP Phone) 2-W remote subscriber (10 telephone sets) | Lot | 1 | | | |

Name of Bidder:

Signature of Bidder:

| No | Equipment | Unit | Quantity <i>(1)</i> | Code | Foreign Curre Unit Price CIP (2) | ency (in) Total Price CIP (3) = (1) x (2) |
|------|---|------|------------------------|------|---|--|
| | Hot-line telephone system | | | | | |
| H3.X | A lot of underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame) shall be designed, supplied, delivered, installed, tested and commissioned, including supply and installation of MDF and digital cables | Lot | 1 | | | |
| I | Multicore Low Voltage Auxiliary Power and Control Cables | | | | - | |
| I1.X | A complete lot of multicore low voltage auxiliary power and control cables , including all other necessary material and equipment, between all items of equipment supplied under the contract shall be designed, supplied, delivered, installed, tested and commissioned | Lot | 1 | | | |
| J | LV DC, Batteries, Chargers and DC Distribution | | | | | |
| J1.X | A complete lot consists of two (2) sets of 110 V Ni-Cd batteries, complete with chargers and distribution switchboards, including all other necessary material and equipment, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide complete LV DC 110 V supplies for the substation. The system shall generally be as shown in the bid drawings and shall minimum include the following: (a) Two (2) sets of 100% Ni-Cd batteries, complete, each capacity shall not be less than 400 Ah at the 10-hour rate of discharge. (b) Two (2) sets of battery chargers complete, each float charge shall not be less than 100 A rating. (c) One (1) set of DC distribution switchboards. A complete lot consists of two (2) sets of 48V Ni-Cd batteries, complete with chargers and distribution switchboards, | Lot | 1 | | | |
| J2.X | including all other necessary material and equipment, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide complete LV DC 48 V supplies for fibre optic multiplexer equipment for control, protection metering and communication. The system shall generally be as shown in the bid drawings and shall minimum include the following: (a) Two (2) sets of 100% Ni-Cd batteries, complete, each capacity shall not be less than 250 Ah at the 5-hour rate of discharge. (b) Two (2) sets of battery chargers complete, each float charge shall not be less than 50 A rating. (c) One (1) set of DC distribution switchboard. | Lot | 1 | | | |
| К | LV AC Distribution | | | | | |
| K1.X | A complete lot, including all necessary material and equipment, including a set of LV AC switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide the LV AC 400/230V, 50 Hz auxiliary power supplies for the substation The system shall generally be as shown in the bid drawings and shall include one 125A outdoor weatherproof, 3-phase with neutral and earth switched socket outlet close to the power transformers | Lot | 1 | | | |
| L | Civil Works, Control Building and Foundations | | | | | |
| L1.X | One (1) lot of complete land development of complete switchyard area by cutting, land filling, compacting up to a suitable level. The approximate total area of the substation is 3 acres | Lot | 1 | | | |

Name of Bidder: Signatur

| | Schedule 1: Plant & Equipment supplied from Abroad | | | | | | | | |
|-------|--|------|------------------------|------|---|---|--|--|--|
| No | Equipment | Unit | Quantity <i>(1)</i> | Code | Foreign Curre Unit Price CIP (2) | ncy (in) Total Price CIP (3) = (1) x (2) | | | |
| L2.X | One (1) lot of complete design, supply and construction of outdoor civil works including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary power transformers foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing | Lot | 1 | | | | | | |
| L3.1X | One (1) lot of complete design, supply and construction of civil works and facilities for one new GIS 132 kV and control three- storey building with cable basement, including foundation works, super structure works, finishing works like rendering, painting, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, etc. | Lot | 1 | | | | | | |
| L3.2X | One (1) lot of complete design, supply and construction of civil works and facilities for water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipe lines, etc., sewage facilities including septic tank, etc. | Lot | 1 | | | | | | |
| L4.X | One (1) lot of complete Pile load test | Lot | 1 | | | | | | |
| М | Building Lighting, Small Power, Air Conditioning and Ventilation | | | | | | | | |
| M1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide lighting, LV power supply, air conditioning system, ventilation and emergency DC lighting for the substation control building(s). | Lot | 1 | | | | | | |
| Ν | Switchyard Lighting | | | | | | | | |
| N1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections. | Lot | 1 | | | | | | |
| Р | Earthing and Lightning Protection | | | - | | | | | |
| P1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, of earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations. | Lot | 1 | | | | | | |
| P2 | Two (2) sets of 3-phase portable (maintenance) earthing equipment devices with connectors and telescopic glass fibre operating stick suitable for each voltage | Set | 2 | | | | | | |
| Q | Cable | | | | | | | | |
| Q.2.2 | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three single phase XLPE cables with corresponding GIS connections and Cable End Terminals; with all required equipment; 145 kV, 1,000 A, 40 kA / 1 sec, 50 Hz, for connection of one 132 kV bay. Approximate lengths are 100 meters | Lot | 12 | | | | | | |
| Q3.1 | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three phase or three single phase cables and cable end terminal and correspondent equipment 36 kV, 800 A, 25 kA / 1 sec, 50 Hz. Approximate lengths are 100 meters | Lot | 4 | | | | | | |
| | Renovation/New 132/33/11 kV GIS Substation SHAHJIBAZ | AR | | | | | | | |

Schedule 1: Plant & Equipment supplied from Abroad

Subtotal - to Schedule 5 - Grand Total

| Schedule 1: F | Plant & Equipment | supplied from Abroad |
|---------------|-------------------|----------------------|
|---------------|-------------------|----------------------|

| | | | | | Foreign Currency (in) | | |
|-------|---|---------|----------|------|-----------------------|------------------------|--|
| No | Equipment | Unit | Quantity | Code | Unit Price CIP | Total Price CIP | |
| | | | (1) | | (2) | $(3) = (1) \times (2)$ | |
| | Renovation/Upgading of 132/33 kV AIS Subst | ation S | SATHK | HIRA | | | |
| В | 132 kV switchgear, equipment connection and steel structures | | | | | | |
| | One (1) set of complete equipment for switchgear 132 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | | |
| B5 | Surge arrester 145kV, 120 kV continuous operating voltage, 10kA nominal discharge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide type | Set | 3 | | | | |
| B7.X | Conductors for connection of the 132 kV switchgear, 145 kV, 2000 A, 40 kA | Lot | 1 | | | | |
| B8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear | Lot | 1 | | | | |
| B9.X | Gantry steel structures and equipment supports required for completing 132 kV switchgear | Lot | 1 | | | | |
| B10.X | All other necessary material and equipment required for completing 132 kV switchgear. | Lot | 1 | | | | |
| С | 33 kV Switchgear, equipment connection and steel structures | | | | | | |
| | One (1) set of complete equipment for switchgear 33 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | | |
| C5 | Surge arrester 36 kV, 30 kV continuous operating voltage, 10 kA nominal discharge current, 50 Hz, single phase, gapless, metal oxide type | Set | 3 | | | | |
| C7.X | Conductors for connection of the 33 kV switchgear, 36 kV, 2000 A, 25 kA | Lot | 1 | | | | |
| C8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 33 kV switchgear | Lot | 1 | | | | |
| C9.X | Gantry steel structures and equipment supports required for completing 33 kV switchgear | Lot | 1 | | | | |
| C10.X | All other necessary material and equipment required for completing 33 kV switchgear. | Lot | 1 | | | | |
| D | Transformers | | | - | | - | |
| D2 | Power transformer 132/33 kV three phase 80/120 MVA, Dyn1, ONAN/ONAF | Set | 1 | | | | |
| D9 | Water Spray System | Set | 1 | | | | |
| D10.X | All other necessary material and equipment required for completing transformers | Lot | 1 | | | | |
| G | Control, Protection, SCADA System and Metering | | | | | | |
| | Extension of the existing Control, Protection, SCADA System and Metering New equipment shall be integrated into the existing system. One (1) lot of equipment for extension of the existing control, protection, SCADA and metering for 230, 132, 33 kV as well as LV AC and LV DC system, for required part of substation, shall be designed, calculated, supplied, delivered, installed, | | | | | | |
| | tested and commissioned and integrated into the existing system, under this contract. The control and protection panels shall mirror the switchyard layout. | Lot | 1 | | | | |
| | Enough space shall be reserved for future circuits. | | | | | | |
| | The system comprise the following: | | | | | | |
| G1 | Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) | Set | 0 | | | | |
| G2 | Control, Protection and SAS set for 132/33 kV Power Transformer circuits | Set | 1 | | | | |
| G3 | Control, Protection and SAS set for Busbar 132 kV | Set | 0 | | | | |
| | Extension of the existing Tariff Metering | | | | | 1 | |

| | | | | | Foreign Currency (in) | | |
|-------|--|------|----------|------|--------------------------|---------------------------------------|--|
| No | Equipment | Unit | Quantity | Code | Unit Price CIP (2) | Total Price CIP (3) = (1) x (2) | |
| G4.XE | Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation. For each feeder, minimum two (2) meters (main-1 & main-2) shall be provided | Lot | 1 | | | | |
| G5.XE | Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, for required part of substation | Lot | 1 | | | | |
| G6.X | Tele-control & Tele-protection & Tele-metering facilities, A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut Bhaban, for integration of the complete substation. All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5-104 protocol. | Lot | 1 | | | | |
| G10.X | All other necessary material and equipment required for completing control, protection, substation automation and metering system. | Lot | 1 | | | | |
| Н | Fibre Optic Multiplexer Equipment for Tele-protection and Communication | | 1 | | | 1 | |
| H1.X | Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer equipment for protection & communication, for required part of substation, shall be designed, supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay SCADA data from switchgear and control system Hot-line telephone system | Lot | 1 | | | | |
| H3.XE | A lot of underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame) shall be designed, supplied, delivered, installed, tested and commissioned, including supply and installation of MDF and digital cables, for required part of substation | Lot | 1 | | | | |
| 1 | Multicore Low Voltage Auxiliary Power and Control Cables | | | | | | |
| I1.XE | A complete lot of multicore low voltage auxiliary power and control cables , including all other necessary material and equipment, between all items of equipment supplied under the contract , and connection and integration of new equipment with existing equipment, shall be designed, supplied, delivered, installed, tested and commissioned | Lot | 1 | | | | |
| J | LV DC, Batteries, Chargers and DC Distribution | | | - | | | |
| J1.XE | Extension of existing LV DC 110 V Auxiliary Power Supply A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV DC 110 V Auxiliary Power Supply and for connection of new equipment and integration with the existing equipment | Lot | 1 | | | | |
| | Extension of existing LV DC 48 V Auxiliary Power Supply | | | | | 1 | |

| Schedule 1: Plant & | Equipment | supplied from Ab | broad |
|---------------------|-----------|------------------|-------|
|---------------------|-----------|------------------|-------|

| No | Equipment | Unit | Quantity <i>(1)</i> | Code | Foreign Curre Unit Price CIP (2) | ncy (in) Total Price CIP (3) = (1) x (2) |
|-------|---|------|------------------------|------|---|---|
| J2.XE | A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV DC 48 V auxiliary power supply system for fibre optic multiplexer equipment for control, protection metering and communication and for connection of new equipment and integration with the existing equipment | | | | | |
| K | LV AC Distribution | | | | | |
| K1.XE | Extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system. A complete lot, including all necessary material and equipment, including a set of LV AC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system and for connection of new equipment and integration with the existing equipment | Lot | 1 | | | |
| L | Civil Works, Control Building and Foundations | | | | | |
| L2.XE | One (1) lot of complete design, supply and construction of outdoor civil works of required switchyard area, including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary power transformers foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing and for connection of new equipment and integration with the existing equipment | Lot | 1 | | | |
| L3.XE | One (1) lot of complete design, supply and construction of civil works and facilities for adaptation of the existing control building, including finishing works such as rendering, painting, floor finishing, etc. | Lot | 1 | | | |
| N | Switchyard Lighting | | | | | |
| N1.XE | One (1) lot of complete equipment for required switchyard area , shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections and for connection of new equipment and integration with the existing equipment . | Lot | 1 | | | |
| Р | Earthing and Lightning Protection | | | | | |
| P1.XE | One (1) lot of complete equipment for required switchyard area , shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations and for connection of new equipment and integration with the existing equipment . | Lot | 1 | | | |
| | Renovation/Upgading of 132/33 kV AIS Substation SATHKH Subtotal - to Schedule 5 - Grand Total | IIRA | | | | |

| | | | | | Foreign Curre | rrency (in) | |
|------|--|---------|----------|----------|-------------------|------------------------|--|
| No | Equipment | Unit | Quantity | Code | Unit Price CIP | Total Price CIP | |
| | Demovation/Novy 422/22 L// CIC Cubetet | | (1) | | (2) | $(3) = (1) \times (2)$ | |
| | Renovation/New 132/33 kV GIS Substat | ion 5 r | LHEI | | | | |
| В | 132 kV switchgear, equipment connection and steel structures | | | | | | |
| | One (1) set of complete equipment for switchgear 132 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | | |
| | A complete indoor and partly outdoor GIS Line feeder 145 kV, 3150 A busbars / 2000 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | | | | | | |
| | Q0 - One (1) set of three pole, GIS type, SF6 gas circuit breaker with three spring-stored energy operating mechanism | | | | | | |
| | Q1, Q2, Q9 - Three (3) sets of three pole, three positions, motor operated, insulated disconnector with earthing switch | | | | | | |
| | Q8 - One (1) set of three pole, make-proof, motor operated earthing switch | | | | | | |
| | T1 - Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1 A, GIS type current transformers | | | | | | |
| BG.1 | T5 - Three (3) single-phase, 2-secondary winding, 132/V3 / 110/V3 / 110/V3 kV/V/V, GIS type voltage transformers | Set | 8 | | | | |
| | T6 - One (1) set of three-phase, GIS type, hand operated disconnector link | | | | | | |
| | SA - Three (3) single-phase outdoor surge arresters, GIS type | | | | | | |
| | Z1 - One (1) set of three-phase, GIS type, cable compartment | | | | | | |
| | or | | | | | | |
| | Z2 - One (1) set of three phase indoor and outdoor GIB with three outdoor GIS/AIR bushings | | | | | | |
| | GIS.X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | | | | | | |
| | A complete indoor and partly outdoor GIS Transformer feeder 145 kV, 3150A busbars / 2000 A feeder, 40 kA, 50Hz, | | | | | | |
| | 650/275 kV BIL, equipped with: | | | | | | |
| | Q0 - One (1) set of three pole, GIS type, SF6 gas circuit breaker with one spring-stored energy operating mechanism | | | | | | |
| | Q1, Q2, Q9 - Three (3) set of three pole, three position, motor operated, insulated disconnector with earthing switch | | | | | | |
| | Q8 - One (1) set of three pole, make-proof, motor operated earthing switch | | | | | | |
| BG.2 | T1 - Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1 A, GIS type current transformers | Set | 4 | | | | |
| | SA - Three (3) single-phase outdoor surge arresters, GIS type | | | | | | |
| | Z1 - One (1) set of three-phase, GIS type, cable compartment | | | | | | |
| | or | | | | | | |
| | Z2 - One (1) set of three phase indoor and outdoor GIB with three outdoor GIS/AIR bushings | | | | | | |
| | X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | | | | | | |
| | A complete indoor GIS Bus Coupler bay 145 kV, 3150A busbars / 3150 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | | | | | | |
| BG.3 | Q0 - One (1) set of three pole, GIS type, SF6 gas circuit breaker with one spring-stored energy operating mechanism | Set | 1 | | | | |
| 66.3 | Q1, Q2 - Two (2) set of three pole, three position, motor operated, insulated disconnector with earthing switch | Jei | | | | | |
| | T1 - Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1/1 A, GIS type current transformers | | | | | | |
| | X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | | | <u> </u> | | | |

| | | | | | Foreign Currency (in) | | |
|----------|---|------|------------------------|------|--------------------------|---------------------------------------|--|
| No | Equipment | Unit | Quantity <i>(1)</i> | Code | Unit Price CIP (2) | Total Price CIP (3) = (1) x (2) | |
| | A complete indoor GIS Metering bay 145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | | (1) | | (2) | $(3) - (1) \times (2)$ | |
| | Q21, Q22 - Two (2) set of three pole, three position, motor operated, insulated disconnector | | | | | | |
| BG.4 | T5 - Three (3) single-phase, 2-winding, 132/V3 / 110/V3 / 110/V3 kV/V/V, GIS type voltage transformers | Set | 1 | | | | |
| | X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | | | | | | |
| | A complete indoor GIS Busbars Earthing bay 145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | | | | | | |
| BG.5 | Q81, Q82 - Two (2) set of three pole, make-proof, motor operated earthing switch | Set | 1 | | | | |
| <u> </u> | | | | | | | |
| B5 | Surge arrester 145kV, 120 kV continuous operating voltage, 10kA nominal discharge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide type | Set | 72 | | | | |
| B7.X | Conductors for connection of the 132 kV switchgear, 145 kV, 2000 A, 40 kA | Lot | 1 | | | | |
| B8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear | Lot | 1 | | | | |
| B9.X | Gantry steel structures and equipment supports required for completing 132 kV switchgear | Lot | 1 | | | | |
| B10.X | All other necessary material and equipment required for completing 132 kV switchgear. | Lot | 1 | | | | |
| С | 33 kV Switchgear, equipment connection and steel structures | | | | - | - | |
| | One (1) set of complete equipment for switchgear 33 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | | |
| C1 | Circuit Breaker 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, vacuum type, for outdoor installation with one spring-stored energy operating mechanism | Set | 4 | | | | |
| C2.1 | Disconnector 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated | Set | 7 | | | | |
| C2.2 | Disconnector 36 kV, 100 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated, with integrated fuse of 10 A | Set | 2 | | | | |
| C3.1 | Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 2000/1/1/1/1 A/A, 4-core, single ratio, post type | Set | 12 | | | | |
| C3.2 | Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 10/1/1/1 A/A, 3-core, single ratio, post type | Set | 6 | | | | |
| C4 | Voltage transformer 36kV, 50Hz, 170/70 kV BIL, single phase, 33/V3 / 110/V3 / 110/V3 kV/V/V, 2 secondary windings, inductive type | Set | 12 | | | | |
| C5 | Surge arrester 36 kV, 30 kV continuous operating voltage, 10 kA nominal discharge current, 50 Hz, single phase, gapless, metal oxide type | Set | 12 | | | | |
| C7.X | Conductors for single busbar system and for connection of the 33 kV switchgear, 36 kV, 2000 A, 25 kA | Lot | 1 | | | | |
| C8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 33 kV switchgear | Lot | 1 | | | | |
| C9.X | Gantry steel structures and equipment supports required for completing 33 kV switchgear | Lot | 1 | | | | |
| C10.X | All other necessary material and equipment required for completing 33 kV switchgear. | Lot | 1 | | | | |
| D | Transformers | | | | | | |
| D2 | Power transformer 132/33 kV three phase 80/120 MVA, Dyn1, ONAN/ONAF | Set | 2 | | | | |
| D9 | Water Spray System | Set | 2 | | | | |
| D10.X | All other necessary material and equipment required for completing transformers | Lot | 1 | | | | |
| F | Earthing / Auxiliary Power Transformers | | | _ | - | | |
| F1 | Earthing / Auxiliary Power Transformer 33/0.4 kV, three phase 200 kVA, Dyn11, ONAN | Set | 2 | | | | |

Name of Bidder:

| | | | | | Foreign Currency (in) | | |
|-------|---|-------|----------|---------|-----------------------|-----------------|--|
| No | | 11 14 | Quantity | 0 - 1 - | Unit Price | Total Price | |
| No | Equipment | Unit | | Code | CIP | CIP | |
| | | | (1) | | (2) | (3) = (1) x (2) | |
| F10.X | All other necessary material and equipment required for completing Earthing / Auxiliary Power transformers. | Lot | 1 | | | | |
| G | Control, Protection, SCADA System and Metering | | | | | | |
| | One (1) lot of complete equipment for control, protection, SCADA System and metering for 230, 132, 33 kV as well as LV AC and LV DC system (for complete substation) shall be designed, calculated, supplied, delivered, installed, tested and commissioned, under this contract. The control and protection panels shall mirror the switchyard layout. | Lot | 1 | | | | |
| | Enough space shall be reserved for future circuits. | | | | | | |
| | The system comprise the following: | | | | | | |
| G1 | Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) | Set | 8 | | | | |
| G2 | Control, Protection and SAS set for 132/33 kV Power Transformer circuits | Set | 4 | | | | |
| G3 | Control, Protection and SAS set for Busbar 132 kV | Set | 1 | | | | |
| G4.X | Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for each line and transformer feeder. For each feeder, minimum two (2) meters (main-1 & main-2) shall be provided | Lot | 1 | | | | |
| G5.X | Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders | Lot | 1 | | | | |
| G6.X | Tele-control & Tele-protection & Tele-metering facilities, A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut Bhaban, for integration of the complete substation. All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5-104 protocol. | Lot | 1 | | | | |
| G10.X | All other necessary material and equipment required for completing control, protection, substation automation and metering system. | Lot | 1 | | | | |
| Н | Fibre Optic Multiplexer Equipment for Tele-protection and Communication | | | | • | • | |
| H1.X | Fibre Optic Multiplexer Equipment, a complete lot of fibre optic multiplexer equipment for protection & communication at substation shall be designed, supplied, delivered, installed, tested and commissioned, under this contract. Fibre optic multiplexer equipment is to be provided for. Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay SCADA data from switchgear and control system VOIP system (2-IP Phone) 2-W remote subscriber (10 telephone sets) Hot-line telephone system | Lot | 1 | | | | |

| Schedule 1: Plant 8 | Equipment : | supplied from Abroad |
|---------------------|-------------|----------------------|
|---------------------|-------------|----------------------|

| No | Equipment | Unit | Quantity <i>(1)</i> | Code | Foreign Curro Unit Price CIP (2) | ency (in) Total Price CIP (3) = (1) x (2) |
|------|--|------|------------------------|------|---|--|
| H3.X | A lot of underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame) shall be designed, supplied, delivered, installed, tested and commissioned, including supply and installation of MDF and digital cables | Lot | 1 | | | |
| l I | Multicore Low Voltage Auxiliary Power and Control Cables | | | | | |
| I1.X | A complete lot of multicore low voltage auxiliary power and control cables , including all other necessary material and equipment, between all items of equipment supplied under the contract shall be designed, supplied, delivered, installed, tested and commissioned | Lot | 1 | | | |
| J | LV DC, Batteries, Chargers and DC Distribution | | | - | | |
| J1.X | A complete lot consists of two (2) sets of 110 V Ni-Cd batteries, complete with chargers and distribution switchboards, including all other necessary material and equipment, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide complete LV DC 110 V supplies for the substation. The system shall generally be as shown in the bid drawings and shall minimum include the following: (a) Two (2) sets of 100% Ni-Cd batteries, complete, each capacity shall not be less than 400 Ah at the 10-hour rate of discharge. (b) Two (2) sets of battery chargers complete, each float charge shall not be less than 100 A rating. (c) One (1) set of DC distribution switchboards. | Lot | 1 | | | |
| J2.X | A complete lot consists of two (2) sets of 48V Ni-Cd batteries, complete with chargers and distribution switchboards, including all other necessary material and equipment, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide complete LV DC 48 V supplies for fibre optic multiplexer equipment for control, protection metering and communication. The system shall generally be as shown in the bid drawings and shall minimum include the following: (a) Two (2) sets of 100% Ni-Cd batteries, complete, each capacity shall not be less than 250 Ah at the 5-hour rate of discharge. (b) Two (2) sets of battery chargers complete, each float charge shall not be less than 50 A rating. (c) One (1) set of DC distribution switchboard. | Lot | 1 | | | |
| К | LV AC Distribution | | | | | |
| K1.X | A complete lot, including all necessary material and equipment, including a set of LV AC switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide the LV AC 400/230V, 50 Hz auxiliary power supplies for the substation The system shall generally be as shown in the bid drawings and shall include one 125A outdoor weatherproof, 3-phase with neutral and earth switched socket outlet close to the power transformers | Lot | 1 | | | |
| L | Civil Works, Control Building and Foundations | | | | • | |
| L1.X | One (1) lot of complete land development of complete switchyard area by cutting, land filling, compacting up to a suitable level. The approximate total area of the substation is 3 acres | Lot | 1 | | | |

| | | | | | Foreign Curre | ncy (in) |
|-------|--|------|----------|------|-------------------|--------------------|
| No | Equipment | Unit | Quantity | Code | Unit Price CIP | Total Price CIP |
| | | | (1) | | (2) | (3) = (1) x (2) |
| L2.X | One (1) lot of complete design, supply and construction of outdoor civil works including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary power transformers foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing | Lot | 1 | | | |
| L3.1X | One (1) lot of complete design, supply and construction of civil works and facilities for one new GIS 132 kV and control three- storey building with cable basement, including foundation works, super structure works, finishing works like rendering, painting, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, etc. | Lot | 1 | | | |
| L3.2X | One (1) lot of complete design, supply and construction of civil works and facilities for one new warehouse, including foundation works, super structure works, finishing works like rendering, painting, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, etc. | Lot | 1 | | | |
| L3.3X | One (1) lot of complete design, supply and construction of civil works and facilities for water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipe lines, etc., sewage facilities including septic tank, etc. | Lot | 1 | | | |
| L4.X | One (1) lot of complete Pile load test | Lot | 1 | | | |
| М | Building Lighting, Small Power, Air Conditioning and Ventilation | | | | | |
| M1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide lighting, LV power supply, air conditioning system, ventilation and emergency DC lighting for the substation control building(s). | Lot | 1 | | | |
| N | Switchyard Lighting | | | | | |
| N1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections. | Lot | 1 | | | |
| Р | Earthing and Lightning Protection | | | | | |
| P1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, of earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations. | Lot | 1 | | | |
| P2 | Two (2) sets of 3-phase portable (maintenance) earthing equipment devices with connectors and telescopic glass fibre operating stick suitable for each voltage | Set | 2 | | | |
| Q | Cable | | | | | |
| Q.2.2 | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three single phase XLPE cables with corresponding GIS connections and Cable End Terminals; with all required equipment; 145 kV, 1,000 A, 40 kA / 1 sec, 50 Hz, for connection of one 132 kV bay. Approximate lengths are 50 to 100 meters | Lot | 12 | | | |

| No | Equipment | Unit | Quantity <i>(1)</i> | Code | Foreign Curre Unit Price CIP (2) | ncy (in) Total Price CIP (3) = (1) x (2) |
|------|---|------|------------------------|------|---|---|
| Q3.1 | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three phase or three single phase cables and cable end terminal and correspondent equipment 36 kV, 800 A, 25 kA / 1 sec, 50 Hz. Approximate lengths are 20 meters | Lot | 4 | | | |
| | Renovation/New 132/33 kV GIS Substation SYLHET Subtotal - to Schedule 5 - Grand Total | | | | | |

| Schedule 1: Plant & | Equipment suppl | lied from Abroad |
|---------------------|-----------------|------------------|
|---------------------|-----------------|------------------|

| | | | | | Foreign Currency (in) | | |
|------|--|------|----------|------|--------------------------|---------------------------------------|--|
| No | Equipment | Unit | Quantity | Code | Unit Price CIP (2) | Total Price CIP (3) = (1) x (2) | |
| | Extension of 132/33 kV AIS Substation I | BHAN | | | (~) | (3) - (1) x (2) | |
| В | 132 kV switchgear, equipment connection and steel structures | | | | 1 | | |
| | One (1) set of complete equipment for switchgear 132 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | | |
| B1.1 | Circuit Breaker 145 kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with three spring-stored energy operating mechanism | Set | 0 | | | | |
| B1.2 | Circuit Breaker 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with three spring-stored energy operating mechanism | Set | 2 | | | | |
| B1.3 | Circuit Breaker 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with three spring-stored energy operating mechanism | Set | 0 | | | | |
| B1.4 | Circuit Breaker 145 kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 | | | | |
| B1.5 | Circuit Breaker 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 | | | | |
| B1.6 | Circuit Breaker 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 | | | | |
| B2.1 | Disconnector with Earthing Switch 145kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch | Set | 0 | | | | |
| B2.2 | Disconnector with Earthing Switch 145kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch | Set | 2 | | | | |
| B2.3 | Disconnector with Earthing Switch 145kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch | Set | 0 | | | | |
| B2.4 | Disconnector 145kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 0 | | | | |
| B2.5 | Disconnector 145kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 6 | | | | |
| B2.6 | Disconnector 145kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 0 | | | | |
| B3.1 | Current transformer 145kV, 40kA, 50Hz, 650/275 kV BIL, single phase, 4000-2000/1/1/1/1/1 A/A, 5-core, multi ratio, post type | Set | 0 | | | | |
| B3.2 | Current transformer 145kV, 40kA, 50Hz, 650/275 kV BIL, single phase, 2000-1000/1/1/1/1 A/A, 5-core, multi ratio, post type | Set | 6 | | | | |
| B4 | Voltage transformer 145kV, 50Hz, 650/275 kV BIL, single phase, 132/V3 / 110/V3 / 110/V3 kV/V/V, 2 secondary windings, capacitor type | Set | 6 | | | | |
| B5 | Surge arrester 145kV, 120 kV continuous operating voltage, 10kA nominal discharge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide type | Set | 6 | | | | |
| B7.X | Conductors for double busbar system and for connection of the 132 kV switchgear, 145 kV, 3150 & 2000 A, 40 kA | Lot | 1 | | | | |
| B8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear | Lot | 1 | | | | |

| | | | Quantity | | Foreign Curre Unit Price | ency (in) Total Price |
|-------|---|------|----------|------|-----------------------------|--------------------------|
| No | Equipment | Unit | | Code | CIP | CIP |
| | | | (1) | | (2) | $(3) = (1) \times (2)$ |
| B9.X | Gantry steel structures and equipment supports required for completing 132 kV switchgear | Lot | 1 | | | |
| B10.X | All other necessary material and equipment required for completing 132 kV switchgear. | Lot | 1 | | | |
| G | Control, Protection, SCADA System and Metering | | | | | |
| | Extension of the existing Control, Protection, SCADA System and Metering | | | | | |
| | New equipment shall be integrated into the existing system. | | | | | |
| | One (1) lot of equipment for extension of the existing control, protection, SCADA and metering for 230, 132, 33 kV as well | | | | | |
| | as LV AC and LV DC system, for required part of substation, shall be designed, calculated, supplied, delivered, installed, | Lot | 1 | | | |
| | tested and commissioned and integrated into the existing system, under this contract. | 201 | | | | |
| | The control and protection panels shall mirror the switchyard layout. | | | | | |
| | Enough space shall be reserved for future circuits. | | | | | |
| | The system comprise the following: | | | | | |
| G1 | Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) | Set | 2 | | | |
| G2 | Control, Protection and SAS set for 132/33 kV Power Transformer circuits | Set | 0 | | | |
| G3 | Control, Protection and SAS set for Busbar 132 kV | Set | 0 | | | |
| | Extension of the existing Tariff Metering | | | | | |
| G4.XE | Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh | Lot | 1 | | | |
| | and MVArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation. For | | | | | |
| | each feeder, minimum two (2) meters (main-1 & main-2) shall be provided | | | | | |
| G5.XE | Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, for required part of substation | Lot | 1 | | | |
| | Tele-control & Tele-protection & Tele-metering facilities, | | | | | |
| | A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, | | | | | |
| | modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and | | | | | |
| G6.X | at the back-up station at Biddut Bhaban, for integration of the complete substation. | Lot | 1 | | | |
| | All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the | | | | | |
| | substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC | | | | | |
| | through the gateway of the substation automation system using the IEC 60870-5-104 protocol. | | | | | |
| | All other recordence waterial and environment required for completion control involvation, substation substation and | | | | | |
| G10.X | All other necessary material and equipment required for completing control, protection, substation automation and metering system. | Lot | 1 | | | |
| | | | | | | |
| Н | Fibre Optic Multiplexer Equipment for Tele-protection and Communication | | | | 1 | 1 |
| | Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer | | | | | |
| | equipment for protection & communication, for required part of substation, shall be designed, supplied, delivered, installed, | | | | | |
| | tested and commissioned and integrated into the existing system , under this contract. Fibre optic multiplexer equipment is to be provided for. | | | | | |
| H1.X | | Lot | 1 | | | |
| | Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay | | | | | |
| 1 | Dus protection / preaker railure relay | | 1 | | 1 | 1 |

| | | | | | Foreign Currency (in | |
|-------|---|------|----------|------|----------------------|--------------------|
| No | Equipment | Unit | Quantity | Code | Unit Price CIP | Total Price CIP |
| | | | (1) | | (2) | (3) = (1) x (2) |
| | SCADA data from switchgear and control system | | | | | |
| | Hot-line telephone system | | | | | |
| H3.XE | A lot of underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame) shall be designed, supplied, delivered, installed, tested and commissioned, including supply and installation of MDF and digital cables, for required part of substation | Lot | 1 | | | |
| - I | Multicore Low Voltage Auxiliary Power and Control Cables | | | | | |
| I1.XE | A complete lot of multicore low voltage auxiliary power and control cables , including all other necessary material and equipment, between all items of equipment supplied under the contract, and connection and integration of new equipment with existing equipment, shall be designed, supplied, delivered, installed, tested and commissioned | Lot | 1 | | | |
| J | LV DC, Batteries, Chargers and DC Distribution | | | | | |
| | Extension of existing LV DC 110 V Auxiliary Power Supply | | | | | |
| J1.XE | A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV DC 110 V Auxiliary Power Supply and for connection of new equipment and integration with the existing equipment | | 1 | | | |
| | Extension of existing LV DC 48 V Auxiliary Power Supply | Lot | | | | |
| J2.XE | A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV DC 48 V auxiliary power supply system for fibre optic multiplexer equipment for control, protection metering and communication and for connection of new equipment and integration with the existing equipment | | | | | |
| К | LV AC Distribution | | | | | |
| K1.XE | Extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system. A complete lot, including all necessary material and equipment, including a set of LV AC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system and for connection of new equipment and integration with the existing equipment | Lot | 1 | | | |
| L | Civil Works, Control Building and Foundations | | , | | | |
| L2.XE | One (1) lot of complete design, supply and construction of outdoor civil works of required switchyard area, including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary power transformers foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing and for connection of new equipment and integration with the existing equipment | Lot | 1 | | | |
| L3.XE | One (1) lot of complete design, supply and construction of civil works and facilities for adaptation of the existing control building, including finishing works such as rendering, painting, floor finishing, etc. | Lot | 1 | | | |

Name of Bidder: Signature of Bidder:

| No | Equipment | Unit | Quantity <i>(1)</i> | Code | Foreign Curre Unit Price CIP (2) | ncy (in) Total Price CIP (3) = (1) x (2) |
|-------|--|------|------------------------|------|---|---|
| N | Switchyard Lighting | | | | | |
| N1.XE | One (1) lot of complete equipment for required switchyard area , shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections and for connection of new equipment and integration with the existing equipment . | Lot | 1 | | | |
| Р | Earthing and Lightning Protection | - | | | | |
| P1.XE | One (1) lot of complete equipment for required switchyard area , shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations and for connection of new equipment and integration with the existing equipment . | Lot | 1 | | | |
| Q | Cable | | | | | |
| Q.2.2 | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three single phase XLPE cables with corresponding GIS connections and Cable End Terminals; with all required equipment; 145 kV, 1,000 A, 40 kA / 1 sec, 50 Hz, for connection of one 132 kV bay. Approximate lengths are 100 meters | Lot | 2 | | | |
| | Extension of 132/33 kV AIS Substation BHANDARIA Subtotal - to Schedule 5 - Grand Total | | | | | |

| No | Equipment | Unit | Quantity | Code | Foreign Curre Unit Price CIP | ency (in) Total Price CIP |
|------|--|-------|----------|------|------------------------------------|---------------------------------|
| | | | (1) | | (2) | $(3) = (1) \times (2)$ |
| | Extension of 230/132/33 kV AIS Substation | n BAR | ISAL (I | N) | | |
| В | 132 kV switchgear, equipment connection and steel structures | | | | | |
| | One (1) set of complete equipment for switchgear 132 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | |
| B1.1 | Circuit Breaker 145 kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with three spring-stored energy operating mechanism | Set | 0 | | | |
| B1.2 | Circuit Breaker 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with three spring-stored energy operating mechanism | Set | 2 | | | |
| B1.3 | Circuit Breaker 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with three spring-stored energy operating mechanism | Set | 0 | | | |
| B1.4 | Circuit Breaker 145 kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 | | | |
| B1.5 | Circuit Breaker 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 | | | |
| B1.6 | Circuit Breaker 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 | | | |
| B2.1 | Disconnector with Earthing Switch 145kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch | Set | 0 | | | |
| B2.2 | Disconnector with Earthing Switch 145kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch | Set | 2 | | | |
| B2.3 | Disconnector with Earthing Switch 145kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch | Set | 0 | | | |
| B2.4 | Disconnector 145kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 0 | | | |
| B2.5 | Disconnector 145kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 4 | | | |
| B2.6 | Disconnector 145kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 0 | | | |
| B3.1 | Current transformer 145kV, 40kA, 50Hz, 650/275 kV BIL, single phase, 4000-2000/1/1/1/1 A/A, 5-core, multi ratio, post type | Set | 0 | | | |
| B3.2 | Current transformer 145kV, 40kA, 50Hz, 650/275 kV BIL, single phase, 2000-1000/1/1/1/1 A/A, 5-core, multi ratio, post type | Set | 6 | | | |
| B4 | Voltage transformer 145kV, 50Hz, 650/275 kV BIL, single phase, 132/V3 / 110/V3 / 110/V3 kV/V/V, 2 secondary windings, capacitor type | Set | 6 | | | |
| B5 | Surge arrester 145kV, 120 kV continuous operating voltage, 10kA nominal discharge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide type | Set | 6 | | | |
| B7.X | Conductors for double busbar system and for connection of the 132 kV switchgear, 145 kV, 3150 & 2000 A, 40 kA | Lot | 1 | | | |
| B8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear | Lot | 1 | | | |
| | | | | | | |

Name of Bidder:

Signature of Bidder:

| | | | Quantity | | Foreign Curre Unit Price | ency (in) Total Price |
|-------|--|------|----------|------|-----------------------------|--------------------------|
| No | Equipment | Unit | | Code | CIP | CIP |
| | | | (1) | | (2) | $(3) = (1) \times (2)$ |
| B9.X | Gantry steel structures and equipment supports required for completing 132 kV switchgear | Lot | 1 | | | |
| B10.X | All other necessary material and equipment required for completing 132 kV switchgear. | Lot | 1 | | | |
| G | Control, Protection, SCADA System and Metering | | | | | |
| | Extension of the existing Control, Protection, SCADA System and Metering | | | | | |
| | New equipment shall be integrated into the existing system. | | | | | |
| | One (1) lot of equipment for extension of the existing control, protection, SCADA and metering for 230, 132, 33 kV as well | | | | | |
| | as LV AC and LV DC system, for required part of substation, shall be designed, calculated, supplied, delivered, installed, | Lot | 1 | | | |
| | tested and commissioned and integrated into the existing system, under this contract. | LOI | | | | |
| | The control and protection panels shall mirror the switchyard layout. | | | | | |
| | Enough space shall be reserved for future circuits. | | | | | |
| | The system comprise the following: | | | | | |
| G1 | Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) | Set | 2 | | | |
| G2 | Control, Protection and SAS set for 132/33 kV Power Transformer circuits | Set | 0 | | | |
| G3 | Control, Protection and SAS set for Busbar 132 kV | Set | 0 | | | |
| | Extension of the existing Tariff Metering | | | | | |
| G4.XE | Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh | Lot | 1 | | | |
| G4.AL | and MVArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation. For | LUI | ' | | | |
| | each feeder, minimum two (2) meters (main-1 & main-2) shall be provided | | | | | |
| G5.XE | Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, for required part of substation | Lot | 1 | | | |
| | Tele-control & Tele-protection & Tele-metering facilities, | | | | | |
| | A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, | | | | | |
| | modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware | | | | | |
| G6.X | and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and | Lot | 1 | | | |
| | at the back-up station at Biddut Bhaban, for integration of the complete substation. | | | | | |
| | All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the | | | | | |
| | substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC | | | | | |
| | through the gateway of the substation automation system using the IEC 60870-5-104 protocol. | | | | | |
| G10.X | All other necessary material and equipment required for completing control, protection, substation automation and | Lot | 1 | | | |
| GIU.X | metering system. | LUI | ' | | | |
| Н | Fibre Optic Multiplexer Equipment for Tele-protection and Communication | | | | L | L |
| | Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer | | | | | |
| | equipment for protection & communication, for required part of substation, shall be designed, supplied, delivered, installed, | | | | | |
| | tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is | | | | | |
| H1.X | to be provided for. | Lot | 1 | | | |
| H1.X | Distance relay carrier signal (main and back-up) | LUI | ' | | | |
| | Bus protection / breaker failure relay | | | | | |

| | | | Quantity | | Foreign Curre | ncy (in) |
|----------|---|------|----------|------|---------------|------------------------|
| No | Equipment | Unit | | Code | Unit Price | Total Price |
| | Lyupment | | | Code | CIP | CIP |
| | | | (1) | | (2) | $(3) = (1) \times (2)$ |
| | SCADA data from switchgear and control system | | | | | |
| | Hot-line telephone system | | | | | |
| H3.XE | A lot of underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame) shall be designed, supplied, delivered, installed, tested and commissioned, including supply and installation of MDF and digital cables, for required part of substation | Lot | 1 | | | |
| <u> </u> | Multicore Low Voltage Auxiliary Power and Control Cables | | | | - | |
| I1.XE | A complete lot of multicore low voltage auxiliary power and control cables , including all other necessary material and equipment, between all items of equipment supplied under the contract, and connection and integration of new equipment with existing equipment , shall be designed, supplied, delivered, installed, tested and commissioned | Lot | 1 | | | |
| J | LV DC, Batteries, Chargers and DC Distribution | | | | | |
| | Extension of existing LV DC 110 V Auxiliary Power Supply | | | | | |
| J1.XE | A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV DC 110 V Auxiliary Power Supply and for connection of new equipment and integration with the existing equipment | | 1 | | | |
| | Extension of existing LV DC 48 V Auxiliary Power Supply | Lot | | | | |
| J2.XE | A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV DC 48 V auxiliary power supply system for fibre optic multiplexer equipment for control, protection metering and communication and for connection of new equipment and integration with the existing equipment | | | | | |
| K | LV AC Distribution | | | | | |
| | Extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system. | | | | | |
| K1.XE | A complete lot, including all necessary material and equipment, including a set of LV AC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system and for connection of new equipment and integration with the existing equipment | Lot | 1 | | | |
| L | Civil Works, Control Building and Foundations | | | | | |
| L2.XE | One (1) lot of complete design, supply and construction of outdoor civil works of required switchyard area, including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary power transformers foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing and for connection of new equipment and integration with the existing equipment | Lot | 1 | | | |
| L3.XE | One (1) lot of complete design, supply and construction of civil works and facilities for adaptation of the existing control building, including finishing works such as rendering, painting, floor finishing, etc. | Lot | 1 | | | |

Name of Bidder: Signature of Bidder:

| No | Equipment | Unit | Quantity <i>(1)</i> | Code | Foreign Curre Unit Price CIP (2) | ncy (in) Total Price CIP (3) = (1) x (2) |
|-------|--|------|------------------------|------|---|---|
| N | Switchyard Lighting | | | | r | 1 |
| N1.XE | One (1) lot of complete equipment for required switchyard area , shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections and for connection of new equipment and integration with the existing equipment . | Lot | 1 | | | |
| Р | Earthing and Lightning Protection | | | | • | |
| P1.XE | One (1) lot of complete equipment for required switchyard area , shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations and for connection of new equipment and integration with the existing equipment . | Lot | 1 | | | |
| | Extension of 230/132/33 kV AIS Substation BARISAL (N Subtotal - to Schedule 5 - Grand Total |) | | | | |

Schedule 1: Plant & Equipment supplied from Abroad

Name of Bidder:

| | | | | Foreian Curre | ency (in) | Local Curre | Local Currency (in BDT) | |
|------|--|-------|----------|-------------------|------------------------|-------------------|-------------------------|--|
| No | Equipment | Unit | Quantity | Unit Price CIP | Total Price CIP | Unit Price EXW | Total Price EXW | |
| | | | (1) | (2) | $(3) = (1) \times (2)$ | (4) | (5)=(1)x(4) | |
| | Renovation/New 132/33/11 kV GIS Substatio | n SHA | HJIBA | ZAR | | | 1 | |
| В | 132 kV switchgear, equipment connection and steel structures | | | | | | | |
| | One (1) set of complete equipment for switchgear 132 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | | | |
| BG.1 | A complete indoor and partly outdoor GIS Line feeder 145 kV, 3150 A busbars / 2000 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: Q0 - One (1) set of three pole, GIS type, SF6 gas circuit breaker with three spring-stored energy operating mechanism Q1, Q2, Q9 - Three (3) sets of three pole, three positions, motor operated, insulated disconnector with earthing switch Q8 - One (1) set of three pole, make-proof, motor operated earthing switch T1 - Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1/1 A, GIS type current transformers T5 - Three (3) single-phase, 2-secondary winding, 132/V3 / 110/V3 / 110/V3 kV/V/V, GIS type voltage transformers T6 - One (1) set of three-phase, GIS type, hand operated disconnector link SA - Three (3) single-phase outdoor surge arresters, GIS type Z1 - One (1) set of three-phase, GIS type, cable compartment or Z2 - One (1) set of three phase indoor and outdoor GIB with three outdoor GIS/AIR bushings GIS.X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | Set | 8 | | | | | |
| BG.2 | A complete indoor and partly outdoor GIS Transformer feeder 145 kV, 3150A busbars / 2000 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: Q0 - One (1) set of three pole, GIS type, SF6 gas circuit breaker with one spring-stored energy operating mechanism Q1, Q2, Q9 - Three (3) set of three pole, three position, motor operated, insulated disconnector with earthing switch Q8 - One (1) set of three pole, make-proof, motor operated earthing switch T1 - Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1/1 A, GIS type current transformers SA - Three (3) single-phase outdoor surge arresters, GIS type Z1 - One (1) set of three-phase, GIS type, cable compartment or Z2 - One (1) set of three phase indoor and outdoor GIB with three outdoor GIS/AIR bushings X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | Set | 4 | | | | | |
| BG.3 | A complete indoor GIS Bus Coupler bay 145 kV, 3150A busbars / 3150 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: Q0 - One (1) set of three pole, GIS type, SF6 gas circuit breaker with one spring-stored energy operating mechanism Q1, Q2 - Two (2) set of three pole, three position, motor operated, insulated disconnector with earthing switch T1 - Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1 A, GIS type current transformers X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | Set | 1 | | | | | |

Name of Bidder:

| | | | . , | Foreign Currency (in) Loca | | Local Curre | ncy (in BDT) |
|---------|---|------|----------|----------------------------|-----------------|-------------|--------------|
| | | | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| No | Equipment | Unit | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| | A complete indoor GIS Metering bay 145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | | | | | | |
| | Q21, Q22 - Two (2) set of three pole, three position, motor operated, insulated disconnector | | | | | | |
| BG.4 | T5 - Three (3) single-phase, 2-winding, 132/V3 / 110/V3 / 110/V3 kV/V/V, GIS type voltage transformers | Set | 1 | | | | |
| | X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | | | | | | |
| | A complete indoor GIS Busbars Earthing bay 145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | | | | | | |
| BG.5 | Q81, Q82 - Two (2) set of three pole, make-proof, motor operated earthing switch | Set | 1 | | | | |
| | Surge arrester 145kV, 120 kV continuous operating voltage, 10kA nominal discharge current, 50Hz, single phase, heavy | | 1 | | | | |
| B5 | duty, station class, gapless, metal oxide type | Set | 72 | | | | |
| B6 | Post Insulator 132kV, 50 Hz, 650/275 kV BIL, 10 kN | Set | 72 | | | | |
| B7.X | Conductors for connection of the 132 kV switchgear, 145 kV, 2000 A, 40 kA | Lot | 1 | | | | |
| B8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear | Lot | 1 | | | | |
| B9.X | Gantry steel structures and equipment supports required for completing 132 kV switchgear | Lot | 1 | | | | |
| B10.X | All other necessary material and equipment required for completing 132 kV switchgear. | Lot | 1 | | | | |
| С | 33 kV Switchgear, equipment connection and steel structures | | | | | | |
| | One (1) set of complete equipment for switchgear 33 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | | |
| C1 | Circuit Breaker 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, vacuum type, for outdoor installation with one spring-stored energy operating mechanism | Set | 4 | | | | |
| C2.1 | Disconnector 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated | Set | 7 | | | | |
| C2.2 | Disconnector 36 kV, 100 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated, with integrated fuse of 10 A | Set | 2 | | | | |
| C3.1 | Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 2000/1/1/1/1 A/A, 4-core, single ratio, post type | Set | 12 | | | | |
| C3.2 | Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 10/1/1/1 A/A, 3-core, single ratio, post type | Set | 6 | | | | |
| C4 | Voltage transformer 36kV, 50Hz, 170/70 kV BIL, single phase, 33/V3 / 110/V3 / 110/V3 kV/V/V, 2 secondary windings, inductive type | Set | 12 | | | | |
| C5 | Surge arrester 36 kV, 30 kV continuous operating voltage, 10 kA nominal discharge current, 50 Hz, single phase, gapless, metal oxide type | Set | 12 | | | | |
| C7.X | Conductors for single busbar system and for connection of the 33 kV switchgear, 36 kV, 2000 A, 25 kA | Lot | 1 | | | | |
| C8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 33 kV switchgear | Lot | 1 | | | | |
| C9.X | Gantry steel structures and equipment supports required for completing 33 kV switchgear | Lot | 1 | | | | |
| C10.X | All other necessary material and equipment required for completing 33 kV switchgear. | Lot | 1 | | | | |
| D | Transformers | | | | | | |
| D2 | Power transformer 132/33 kV three phase 80/120 MVA, Dyn1, ONAN/ONAF | Set | 2 | | | | |
| D9 | Water Spray System | Set | 2 | | | | |
| D10.X | All other necessary material and equipment required for completing transformers | Lot | 1 | | | | |

Name of Bidder:

| | | | | Foreign Curre | ency (in) | Local Curre | ency (in BDT) |
|-------|---|------|----------|---------------|-----------------|-------------|---------------|
| | | | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| No | Equipment | Unit | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| F | Earthing / Auxiliary Power Transformers | | | | | | |
| F1 | Earthing / Auxiliary Power Transformer 33/0.4 kV, three phase 200 kVA, Dyn11, ONAN | Set | 2 | | | | |
| F10.X | All other necessary material and equipment required for completing Earthing / Auxiliary Power transformers. | Lot | 1 | | | | |
| G | Control, Protection, SCADA System and Metering | | | | | | |
| | One (1) lot of complete equipment for control, protection, SCADA System and metering for 230, 132, 33 kV as well as LV AC and LV DC system (for complete substation) shall be designed, calculated, supplied, delivered, installed, tested and commissioned, under this contract. | | | | | | |
| | The control and protection panels shall mirror the switchyard layout. | Lot | 1 | | | | |
| | Enough space shall be reserved for future circuits. | | | | | | |
| | The system comprise the following: | | | | | | |
| G1 | Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) | Set | 8 | | | | |
| G2 | Control, Protection and SAS set for 132/33 kV Power Transformer circuits | Set | 4 | | | | |
| G3 | Control, Protection and SAS set for Busbar 132 kV | Set | 1 | | | | |
| | Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh | 001 | | | | | |
| G4.X | and MVArh meters (accuracy class 0.2) for each line and transformer feeder. For each feeder, minimum two (2) meters (main-1 & main-2) shall be provided | Lot | 1 | | | | |
| G5.X | Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders | Lot | 1 | | | | |
| G6.X | Tele-control & Tele-protection & Tele-metering facilities, A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut Bhaban, for integration of the complete substation. All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5-104 protocol. | Lot | 1 | | | | |
| G10.X | All other necessary material and equipment required for completing control, protection, substation automation and metering system. | Lot | 1 | | | | |
| Н | Fibre Optic Multiplexer Equipment for Tele-protection and Communication | | | | | | |
| H1.X | Fibre Optic Multiplexer Equipment, a complete lot of fibre optic multiplexer equipment for protection & communication at substation shall be designed, supplied, delivered, installed, tested and commissioned, under this contract. Fibre optic multiplexer equipment is to be provided for. Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay SCADA data from switchgear and control system VOIP system (2-IP Phone) 2-W remote subscriber (10 telephone sets) Hot-line telephone system | Lot | 1 | | | | |

Name of Bidder:

| | Schedule 2: Plant & Equipment Supplied from within | i the E | трюу | • • | | | | | | |
|------|---|---------|----------|------------|-----------------|--------------|--------------|--|--|--|
| | | | | | | Local Currer | ncy (in BDT) | | | |
| Ne | Equipment | Unit | Quantity | Unit Price | Total Price | Unit Price | Total Price | | | |
| No | Jupment | | CIP | CIP | EXW | EXW | | | | |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) | | | |
| H3.X | A lot of underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame) shall be designed, supplied, delivered, installed, tested and commissioned, including supply and installation of MDF and digital cables | Lot | 1 | | | | | | | |
| 1 | Multicore Low Voltage Auxiliary Power and Control Cables | | | | | | | | | |
| I1.X | A complete lot of multicore low voltage auxiliary power and control cables , including all other necessary material and equipment, between all items of equipment supplied under the contract shall be designed, supplied, delivered, installed, tested and commissioned | Lot | 1 | | | | | | | |
| J | LV DC, Batteries, Chargers and DC Distribution | | | | | | | | | |
| J1.X | A complete lot consists of two (2) sets of 110 V Ni-Cd batteries, complete with chargers and distribution switchboards, including all other necessary material and equipment, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide complete LV DC 110 V supplies for the substation. The system shall generally be as shown in the bid drawings and shall minimum include the following: (a) Two (2) sets of 100% Ni-Cd batteries, complete, each capacity shall not be less than 400 Ah at the 10-hour rate of discharge. (b) Two (2) sets of battery chargers complete, each float charge shall not be less than 100 A rating. (c) One (1) set of DC distribution switchboards. A complete lot consists of two (2) sets of 48V Ni-Cd batteries, complete with chargers and distribution switchboards, including all other necessary material and equipment, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide complete LV DC 48 V supplies for fibre optic multiplexer equipment for control, | Lot | 1 | | | | | | | |
| J2.X | protection metering and communication. The system shall generally be as shown in the bid drawings and shall minimum include the following: (a) Two (2) sets of 100% Ni-Cd batteries, complete, each capacity shall not be less than 250 Ah at the 5-hour rate of discharge. (b) Two (2) sets of battery chargers complete, each float charge shall not be less than 50 A rating. (c) One (1) set of DC distribution switchboard. | Lot | 1 | | | | | | | |
| K | LV AC Distribution | | | | | | | | | |
| K1.X | A complete lot, including all necessary material and equipment, including a set of LV AC switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide the LV AC 400/230V, 50 Hz auxiliary power supplies for the substation The system shall generally be as shown in the bid drawings and shall include one 125A outdoor weatherproof, 3-phase with | Lot | 1 | | | | | | | |
| | neutral and earth switched socket outlet close to the power transformers | | | | | | | | | |
| L | Civil Works, Control Building and Foundations | | | | | | | | | |
| L1.X | One (1) lot of complete land development of complete switchyard area by cutting, land filling, compacting up to a suitable level. | Lot | 1 | | | | | | | |

Name of Bidder:

Signature of Bidder:

The approximate total area of the substation is 3 acres

| | | | | Foreign Curre | ency (in) | Local Curre | ncy (in BDT) |
|-------|--|------|-----------------|--------------------------|---------------------------------------|--------------------------|-----------------------------------|
| No | Equipment | Unit | Quantity (1) | Unit Price CIP (2) | Total Price CIP (3) = (1) x (2) | Unit Price EXW (4) | Total Price EXW (5)=(1)x(4) |
| L2.X | One (1) lot of complete design, supply and construction of outdoor civil works including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary power transformers foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing | Lot | 1 | | | | |
| L3.1X | One (1) lot of complete design, supply and construction of civil works and facilities for one new GIS 132 kV and control three- storey building with cable basement, including foundation works, super structure works, finishing works like rendering, painting, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, etc. | Lot | 1 | | | | |
| L3.2X | One (1) lot of complete design, supply and construction of civil works and facilities for water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipe lines, etc., sewage facilities including septic tank, etc. | Lot | 1 | | | | |
| L4.X | One (1) lot of complete Pile load test | Lot | 1 | | | | |
| М | Building Lighting, Small Power, Air Conditioning and Ventilation | | | | | | |
| M1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide lighting, LV power supply, air conditioning system, ventilation and emergency DC lighting for the substation control building(s). | Lot | 1 | | | | |
| N | Switchyard Lighting | | | | | | |
| N1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections. | Lot | 1 | | | | |
| Р | Earthing and Lightning Protection | | | | | | |
| P1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, of earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations. | Lot | 1 | | | | |
| P2 | Two (2) sets of 3-phase portable (maintenance) earthing equipment devices with connectors and telescopic glass fibre operating stick suitable for each voltage | Set | 2 | | | | |
| Q | Cable | | | | | | |
| Q.2.2 | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three single phase XLPE cables with corresponding GIS connections and Cable End Terminals; with all required equipment; 145 kV, 1,000 A, 40 kA / 1 sec, 50 Hz, for connection of one 132 kV bay. Approximate lengths are 100 meters | Lot | 12 | | | | |
| Q3.1 | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three phase or three single phase cables and cable end terminal and correspondent equipment 36 kV, 800 A, 25 kA / 1 sec, 50 Hz. Approximate lengths are 100 meters | Lot | 4 | | | | |
| | Renovation/New 132/33/11 kV GIS Substation SHAHJIBAZ Subtotal - to Schedule 5 - Grand Total | AR | 1 | | | | |

| | | | | Foreign Currency (in) | | Local Currency (in BDT) | |
|-------|--|-------|----------|-----------------------|------------------------|-------------------------|-------------|
| No | Equipment | Unit | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| | | • | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | $(3) = (1) \times (2)$ | (4) | (5)=(1)x(4) |
| | | | | | | | |
| | Renovation/Upgading of 132/33 kV AIS Subst | ation | SATHK | HIRA | | | |
| В | 132 kV switchgear, equipment connection and steel structures | | | | | | |
| | One (1) set of complete equipment for switchgear 132 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | | |
| B5 | Surge arrester 145kV, 120 kV continuous operating voltage, 10kA nominal discharge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide type | Set | 3 | | | | |
| B7.X | Conductors for connection of the 132 kV switchgear, 145 kV, 2000 A, 40 kA | Lot | 1 | | | | |
| B8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear | Lot | 1 | | | | |
| B9.X | Gantry steel structures and equipment supports required for completing 132 kV switchgear | Lot | 1 | | | | |
| B10.X | All other necessary material and equipment required for completing 132 kV switchgear. | Lot | 1 | | | | |
| С | 33 kV Switchgear, equipment connection and steel structures | | | | | | |
| | One (1) set of complete equipment for switchgear 33 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | | |
| C5 | Surge arrester 36 kV, 30 kV continuous operating voltage, 10 kA nominal discharge current, 50 Hz, single phase, gapless, metal oxide type | Set | 3 | | | | |
| C7.X | Conductors for connection of the 33 kV switchgear, 36 kV, 2000 A, 25 kA | Lot | 1 | | | | |
| C8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 33 kV switchgear | Lot | 1 | | | | |
| C9.X | Gantry steel structures and equipment supports required for completing 33 kV switchgear | Lot | 1 | | | | |
| C10.X | All other necessary material and equipment required for completing 33 kV switchgear. | Lot | 1 | | | | |
| D | Transformers | | | | | | |
| D2 | Power transformer 132/33 kV three phase 80/120 MVA, Dyn1, ONAN/ONAF | Set | 1 | | | | |
| D9 | Water Spray System | Set | 1 | | | | |
| D10.X | All other necessary material and equipment required for completing transformers | Lot | 1 | | | | |
| G | Control, Protection, SCADA System and Metering | | | | | | |
| | Extension of the existing Control, Protection, SCADA System and Metering | | | | | | |
| | New equipment shall be integrated into the existing system. | | | | | | |
| | One (1) lot of equipment for extension of the existing control, protection, SCADA and metering for 230, 132, 33 kV as well | | | | | | |
| | as LV AC and LV DC system, for required part of substation, shall be designed, calculated, supplied, delivered, installed, | Lot | 1 | | | | |
| | tested and commissioned and integrated into the existing system, under this contract. | LOI | I | | | | |
| | The control and protection panels shall mirror the switchyard layout. | | | | | | |
| | Enough space shall be reserved for future circuits. | | | | | | |
| | The system comprise the following: | | L | | | | |
| G1 | Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) | Set | 0 | | | | |
| G2 | Control, Protection and SAS set for 132/33 kV Power Transformer circuits | Set | 1 | | | | |
| G3 | Control, Protection and SAS set for Busbar 132 kV | Set | 0 | | | | |

Name of Bidder:

| | | | · · · | | ency (in) | Local Curre | ncy (in BDT) |
|-------|--|------|----------|------------|------------------------|-------------|--------------|
| | | | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| No | Equipment | Unit | quantity | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | $(3) = (1) \times (2)$ | (4) | (5)=(1)x(4) |
| | Extension of the existing Tariff Metering | | | | | | |
| G4.XE | Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation. For each feeder, minimum two (2) meters (main-1 & main-2) shall be provided | Lot | 1 | | | | |
| G5.XE | Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, for required part of substation | Lot | 1 | Ì | | | |
| | Tele-control & Tele-protection & Tele-metering facilities, | | | | | | |
| G6.X | A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut Bhaban, for integration of the complete substation. | Lot | 1 | | | | |
| | All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5-104 protocol. | | | | | | |
| G10.X | All other necessary material and equipment required for completing control, protection, substation automation and metering system. | Lot | 1 | | | | |
| Н | Fibre Optic Multiplexer Equipment for Tele-protection and Communication | | | | | | |
| H1.X | Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer equipment for protection & communication, for required part of substation, shall be designed, supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay SCADA data from switchgear and control system Hot-line telephone system | Lot | 1 | | | | |
| H3.XE | A lot of underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame) shall be designed, supplied, delivered, installed, tested and commissioned, including supply and installation of MDF and digital cables, for required part of substation | Lot | 1 | | | | |
| 1 | Multicore Low Voltage Auxiliary Power and Control Cables | | | | | | |
| I1.XE | A complete lot of multicore low voltage auxiliary power and control cables , including all other necessary material and equipment, between all items of equipment supplied under the contract, and connection and integration of new equipment with existing equipment, shall be designed, supplied, delivered, installed, tested and commissioned | Lot | 1 | | | | |
| J | LV DC, Batteries, Chargers and DC Distribution | | | | | | |
| J1.XE | Extension of existing LV DC 110 V Auxiliary Power Supply A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV DC 110 V Auxiliary Power Supply and for connection of new equipment and integration with the existing equipment | Lot | 1 | | | | |

Name of Bidder:

| | | | | Foreign Curre | ency (in) | Local Currency (in BDT) | |
|---------|--|---------|----------|---------------|-----------------|-------------------------|-------------|
| | | | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| No | Equipment | Unit | _ | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| | Extension of existing LV DC 48 V Auxiliary Power Supply | LUI | I | | | | |
| | A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be | | | | | | |
| J2.XE | designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing | | | | | | |
| | LV DC 48 V auxiliary power supply system for fibre optic multiplexer equipment for control, protection metering and | | | | | | |
| | communication and for connection of new equipment and integration with the existing equipment | | | | | | |
| К | LV AC Distribution | | | | | | |
| | Extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system. | | | | | | |
| K1.XE | A complete lot, including all necessary material and equipment, including a set of LV AC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing | Lot | 1 | | | | |
| | LV AC 400/230 V 50 Hz auxiliary power supply system and for connection of new equipment and integration with the | Lot | • | | | | |
| | existing equipment | | | | | | |
| L | Civil Works, Control Building and Foundations | | | | | | |
| | One (1) lot of complete design, supply and construction of outdoor civil works of required switchyard area, including 132 kV | | | | | | |
| | and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary power transformers | | | | | | |
| L2.XE | foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including | Lot | 1 | | | | |
| | soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing and for connection of new equipment and | | | | | | |
| | integration with the existing equipment | | | | | | |
| L3.XE | One (1) lot of complete design, supply and construction of civil works and facilities for adaptation of the existing control | Lot | 1 | | | | |
| | building, including finishing works such as rendering, painting, floor finishing, etc. | 201 | | | | | |
| N | Switchyard Lighting | | | | | | |
| | One (1) lot of complete equipment for required switchyard area , shall be designed, supplied, delivered, installed, tested | | | | | | |
| N1.XE | and commissioned, to provide extension of the existing switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections and for connection of new | Lot | 1 | | | | |
| | equipment and integration with the existing equipment. | | | | | | |
| Р | Earthing and Lightning Protection | | | | | | |
| | One (1) lot of complete equipment for required switchyard area , shall be designed, supplied, delivered, installed, tested | | | | | | |
| P1.XE | and commissioned, to provide extension of the existing earthing system and lightning protection screen including | Lot | 1 | | | | |
| 1 1.742 | connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations | 201 | | | | | |
| | and for connection of new equipment and integration with the existing equipment. | | | | | | |
| | Renovation/Upgading of 132/33 kV AIS Substation SATHKH | IIRA | | | | | |
| | Subtotal - to Schedule 5 - Grand Total | | | | | | |
| | | 1 | | | | | |
| | Panavatian/Nav 122/22 KV CIS Substat | ion CV | | | 1 | | I |
| | Renovation/New 132/33 kV GIS Substat | 1011 31 | LUCI | | | | |
| В | 132 kV switchgear, equipment connection and steel structures | | | | | | |

Name of Bidder:

| | Schedule 2: Plant & Equipment Supplied from within | | | | | | |
|-------------|--|--|----------|-----|-----|-------------------------|--------------------|
| | | | | | | Local Currency (in BDT) | |
| No | Equipment | Unit | Quantity | | | Unit Price | Total Price |
| | | | (1) | | | EXW (4) | EXW (5)=(1)x(4) |
| | One (1) set of complete equipment for switchgear 132 kV shall be designed, supplied, delivered, installed, tested and | | | (2) | | (-) | |
| | commissioned, under this contract, comprise the following: | Set | 1 | | | | |
| | A complete indoor and partly outdoor GIS Line feeder 145 kV, 3150 A busbars / 2000 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: Q0 - One (1) set of three pole, GIS type, SF6 gas circuit breaker with three spring-stored energy operating mechanism | | | | | | |
| | Q1, Q2, Q9 - Three (3) sets of three pole, three positions, motor operated, insulated disconnector with earthing switch | | | | | | |
| | Q8 - One (1) set of three pole, make-proof, motor operated earthing switch | Unit Quantity (1) Foreign Currency (in) Unit Price CIP (2) Tata Price CIP (3) = (1) x (2) U d, tested and Set 1 - - - 30Hz, 650/275 kV org mechanism arthing switch s Set 1 - - - s Set 8 - - - - - e bay - - 8 - - - - e bay - - - - - - - y mechanism hing switch Set 4 - - - - s Set 4 - - - - - vitch s Set 1 - - - - | | | | | |
| | T1 - Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1 A, GIS type current transformers | | | | | | |
| BG.1 | T5 - Three (3) single-phase, 2-secondary winding, 132/V3 / 110/V3 / 110/V3 kV/V/V, GIS type voltage transformers | | | | | | |
| BG.1 | T6 - One (1) set of three-phase, GIS type, hand operated disconnector link | | | | | | |
| | SA - Three (3) single-phase outdoor surge arresters, GIS type | | | | | | |
| | Z1 - One (1) set of three-phase, GIS type, cable compartment | | | | | | |
| | or | | | | | | |
| | Z2 - One (1) set of three phase indoor and outdoor GIB with three outdoor GIS/AIR bushings | | | | | | |
| | GIS.X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | | | | | | |
| | A complete indoor and partly outdoor GIS Transformer feeder 145 kV, 3150A busbars / 2000 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | | | | | | |
| | Q0 - One (1) set of three pole, GIS type, SF6 gas circuit breaker with one spring-stored energy operating mechanism | | | | | | |
| | Q1, Q2, Q9 - Three (3) set of three pole, three position, motor operated, insulated disconnector with earthing switch | | | | | | |
| | Q8 - One (1) set of three pole, make-proof, motor operated earthing switch | | | | | | |
| BG.2 | T1 - Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1 A, GIS type current transformers | Unit CIP CIP (1) CIP (2) CIP (2) (3)=(1) × (2) (3)=(1) × (2) 32 kV shall be designed, supplied, delivered, installed, tested and lowing: Set 1 Image: CIP 1 Image: CIP (3)=(1) × (2) CIP (3)=(1) × (2) 1 Image: CIP (3)=(1) × (2) (3)=(1) × (2) 1 Image: CIP (3)=(1) × (2) (3)=(1) × (2) 1 Image: CIP (3)=(1) × (2) (3)=(1) × (2) 1 Image: CIP (3)=(1) × (2) (3)=(1) × (2) 1 Image: CIP (3)=(1) × (2) (3)=(1) × (2) 1 Image: CIP (3)=(1) × (2) (3)=(1) × (2) 1 Image: CIP (3)=(1) × (2) (3)=(1) × (2) 1 Image: CIP (3)=(1) × (2) (3)=(1) × (2) 1 Image: CIP (3)=(1) × (2) (3)=(1) × (2) 1 Image: CIP (3)=(1) × (2) (3)=(1) × (2) 1 Image: CIP Image: CIP (3)=(1) × (2) 1 Image: CIP Image: CIP (3)=(1) × (2) 1 Image: CIP Image: CIP Image: CIP 1 Image: CIP Image: CIP Image: CIP 1 <td< td=""><td></td><td></td><td></td></td<> | | | | | |
| | SA - Three (3) single-phase outdoor surge arresters, GIS type | | | | | | |
| | Z1 - One (1) set of three-phase, GIS type, cable compartment | | | | | | |
| | or | | | | | | |
| | Z2 - One (1) set of three phase indoor and outdoor GIB with three outdoor GIS/AIR bushings | | | | | | |
| | X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | | | | | | |
| | A complete indoor GIS Bus Coupler bay 145 kV, 3150A busbars / 3150 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | | | | | | |
| DO 0 | Q0 - One (1) set of three pole, GIS type, SF6 gas circuit breaker with one spring-stored energy operating mechanism | Set | | | | | |
| BG.3 | Q1, Q2 - Two (2) set of three pole, three position, motor operated, insulated disconnector with earthing switch | | 1 | | | | |
| BG.3 | T1 - Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1 A, GIS type current transformers | | | | | | |
| | X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | | | | | | |
| | A complete indoor GIS Metering bay 145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | | | | | | |
| | Q21, Q22 - Two (2) set of three pole, three position, motor operated, insulated disconnector | Set. | 4 | | | | |
| BG.4 | | Set | 1 1 | | 1 1 | | |

Name of Bidder:

Set

Signature of Bidder:

T5 - Three (3) single-phase, 2-winding, 132/V3 / 110/V3 / 110/V3 kV/V/V, GIS type voltage transformers

| | | | | Foreign Curre | ency (in) | Local Currency (in BDT | |
|-------|---|------|----------|---------------|-----------------|------------------------|-------------|
| No | Equipment | Unit | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| No | Equipment | Unit | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| | X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | | | | | | |
| D0 5 | A complete indoor GIS Busbars Earthing bay 145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | 0 | | | | | |
| BG.5 | Q81, Q82 - Two (2) set of three pole, make-proof, motor operated earthing switch | Set | 1 | | | | |
| 5- | Surge arrester 145kV, 120 kV continuous operating voltage, 10kA nominal discharge current, 50Hz, single phase, heavy | 0.1 | | | | | |
| B5 | duty, station class, gapless, metal oxide type | Set | 72 | | | | |
| B6 | Post Insulator 132kV, 50 Hz, 650/275 kV BIL, 10 kN | Set | 72 | | | | |
| B7.X | Conductors for connection of the 132 kV switchgear, 145 kV, 2000 A, 40 kA | Lot | 1 | | | | |
| B8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear | Lot | 1 | | | | |
| B9.X | Gantry steel structures and equipment supports required for completing 132 kV switchgear | Lot | 1 | | | | |
| B10.X | All other necessary material and equipment required for completing 132 kV switchgear. | Lot | 1 | | | | |
| С | 33 kV Switchgear, equipment connection and steel structures | | | | | | |
| | One (1) set of complete equipment for switchgear 33 kV shall be designed, supplied, delivered, installed, tested and | Set | 1 | | | | |
| | commissioned, under this contract, comprise the following: | 001 | | | | | |
| C1 | Circuit Breaker 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, vacuum type, for outdoor installation with one spring-stored energy operating mechanism | Set | 4 | | | | |
| C2.1 | Disconnector 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated | Set | 7 | | | | |
| C2.2 | Disconnector 36 kV, 100 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated, with integrated fuse of 10 A | Set | 2 | | | | |
| C3.1 | Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 2000/1/1/1/1 A/A, 4-core, single ratio, post type | Set | 12 | | | | |
| C3.2 | Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 10/1/1/1 A/A, 3-core, single ratio, post type | Set | 6 | | | | |
| C4 | Voltage transformer 36kV, 50Hz, 170/70 kV BIL, single phase, 33/V3 / 110/V3 / 110/V3 kV/V/V, 2 secondary windings, inductive type | Set | 12 | | | | |
| C5 | Surge arrester 36 kV, 30 kV continuous operating voltage, 10 kA nominal discharge current, 50 Hz, single phase, gapless, metal oxide type | Set | 12 | | | | |
| C7.X | Conductors for single busbar system and for connection of the 33 kV switchgear, 36 kV, 2000 A, 25 kA | Lot | 1 | | | | |
| C8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 33 kV switchgear | Lot | 1 | | | | |
| C9.X | Gantry steel structures and equipment supports required for completing 33 kV switchgear | Lot | 1 | | | | |
| C10.X | All other necessary material and equipment required for completing 33 kV switchgear. | Lot | 1 | | | | |
| D | Transformers | | | | | | |
| D2 | Power transformer 132/33 kV three phase 80/120 MVA, Dyn1, ONAN/ONAF | Set | 2 | | | | |
| D9 | Water Spray System | Set | 2 | | | | |
| D10.X | All other necessary material and equipment required for completing transformers | Lot | 1 | | | | |
| F | Earthing / Auxiliary Power Transformers | | | | | | |
| F1 | Earthing / Auxiliary Power Transformer 33/0.4 kV, three phase 200 kVA, Dyn11, ONAN | Set | 2 | | | | |
| F10.X | All other necessary material and equipment required for completing Earthing / Auxiliary Power transformers. | Lot | 1 | | | | |
| G | Control, Protection, SCADA System and Metering | | | | | | |

| | | | | Foreign Currency (in) | | Local Curre | ncy (in BDT) |
|-------|---|------|----------|-----------------------|-----------------|-------------|--------------|
| | | | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| No | Equipment | Unit | quantity | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| | One (1) lot of complete equipment for control, protection, SCADA System and metering for 230, 132, 33 kV as well as LV AC and LV DC system (for complete substation) shall be designed, calculated, supplied, delivered, installed, tested and commissioned, under this contract. The control and protection panels shall mirror the switchyard layout. Enough space shall be reserved for future circuits. The system comprise the following: | Lot | 1 | | | | |
| G1 | Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) | Set | 8 | | | | |
| G2 | Control, Protection and SAS set for 132/33 kV Power Transformer circuits | Set | 4 | | | | |
| G3 | Control, Protection and SAS set for Busbar 132 kV | Set | 1 | | | | |
| G4.X | Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for each line and transformer feeder. For each feeder, minimum two (2) meters (main-1 & main-2) shall be provided | Lot | 1 | | | | |
| G5.X | Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders | Lot | 1 | | | | |
| G6.X | Tele-control & Tele-protection & Tele-metering facilities, A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut Bhaban, for integration of the complete substation. All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5-104 protocol. | Lot | 1 | | | | |
| G10.X | All other necessary material and equipment required for completing control, protection, substation automation and metering system. | Lot | 1 | | | | |
| Н | Fibre Optic Multiplexer Equipment for Tele-protection and Communication | | | | | | |
| H1.X | Fibre Optic Multiplexer Equipment, a complete lot of fibre optic multiplexer equipment for protection & communication at substation shall be designed, supplied, delivered, installed, tested and commissioned, under this contract. Fibre optic multiplexer equipment is to be provided for. Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay SCADA data from switchgear and control system VOIP system (2-IP Phone) 2-W remote subscriber (10 telephone sets) Hot-line telephone system | Lot | 1 | | | | |
| H3.X | A lot of underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame) shall be designed, supplied, delivered, installed, tested and commissioned, including supply and installation of MDF and digital cables | Lot | 1 | | | | |
| I. | Multicore Low Voltage Auxiliary Power and Control Cables | | | | | | |

| | · · · · · | | | Foreign Currency (in) | | Local Currency (in BDT) | |
|------|--|------|----------|-----------------------|-----------------|-------------------------|-------------|
| | | | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| No | Equipment | Unit | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| I1.X | A complete lot of multicore low voltage auxiliary power and control cables , including all other necessary material and equipment, between all items of equipment supplied under the contract shall be designed, supplied, delivered, installed, tested and commissioned | Lot | 1 | | | | |
| J | LV DC, Batteries, Chargers and DC Distribution | | | | | | |
| J1.X | A complete lot consists of two (2) sets of 110 V Ni-Cd batteries, complete with chargers and distribution switchboards, including all other necessary material and equipment, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide complete LV DC 110 V supplies for the substation. The system shall generally be as shown in the bid drawings and shall minimum include the following: (a) Two (2) sets of 100% Ni-Cd batteries, complete, each capacity shall not be less than 400 Ah at the 10-hour rate of discharge. (b) Two (2) sets of battery chargers complete, each float charge shall not be less than 100 A rating. (c) One (1) set of DC distribution switchboards. | Lot | 1 | | | | |
| J2.X | A complete lot consists of two (2) sets of 48V Ni-Cd batteries, complete with chargers and distribution switchboards, including all other necessary material and equipment, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide complete LV DC 48 V supplies for fibre optic multiplexer equipment for control, protection metering and communication. The system shall generally be as shown in the bid drawings and shall minimum include the following: (a) Two (2) sets of 100% Ni-Cd batteries, complete, each capacity shall not be less than 250 Ah at the 5-hour rate of discharge. (b) Two (2) sets of battery chargers complete, each float charge shall not be less than 50 A rating. (c) One (1) set of DC distribution switchboard. | Lot | 1 | | | | |
| К | LV AC Distribution | | | | | | |
| K1.X | A complete lot, including all necessary material and equipment, including a set of LV AC switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide the LV AC 400/230V, 50 Hz auxiliary power supplies for the substation The system shall generally be as shown in the bid drawings and shall include one 125A outdoor weatherproof, 3-phase with neutral and earth switched socket outlet close to the power transformers | Lot | 1 | | | | |
| L | Civil Works, Control Building and Foundations | | | | | | |
| L1.X | One (1) lot of complete land development of complete switchyard area by cutting, land filling, compacting up to a suitable level. The approximate total area of the substation is 3 acres | Lot | 1 | | | | |
| L2.X | One (1) lot of complete design, supply and construction of outdoor civil works including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary power transformers foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing | Lot | 1 | | | | |

Name of Bidder:

| | | | | Foreign Curre | ency (in) | Local Currency (in BDT) | |
|---------|---|------|----------|---------------|-----------------|-------------------------|-------------|
| | | | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| No | Equipment | Unit | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| L3.1X | One (1) lot of complete design, supply and construction of civil works and facilities for one new GIS 132 kV and control three- storey building with cable basement, including foundation works, super structure works, finishing works like rendering, painting, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, etc. | Lot | 1 | | | | |
| L3.2X | One (1) lot of complete design, supply and construction of civil works and facilities for one new warehouse, including foundation works, super structure works, finishing works like rendering, painting, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, etc. | Lot | 1 | | | | |
| 1.3.3.8 | One (1) lot of complete design, supply and construction of civil works and facilities for water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipe lines, etc., sewage facilities including septic tank, etc. | Lot | 1 | | | | |
| L4.X | One (1) lot of complete Pile load test | Lot | 1 | | | | |
| М | Building Lighting, Small Power, Air Conditioning and Ventilation | | | | | | |
| M1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide lighting, LV power supply, air conditioning system, ventilation and emergency DC lighting for the substation control building(s). | Lot | 1 | | | | |
| N | Switchyard Lighting | | | | | | |
| N1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections. | Lot | 1 | | | | |
| Р | Earthing and Lightning Protection | | | | | | |
| P1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, of earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations. | Lot | 1 | | | | |
| P2 | Two (2) sets of 3-phase portable (maintenance) earthing equipment devices with connectors and telescopic glass fibre operating stick suitable for each voltage | Set | 2 | | | | |
| Q | Cable | | | | | | |
| Q.2.2 | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three single phase XLPE cables with corresponding GIS connections and Cable End Terminals; with all required equipment; 145 kV, 1,000 A, 40 kA / 1 sec, 50 Hz, for connection of one 132 kV bay. Approximate lengths are 50 to 100 meters | Lot | 12 | | | | |

| | · · · · · | | | | | | |
|------|---|------|----------|-----------------------|-----------------|-------------------------|-------------|
| | | | | Foreign Currency (in) | | Local Currency (in BDT) | |
| No | Equipment | Unit | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| NO | Lupnen | Unit | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| Q3.1 | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three phase or three single phase cables and cable end terminal and correspondent equipment 36 kV, 800 A, 25 kA / 1 sec, 50 Hz. Approximate lengths are 20 meters | Lot | 4 | | | | |
| | Renovation/New 132/33 kV GIS Substation SYLHET Subtotal - to Schedule 5 - Grand Total | | | | | | |

Name of Bidder:

| | | | | Foreign Curre | ency (in) | Local Curre | ncy (in BDT) |
|------|--|------|----------|-------------------|--------------------|-------------------|--------------------|
| No | Equipment | Unit | Quantity | Unit Price CIP | Total Price CIP | Unit Price EXW | Total Price EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| | | | | | | | |
| | Extension of 132/33 kV AIS Substation | BHAN | DARIA | | | | l |
| В | 132 kV switchgear, equipment connection and steel structures | | | | | | |
| | One (1) set of complete equipment for switchgear 132 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | | |
| B1.1 | Circuit Breaker 145 kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with three spring-stored energy operating mechanism | Set | 0 | | | | |
| B1.2 | Circuit Breaker 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with three spring-stored energy operating mechanism | Set | 2 | | | | |
| B1.3 | Circuit Breaker 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with three spring-stored energy operating mechanism | Set | 0 | | | | |
| B1.4 | Circuit Breaker 145 kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 | | | | |
| B1.5 | Circuit Breaker 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 | | | | |
| B1.6 | Circuit Breaker 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 | | | | |
| B2.1 | Disconnector with Earthing Switch 145kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch | Set | 0 | | | | |
| B2.2 | Disconnector with Earthing Switch 145kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch | Set | 2 | | | | |
| B2.3 | Disconnector with Earthing Switch 145kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch | Set | 0 | | | | |
| B2.4 | Disconnector 145kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 0 | | | | |
| B2.5 | Disconnector 145kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 6 | | | | |
| B2.6 | Disconnector 145kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 0 | | | | |
| B3.1 | Current transformer 145kV, 40kA, 50Hz, 650/275 kV BIL, single phase, 4000-2000/1/1/1/1/1 A/A, 5-core, multi ratio, post type | Set | 0 | | | | |
| B3.2 | Current transformer 145kV, 40kA, 50Hz, 650/275 kV BIL, single phase, 2000-1000/1/1/1/1/1 A/A, 5-core, multi ratio, post type | Set | 6 | | | | |
| B4 | Voltage transformer 145kV, 50Hz, 650/275 kV BIL, single phase, 132/V3 / 110/V3 / 110/V3 kV/V/V, 2 secondary windings, capacitor type | Set | 6 | | | | |
| B5 | Surge arrester 145kV, 120 kV continuous operating voltage, 10kA nominal discharge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide type | Set | 6 | | | | |
| B7.X | Conductors for busbar system and for connection of the 132 kV switchgear, 145 kV, 3150 & 2000 A, 40 kA | Lot | 1 | | | | |

Name of Bidder:

| | | | . , | Foreign Currency (in) | | Local Curre | ncy (in BDT) |
|--------|--|------|----------|-----------------------|-----------------|-------------|--------------|
| | | | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| No | Equipment | Unit | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| B8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear | Lot | 1 | | | | |
| B9.X | Gantry steel structures and equipment supports required for completing 132 kV switchgear | Lot | 1 | | | | |
| B10.X | All other necessary material and equipment required for completing 132 kV switchgear. | Lot | 1 | | | | |
| G | Control, Protection, SCADA System and Metering | | | | | | |
| | Extension of the existing Control, Protection, SCADA System and Metering | | | | | | |
| | New equipment shall be integrated into the existing system. | | | | | | |
| | One (1) lot of equipment for extension of the existing control, protection, SCADA and metering for 230, 132, 33 kV as well | | | | | | |
| | as LV AC and LV DC system, for required part of substation, shall be designed, calculated, supplied, delivered, installed, | Lot | 1 | | | | |
| | tested and commissioned and integrated into the existing system, under this contract. | 201 | | | | | |
| | The control and protection panels shall mirror the switchyard layout. | | | | | | |
| | Enough space shall be reserved for future circuits. | | | | | | |
| | The system comprise the following: | | | | | | |
| G1 | Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) | Set | 2 | | | | |
| G2 | Control, Protection and SAS set for 132/33 kV Power Transformer circuits | Set | 0 | | | | |
| G3 | Control, Protection and SAS set for Busbar 132 kV | Set | 0 | | | | |
| | Extension of the existing Tariff Metering | | | | | | |
| G4.XE | Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh | Lot | 1 | | | | |
| _ | and MVArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation. For | | | | | | |
| | each feeder, minimum two (2) meters (main-1 & main-2) shall be provided | | ļ | | | | |
| G5.XE | Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, for required part of substation | Lot | 1 | | | | |
| | Tele-control & Tele-protection & Tele-metering facilities, | | | | | | |
| | A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, | | | | | | |
| | modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and | | | | | | |
| G6.X | at the back-up station at Biddut Bhaban, for integration of the complete substation. | Lot | 1 | | | | |
| | All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the | | | | | | |
| | substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC | | | | | | |
| | through the gateway of the substation automation system using the IEC 60870-5-104 protocol. | | | | | | |
| 040.14 | All other necessary material and equipment required for completing control, protection, substation automation and | | | | | | |
| G10.X | metering system. | Lot | 1 | | | | |
| Н | Fibre Optic Multiplexer Equipment for Tele-protection and Communication | | | | | | |
| | Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer | | | | | | |
| 1 | equipment for protection & communication, for required part of substation, shall be designed, supplied, delivered, installed, | | | | | | |
| 1 | tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is | | | | | | |
| H1.X | to be provided for. | Lot | 1 | | | | |
| | Distance relay carrier signal (main and back-up) | | | | | | |

Name of Bidder:

| No Equipment Quark bit of the set of the s | | · · · · · | | | Foreign Currency (in) | | Local Currency (in BDT) | |
|--|-------|--|------|----------|-----------------------|-----------------|-------------------------|-------------|
| No Equipment unit int or ore ore tow dow Bus protection / breaker failure relay Bus protection / breaker failure relay int < | | | | Quantity | | 1 | | |
| Bus protection / breaker failure relay SCADA data from switchgear and control system H3.KE ScADA data from switchgear and control system Image: Control of Control Control System H3.XE Scale designed, supplied, delivered, installed, tested and commissioned, including supply and installation of MDF and digital cables, for required part of substation Image: Control Con | No | Equipment | Unit | , | | | | |
| SCADA data from switchgaar and control system Image: SCADA data from switchgaar and from from switchgaar and control system Image: SCADA data from switchgaar and from from switchgaar and control system Image: SCADA data from switchgaar and from from | | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| SCADA data from switchgaar and control system Image: SCADA data from switchgaar and from from switchgaar and control system Image: SCADA data from switchgaar and from from switchgaar and control system Image: SCADA data from switchgaar and from from | | Bus protection / breaker failure relay | | | | | | |
| Hot-line telephone system Image: System in the system is and system in the system | | | | | | | | |
| Allo of underground optical fibre (48 cores) cables from terminal box at garty structure to MDF (hallaid distribution Framel digital cables, for required part of substation 1 1 1 H3XE Exhall be designed, supplied, delivered, installed, tested and commissioned, including supply and installation of MDF and digital cables, for required part of substation 1 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> | | | | | | | | |
| H3XE shall be designed, supplied, delivered, installed, tested and commissioned, including supply and installation of MDF and equipment substation 1< | | A lot of underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame) | | Ì | Ì | | - | |
| 1 Multicore Low Voltage Auxiliary Power and Control Cables Image: Complete Internet of Complete Internet Internet Internet of Complete Internet | H3.XE | | Lot | 1 | | | | |
| A complete lot of multicore low voltage auxiliary power and control cables, including all other necessary material and equipment, between all items of equipment with existing equipment, shall be designed, supplied, delivered, installed, tested and commissioned Lot 1 </td <td></td> <td>digital cables, for required part of substation</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> | | digital cables, for required part of substation | | | | | | |
| 11.XE equipment, between all items of equipment supplied, under the contract, and connection of new Lot 1 | 1 | Multicore Low Voltage Auxiliary Power and Control Cables | | | | | | |
| equipment with existing equipment, shall be designed, supplied, delivered, installed, tested and commissioned Image: Comparison of existing LV DC Distribution Image: Comparison of existing LV DC Distribution Image: Comparison of existing LV DC Distribution existing equipment and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV DC 48V Auxiliary Power Supply Image: Comparison of the existing LV DC 48V Auxiliary Power Supply Image: Comparison of existing LV DC 48V Auxiliary Power Supply Image: Comparison of existing LV DC 48V Auxiliary Power Supply Image: Comparison of the existing LV DC 48V Auxiliary Power Supply Image: Comparison of the existing LV DC 48V Auxiliary Power Supply Image: Comparison of the existing LV DC 48V Auxiliary Power Supply Image: Comparison of the existing LV DC 48V Auxiliary Power Supply Image: Comparison of the existing LV DC 48V Auxiliary Power Supply Image: Comparison of the existing LV DC 48V Auxiliary Power Supply Image: Comparison of the existing LV DC 48V Auxiliary Power Supply Image: Comparison of the existing LV AC 400/230 V 50 Hz auxiliary power supply system Image: Comparison of the existing LV AC 400/230 V 50 Hz auxiliary power supply system Image: Comparison of the existing LV AC 400/230 V 50 Hz auxiliary power supply system Image: Comparison of the existing LV AC 400/230 V 50 Hz auxiliary power supply system of the function of the existing equipment Image: Comparison of the existing LV AC 400/230 V 50 Hz auxiliary power supply system of the contract, to provide extension of the existing equipment Image: Comparison of t | | | | | | | | |
| J LV DC, Batteries, Chargers and DC Distribution Fatension of existing LV DC 110 V Auxiliary Power Supply J1.XE A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV DC 110 V Auxiliary Power Supply and for connection of new equipment and integration with the existing equipment Lot 1 J2.XE Extension of existing LV DC 48 V Auxiliary Power supply system for fibre optic multiplexer equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV DC 48 V auxiliary power supply system for fibre optic multiplexer equipment Lot 1 K LV AC 01230 V 50 Hz auxiliary power supply system. A complete lot, including all necessary material and equipment, including a set of LV AC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing Lot 1 K LV AC 00/230 V 50 Hz auxiliary power supply system. A complete lot, including all necessary material and equipment including a set of LV AC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing Lot 1 L Civi Works, Control Building and Foundation, power transformers on auxiliary power transf | I1.XE | | Lot | 1 | | | | |
| Extension of existing LV DC 110 V Auxiliary Power Supply J1.XE A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing Lot 1 J2.XE Extension of existing LV DC 48 V Auxiliary Power Supply A complete lot, including all necessary material and equipment and integration with the existing equipment Lot 1 J2.XE Extension of existing LV DC 48 V Auxiliary Power Supply A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV DC 48 V auxiliary power supply system for the optic multiplexer equipment for control, protection metering and communication and for connection of new equipment and integration with the existing equipment Lot 1 K LV AC Distribution Extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system contract, to provide extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system and for connection of new equipment and integration with the existing LV AC 400/230 V 50 Hz auxiliary power supply system and for connection of new equipment and integration with the existing LV AC 400/230 V 50 Hz auxiliary power transformers foundation, hast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal substation, supply and construction of outdoor civil works of required switchyard area, includi | | | | ļ | | | | |
| J1.XE A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing equipment Lot 1 J1.XE A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing equipment Lot 1 J2.XE A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing equipment Lot 1 J2.XE A complete lot, including all necessary material and equipment including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing equipment and integration with the existing equipment Lot 1 K1.XE Extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system. Lot 1 Lot 1 L Civil Works, Control Building and Foundation, power transformers in and integration with the existing equipment and integrati | J | | | | | | | |
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| communication and for connection of new equipment and integration with the existing equipmentImage: Connection of the existing connection of new equipment and integration with the existing equipmentKLV AC DistributionImage: Connection of the existing LV AC 400/230 V 50 Hz auxiliary power supply system. A complete lot, including all necessary material and equipment, including a set of LV AC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system and for connection of new equipment and integration with the existing equipmentLot11Image: Connection of connection of the existing connection of the existing equipmentLCivil Works, Control Building and FoundationsImage: Connection of outdoor civil works of required switchyard area, including 132 kV and 33 kV gantry foundation, to alst wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including integration with the existing equipmentLot11L3.XEOne (1) lot of complete design, supply and construction of civil works and facilities for adaptation of new equipment and integration with the existing equipmentLot11Image: Connection of civil works and facilities for adaptation of the existing controlL0.XEOne (1) lot of complete design, supply and construction of civil works and facilities for adaptation of new equipment and integration with the existing equipmentLot11L1.XEOne (1) lot of complete design, supply and construct | 02.AL | o i i i i i i i i i i | | | | | | |
| K LV AC Distribution Image: Constraint of the existing LV AC 400/230 V 50 Hz auxiliary power supply system. A complete lot, including all necessary material and equipment, including a set of LV AC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system and for connection of new equipment and integration with the existing equipment Lot 1 L Civil Works, Control Building and Foundations Lot 1 L Civil Works, Control Building and Foundations Lot 1 L2.XE One (1) lot of complete design, supply and construction of outdoor civil works of required switchyard drainage system including outfall, cable trench including Lot 1 L3.XE One (1) lot of complete design, supply and construction of civil works and facilities for adaptation of the existing control Lot 1 1 | | | | | | | | |
| A complete lot, including all necessary material and equipment, including a set of LV AC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system and for connection of new equipment and integration with the existing equipmentLot1LCivil Works, Control Building and FoundationsLot1LOne (1) lot of complete design, supply and construction of outdoor civil works of required switchyard area, including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary power transformers foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing and for connection of new equipment and integration with the existing equipment1Lot1L3.XEOne (1) lot of complete design, supply and construction of civil works and facilities for adaptation of the existing building, including finishing works such as rendering, painting, floor finishing, etc.Lot11Lot1 | К | | | | | | | |
| K1.XE designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system and for connection of new equipment and integration with the existing equipment Lot 1 </td <td></td> <td>Extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system.</td> <td></td> <td>Ī</td> <td>ĺ</td> <td></td> <td></td> <td></td> | | Extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system. | | Ī | ĺ | | | |
| LV AC 400/230 V 50 Hz auxiliary power supply system and for connection of new equipment and integration with the existing equipment Image: Control Building and Foundations Image: Control Building and Foundation, 100 to for complete design, supply and construction of outdoor civil works of required switchyard area, including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary power transformers foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing and for connection of new equipment and integration of the existing control Lot 1 Image: Control Building including finishing works such as rendering, painting, floor finishing, etc. L3.XE One (1) lot of complete design, supply and construction of civil works and facilities for adaptation of the existing control building, including finishing works such as rendering, painting, floor finishing, etc. Lot 1 Image: Control Building and construction of civil works and facilities for adaptation of the existing control | | A complete lot, including all necessary material and equipment, including a set of LV AC distribution switchboards, shall be | | | | | | |
| existing equipmentImage: Construction of the existing equipmentImage: Construction of the existing equipmentLCivil Works, Control Building and FoundationsImage: Construction of the existing equipmentImage: Construction of the existing equipmentUne (1) lot of complete design, supply and construction of outdoor civil works of required switchyard area, including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary power transformers foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing and for connection of new equipment and integration with the existing equipmentLot11Image: Construction of civil works and facilities for adaptation of the existing control building, including finishing works such as rendering, painting, floor finishing, etc.Lot11Image: Construction of civil works and facilities for adaptation of the existing control | K1.XE | designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing | Lot | 1 | | | | |
| LCivil Works, Control Building and FoundationsImage: Control Building and FoundationDone (1) lot of complete design, supply and construction of outdoor civil works of required switchyard area, including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary power transformers foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing and for connection of new equipment and integration with the existing equipmentLot11Image: Control Building and FoundationImage: Control Building and FoundationL3.XEOne (1) lot of complete design, supply and construction of civil works and facilities for adaptation of the existing control building, including finishing works such as rendering, painting, floor finishing, etc.Lot11Image: Control Building and Foundation | | | | | | | | |
| Date: L2.XEOne (1) lot of complete design, supply and construction of outdoor civil works of required switchyard area, including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary power transformers foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing and for connection of new equipment andLot1L3.XEOne (1) lot of complete design, supply and construction of civil works and facilities for adaptation of the existing control building, including finishing works such as rendering, painting, floor finishing, etc.Lot11 | | • | | ļ | | | | |
| L2.XEand 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary power transformers foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing and for connection of new equipment andLot1L3.XEOne (1) lot of complete design, supply and construction of civil works and facilities for adaptation of the existing control building, including finishing works such as rendering, painting, floor finishing, etc.Lot11 | L | | | | | | | |
| L2.XE foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing and for connection of new equipment and integration with the existing equipment Lot 1 L3.XE One (1) lot of complete design, supply and construction of civil works and facilities for adaptation of the existing control building, including finishing works such as rendering, painting, floor finishing, etc. Lot 1 1 1 | | | | | | | | |
| L2.XE internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing and for connection of new equipment and integration with the existing equipment Image: Lot mark | | | | | | | | |
| soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing and for connection of new equipment and integration with the existing equipment Image: Construction of constructin constructin constructin construction of construction of construct | L2.XE | | Lot | 1 | | | | |
| integration with the existing equipment Image: Construction of civil works and facilities for adaptation of the existing control building, including finishing works such as rendering, painting, floor finishing, etc. Lot 1 1 | | | | | | | | |
| L3.XE building, including finishing works such as rendering, painting, floor finishing, etc. | | | | | | | | |
| L3.XE building, including finishing works such as rendering, painting, floor finishing, etc. | | One (1) lot of complete design, supply and construction of civil works and facilities for adaptation of the existing control | 1 | | İ | | | |
| N Switchyard Lighting | L3.XE | | Lot | 1 |] | | | |
| | N | Switchyard Lighting | | | | | | |

Name of Bidder:

| No | Equipment | Unit | Quantity | Foreign Curre Unit Price CIP | Total Price CIP | Unit Price EXW | ncy (in BDT) Total Price EXW |
|-------|---|------|----------|------------------------------------|--------------------|-------------------|------------------------------------|
| N1.XE | One (1) lot of complete equipment for required switchyard area , shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections and for connection of new equipment and integration with the existing equipment. | Lot | (1) 1 | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| Р | Earthing and Lightning Protection | | | | | | |
| P1.XE | One (1) lot of complete equipment for required switchyard area , shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations and for connection of new equipment and integration with the existing equipment . | Lot | 1 | | | | |
| Q | Cable | | | | | | |
| Q.2.2 | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three single phase XLPE cables with corresponding GIS connections and Cable End Terminals; with all required equipment; 145 kV, 1,000 A, 40 kA / 1 sec, 50 Hz, for connection of one 132 kV bay. Approximate lengths are 100 meters | Lot | 2 | | | | |
| | Extension of 132/33 kV AIS Substation BHANDARIA Subtotal - to Schedule 5 - Grand Total | | | | | | |

B-40

| | | 1 | | Foreign Curre | ency (in) | Local Currency (in BDT) | |
|------|--|-------|----------|------------------------|------------------------|-------------------------|-------------|
| | | | Quantity | Unit Price Total Price | | Unit Price | Total Price |
| No | Equipment | Unit | quantity | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | $(3) = (1) \times (2)$ | (4) | (5)=(1)x(4) |
| | | | (1) | (-/ | (0) - (1) x (-) | (9 | |
| | | | | | | | |
| | Extension of 230/132/33 kV AIS Substation | n BAR | ISAL (| N) | | | |
| В | 132 kV switchgear, equipment connection and steel structures | | | | | | |
| | One (1) set of complete equipment for switchgear 132 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | | |
| B1.1 | Circuit Breaker 145 kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with three spring-stored energy operating mechanism | Set | 0 | | | | |
| B1.2 | Circuit Breaker 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with three spring-stored energy operating mechanism | Set | 2 | | | | |
| B1.3 | Circuit Breaker 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with three spring-stored energy operating mechanism | Set | 0 | | | | |
| B1.4 | Circuit Breaker 145 kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 | | | | |
| B1.5 | Circuit Breaker 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 | | | | |
| B1.6 | Circuit Breaker 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 | | | | |
| B2.1 | Disconnector with Earthing Switch 145kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch | Set | 0 | | | | |
| B2.2 | Disconnector with Earthing Switch 145kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch | Set | 2 | | | | |
| B2.3 | Disconnector with Earthing Switch 145kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch | Set | 0 | | | | |
| B2.4 | Disconnector 145kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 0 | | | | |
| B2.5 | Disconnector 145kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 4 | | | | |
| B2.6 | Disconnector 145kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 0 | | | | |
| B3.1 | Current transformer 145kV, 40kA, 50Hz, 650/275 kV BIL, single phase, 4000-2000/1/1/1/1/1 A/A, 5-core, multi ratio, post type | Set | 0 | | | | |
| B3.2 | Current transformer 145kV, 40kA, 50Hz, 650/275 kV BIL, single phase, 2000-1000/1/1/1/1/1 A/A, 5-core, multi ratio, post type | Set | 6 | | | | |
| B4 | Voltage transformer 145kV, 50Hz, 650/275 kV BIL, single phase, 132/V3 / 110/V3 / 110/V3 kV/V/V, 2 secondary windings, capacitor type | Set | 6 | | | | |
| B5 | Surge arrester 145kV, 120 kV continuous operating voltage, 10kA nominal discharge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide type | Set | 6 | | | | |
| B7.X | Conductors for busbar system and for connection of the 132 kV switchgear, 145 kV, 3150 & 2000 A, 40 kA | Lot | 1 | | | | |

Name of Bidder:

| | | | . , | Foreign Currency (in) | | Local Curre | ncy (in BDT) |
|--------|---|------|----------|-----------------------|-----------------|-------------|--------------|
| | | | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| No | Equipment | Unit | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| B8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear | Lot | 1 | | | | |
| B9.X | Gantry steel structures and equipment supports required for completing 132 kV switchgear | Lot | 1 | | | | |
| B10.X | All other necessary material and equipment required for completing 132 kV switchgear. | Lot | 1 | | | | |
| G | Control, Protection, SCADA System and Metering | | | | | | |
| | Extension of the existing Control, Protection, SCADA System and Metering | | | | | | |
| | New equipment shall be integrated into the existing system. | | | | | | |
| | One (1) lot of equipment for extension of the existing control, protection, SCADA and metering for 230, 132, 33 kV as well | | | | | | |
| | as LV AC and LV DC system, for required part of substation, shall be designed, calculated, supplied, delivered, installed, | Lot | 1 | | | | |
| | tested and commissioned and integrated into the existing system, under this contract. | 201 | • | | | | |
| | The control and protection panels shall mirror the switchyard layout. | | | | | | |
| | Enough space shall be reserved for future circuits. | | | | | | |
| | The system comprise the following: | | | | | | |
| G1 | Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) | Set | 2 | | | | |
| G2 | Control, Protection and SAS set for 132/33 kV Power Transformer circuits | Set | 0 | | | | |
| G3 | Control, Protection and SAS set for Busbar 132 kV | Set | 0 | | | | |
| | Extension of the existing Tariff Metering | | | | | | |
| G4.XE | Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh | Lot | 1 | | | | |
| _ | and MVArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation. For | | | | | | |
| | each feeder, minimum two (2) meters (main-1 & main-2) shall be provided | | ļ | | | | |
| G5.XE | Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, for required part of substation | Lot | 1 | | | | |
| | Tele-control & Tele-protection & Tele-metering facilities, | | | | | | |
| | A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, | | | | | | |
| | modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and | | | | | | |
| G6.X | at the back-up station at Biddut Bhaban, for integration of the complete substation. | Lot | 1 | | | | |
| | All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the | | | | | | |
| | substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC | | | | | | |
| | through the gateway of the substation automation system using the IEC 60870-5-104 protocol. | | | | | | |
| 040.14 | All other necessary material and equipment required for completing control, protection, substation automation and | | | | | | |
| G10.X | metering system. | Lot | 1 | | | | |
| Н | Fibre Optic Multiplexer Equipment for Tele-protection and Communication | | | | | | |
| | Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer | | | | | | |
| 1 | equipment for protection & communication, for required part of substation, shall be designed, supplied, delivered, installed, | | | | | | |
| 1 | tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is | | | | | | |
| H1.X | to be provided for. | Lot | 1 | | | | |
| | Distance relay carrier signal (main and back-up) | | | | | | |

Name of Bidder:

| | | | | Foreign Curre | ency (in) | Local Curre | ncy (in BDT) |
|-------|---|------|----------|---------------|-----------------|-------------|--------------|
| | | | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| No | Equipment | Unit | , | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| | Bus protection / breaker failure relay | | | | | | |
| | SCADA data from switchgear and control system | | | | | | |
| | Hot-line telephone system | | | | | | |
| | A lot of underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame) | | | | | | |
| H3.XE | shall be designed, supplied, delivered, installed, tested and commissioned, including supply and installation of MDF and | Lot | 1 | | | | |
| | digital cables, for required part of substation | | | | | | |
| 1 | Multicore Low Voltage Auxiliary Power and Control Cables | | | | | | |
| | A complete lot of multicore low voltage auxiliary power and control cables, including all other necessary material and | | | | | | |
| I1.XE | equipment, between all items of equipment supplied under the contract, and connection and integration of new | Lot | 1 | | | | |
| | equipment with existing equipment, shall be designed, supplied, delivered, installed, tested and commissioned | | | | | | |
| J | LV DC, Batteries, Chargers and DC Distribution | | | | | | |
| | Extension of existing LV DC 110 V Auxiliary Power Supply | | | | | | |
| J1.XE | A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be | | | | | | |
| JI.AE | designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing | | | | | | |
| | LV DC 110 V Auxiliary Power Supply and for connection of new equipment and integration with the existing equipment | | | | | | |
| | Extension of existing LV DC 48 V Auxiliary Power Supply | Lot | 1 | | | | |
| | A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be | | | | | | |
| J2.XE | designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing | | | | | | |
| | LV DC 48 V auxiliary power supply system for fibre optic multiplexer equipment for control, protection metering and | | | | | | |
| | communication and for connection of new equipment and integration with the existing equipment | | | | | | |
| К | LV AC Distribution | | | | | | |
| | Extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system. | | | | | | |
| | A complete lot, including all necessary material and equipment, including a set of LV AC distribution switchboards, shall be | | | | | | |
| K1.XE | designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing | Lot | 1 | | | | |
| | LV AC 400/230 V 50 Hz auxiliary power supply system and for connection of new equipment and integration with the | | | | | | |
| L | existing equipment Civil Works, Control Building and Foundations | | | | | | |
| L | One (1) lot of complete design, supply and construction of outdoor civil works of required switchyard area, including 132 kV | | | | | | |
| | and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary power transformers | | | | | | |
| | foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, | | | | | | |
| L2.XE | internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including | Lot | 1 | | | | |
| | soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing and for connection of new equipment and | | | | | | |
| | integration with the existing equipment | | | | | | |
| L3.XE | One (1) lot of complete design, supply and construction of civil works and facilities for adaptation of the existing control | Lot | 1 | | | | |
| - | building, including finishing works such as rendering, painting, floor finishing, etc. | | | | | | |
| N | Switchyard Lighting | | | | | | |

Name of Bidder:

| | | | | Family Original | | 1 1 0 | |
|--|---|-----|----------|------------------------------------|--------------------------------|-----------------------------------|------------------------------------|
| No | Equipment | | Quantity | Foreign Curre Unit Price CIP | ncy (in) Total Price CIP | Local Currer Unit Price EXW | ncy (in BDT) Total Price EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| N1.XE | One (1) lot of complete equipment for required switchyard area , shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections and for connection of new equipment and integration with the existing equipment . | Lot | 1 | | | | |
| Р | Earthing and Lightning Protection | | | | | | |
| P1.XE One (1) lot of complete equipment for required switchyard area , shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations and for connection of new equipment and integration with the existing equipment . | | Lot | 1 | | | | |
| Extension of 230/132/33 kV AIS Substation BARISAL (N) Subtotal - to Schedule 5 - Grand Total | | | 1 | | | | |

Name of Bidder:

Schedule 3: Design Services

Renovation/New 132/33 kV GIS Substation SHAJIBAZAR

| No | Description | Unit | Quantity <i>(1)</i> | Foreign Curre Unit Price foreign portion (2) | ncy (in) Total Price foreign portion (3) = (1) x (2) | Local Curre Unit Price Iocal portion (4) | ncy (in BDT) Total Price local portion (5)=(1) x (4) |
|---|--|------|------------------------|---|---|---|---|
| Design and engineering services, local and foreign part | | | 1 | | | | |
| | Renovation/New 132/33 kV GIS Substation SHAJIBAZAR Subtotal - to Schedule 5 - Grand Total | | | | | | |

Renovation/Upgrading of 132/33 kV AIS Substation SATHKHIRA

| No | Equipment | Unit | Quantity <i>(1)</i> | Foreign Curre Unit Price foreign portion (2) | ncy (in) Total Price foreign portion (3) = (1) x (2) | Local Curre Unit Price local portion (4) | ncy (in BDT) Total Price local portion (5)=(1) x (4) |
|--|---|------|------------------------|---|---|---|---|
| | Design and engineering services, local and foreign part | | | | | | |
| Renovation/Upgrading of 132/33 kV AIS Substation SATHKHIRA Subtotal - to Schedule 5 - Grand Total | | | | | | | |

Renovation/New 132/33 kV GIS Substation SYLHET

| No | Equipment | Unit | Quantity | Foreign Curre Unit Price foreign portion (2) | ncy (in) Total Price foreign portion (3) = (1) x (2) | Local Curre Unit Price local portion (4) | ncy (in BDT) Total Price local portion (5)=(1) x (4) |
|--|---|------|----------|---|---|---|---|
| | Design and engineering services, local and foreign part | | 1 | | | | |
| New 132/33 kV AIS Substation GHATAILRenovation/New 132/33 kV GIS Substation SYLHET Subtotal - to Schedule 5 - Grand Total | | | | | | | |

Schedule 3: Design Services

Extension of 132/33 kV AIS Substation BHANDARIA

| No | Equipment | Unit | Quantity (1) | Foreign Curre Unit Price foreign portion (2) | ncy (in) Total Price foreign portion (3) = (1) x (2) | Local Curre Unit Price Iocal portion (4) | ncy (in BDT) Total Price Iocal portion (5)=(1) x (4) |
|--|---|------|-----------------|---|---|---|---|
| Design and engineering services, local and foreign part Lump | | | 1 | | | | |
| | Extension of 132/33 kV AIS Substation BHANDARIA Subtotal - to Schedule 5 - Grand Total | | | | | | |

Extension of 132/33 kV AIS Substation BARISAL (N)

| No | Equipment | Unit | Quantity <i>(1)</i> | Foreign Curre Unit Price foreign portion (2) | ncy (in) Total Price foreign portion (3) = (1) x (2) | Local Curre Unit Price Iocal portion (4) | ncy (in BDT) Total Price local portion (5)=(1) x (4) |
|---|---|------|------------------------|---|---|---|---|
| | Design and engineering services, local and foreign part | | 1 | | | | |
| Extension of 132/33 kV AIS Substation BARISAL (N) Subtotal - to Schedule 5 - Grand Total | | | | | | | |

| Schedule 4: I | Installation and | Other Services |
|---------------|------------------|-----------------------|
|---------------|------------------|-----------------------|

| | | | | Foreign Curre | ency (in) | Local Curre | ncy (in BDT) |
|------|--|-------|----------|---------------|-----------------|-------------|--------------|
| No | Equipment | Unit | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| NO | Equipment | Onic | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| | Renovation/New 132/33/11 kV GIS Substatio | n SHA | HJIBA | ZAR | | | |
| В | 132 kV switchgear, equipment connection and steel structures | | | | | | |
| | One (1) set of complete equipment for switchgear 132 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | | |
| | A complete indoor and partly outdoor GIS Line feeder 145 kV, 3150 A busbars / 2000 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | | | | | | |
| | Q0 - One (1) set of three pole, GIS type, SF6 gas circuit breaker with three spring-stored energy operating mechanism | | | | | | |
| | Q1, Q2, Q9 - Three (3) sets of three pole, three positions, motor operated, insulated disconnector with earthing switch | | | | | | |
| | Q8 - One (1) set of three pole, make-proof, motor operated earthing switch | | | | | | |
| | T1 - Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1 A, GIS type current transformers | | | | | | |
| BG.1 | T5 - Three (3) single-phase, 2-secondary winding, 132/V3 / 110/V3 / 110/V3 kV/V/V, GIS type voltage transformers | Set | 8 | | | | |
| | T6 - One (1) set of three-phase, GIS type, hand operated disconnector link | | | | | | |
| | SA - Three (3) single-phase outdoor surge arresters, GIS type | | | | | | |
| | Z1 - One (1) set of three-phase, GIS type, cable compartment | | | | | | |
| | or | | | | | | |
| | Z2 - One (1) set of three phase indoor and outdoor GIB with three outdoor GIS/AIR bushings | | | | | | |
| | GIS.X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | | | | | | |
| | A complete indoor and partly outdoor GIS Transformer feeder 145 kV, 3150A busbars / 2000 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | | | | | | |
| | Q0 - One (1) set of three pole, GIS type, SF6 gas circuit breaker with one spring-stored energy operating mechanism | | | | | | |
| | Q1, Q2, Q9 - Three (3) set of three pole, three position, motor operated, insulated disconnector with earthing switch | | | | | | |
| | Q8 - One (1) set of three pole, make-proof, motor operated earthing switch | | | | | | |
| BG.2 | T1 - Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1 A, GIS type current transformers | Set | 4 | | | | |
| | SA - Three (3) single-phase outdoor surge arresters, GIS type | | | | | | |
| | Z1 - One (1) set of three-phase, GIS type, cable compartment | | | | | | |
| | or | | | | | | |
| | Z2 - One (1) set of three phase indoor and outdoor GIB with three outdoor GIS/AIR bushings | | | | | | |
| | X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | | | | | | |
| | A complete indoor GIS Bus Coupler bay 145 kV, 3150A busbars / 3150 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | | | | | | |
| | Q0 - One (1) set of three pole, GIS type, SF6 gas circuit breaker with one spring-stored energy operating mechanism | Cat | 4 | | | | |
| BG.3 | Q1, Q2 - Two (2) set of three pole, three position, motor operated, insulated disconnector with earthing switch | Set | 1 | | | | |
| | T1 - Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1 A, GIS type current transformers | | | | | | |
| | X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | | | | | | |
| | A complete indoor GIS Metering bay 145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | | | | | | |

| Schedule 4: | Installation a | and Other | Services |
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| | | | | Foreign Currency (in) | | Local Currency (in BDT) | |
|-------|---|------|----------|-----------------------|------------------------|-------------------------|--------------------|
| No | Equipment | Unit | Quantity | Unit Price CIP | Total Price CIP | Unit Price EXW | Total Price EXW |
| | | | (1) | (2) | $(3) = (1) \times (2)$ | (4) | (5)=(1)x(4) |
| BG.4 | Q21, Q22 - Two (2) set of three pole, three position, motor operated, insulated disconnector | Set | 1 | | | | |
| | T5 - Three (3) single-phase, 2-winding, 132/V3 / 110/V3 / 110/V3 kV/V/V, GIS type voltage transformers | | | | | | |
| | X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | | | | | | |
| BG.5 | A complete indoor GIS Busbars Earthing bay 145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | Set | 1 | | | | |
| B0.5 | Q81, Q82 - Two (2) set of three pole, make-proof, motor operated earthing switch | Oel | 1 | | | | |
| B5 | Surge arrester 145kV, 120 kV continuous operating voltage, 10kA nominal discharge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide type | Set | 72 | | | | |
| B6 | Post Insulator 132kV, 50 Hz, 650/275 kV BIL, 10 kN | Set | 72 | | | | |
| B7.X | Conductors for connection of the 132 kV switchgear, 145 kV, 2000 A, 40 kA | Lot | 1 | | | | |
| B8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear | Lot | 1 | | | | |
| B9.X | Gantry steel structures and equipment supports required for completing 132 kV switchgear | Lot | 1 | | | | |
| B10.X | All other necessary material and equipment required for completing 132 kV switchgear. | Lot | 1 | | | | |
| С | 33 kV Switchgear, equipment connection and steel structures | | | | | | |
| | One (1) set of complete equipment for switchgear 33 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | | |
| C1 | Circuit Breaker 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, vacuum type, for outdoor installation with one spring-stored energy operating mechanism | Set | 4 | | | | |
| C2.1 | Disconnector 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated | Set | 7 | | | | |
| C2.2 | Disconnector 36 kV, 100 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated, with integrated fuse of 10 A | Set | 2 | | | | |
| C3.1 | Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 2000/1/1/1/1 A/A, 4-core, single ratio, post type | Set | 12 | | | | |
| C3.2 | Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 10/1/1/1 A/A, 3-core, single ratio, post type | Set | 6 | | | | |
| C4 | Voltage transformer 36kV, 50Hz, 170/70 kV BIL, single phase, 33/V3 / 110/V3 / 110/V3 kV/V/V, 2 secondary windings, inductive type | Set | 12 | | | | |
| C5 | Surge arrester 36 kV, 30 kV continuous operating voltage, 10 kA nominal discharge current, 50 Hz, single phase, gapless, metal oxide type | Set | 12 | | | | |
| C7.X | Conductors for single busbar system and for connection of the 33 kV switchgear, 36 kV, 2000 A, 25 kA | Lot | 1 | | | | |
| C8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 33 kV switchgear | Lot | 1 | | | | |
| C9.X | Gantry steel structures and equipment supports required for completing 33 kV switchgear | Lot | 1 | | | | |
| C10.X | All other necessary material and equipment required for completing 33 kV switchgear. | Lot | 1 | | | | |
| D | Transformers | | | | | | |
| D2 | Power transformer 132/33 kV three phase 80/120 MVA, Dyn1, ONAN/ONAF | Set | 2 | | | | |
| D9 | Water Spray System | Set | 2 | | | | |
| D10.X | All other necessary material and equipment required for completing transformers | Lot | 1 | | | | |
| F | Earthing / Auxiliary Power Transformers | | | | | | |
| F1 | Earthing / Auxiliary Power Transformer 33/0.4 kV, three phase 200 kVA, Dyn11, ONAN | Set | 2 | | | | |
| F10.X | All other necessary material and equipment required for completing Earthing / Auxiliary Power transformers. | Lot | 1 | | | | |

| Schedule 4 | Installation | and Othe | r Services |
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| | | | | Foreign Currency (in) | | Local Currency (in BDT) | |
|-------|--|------|----------|-----------------------|-----------------|-------------------------|-------------|
| | | | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| No | Equipment | Unit | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| G | Control, Protection, SCADA System and Metering | | | | | | |
| | One (1) lot of complete equipment for control, protection, SCADA System and metering for 230, 132, 33 kV as well as LV AC | | | | | | |
| | and LV DC system (for complete substation) shall be designed, calculated, supplied, delivered, installed, tested and | | | | | | |
| | commissioned, under this contract. | Lot | 1 | | | | |
| | The control and protection panels shall mirror the switchyard layout. | LOT | 1 | | | | |
| | Enough space shall be reserved for future circuits. | | | | | | |
| | The system comprise the following: | | | | | | |
| G1 | Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) | Set | 8 | | | | |
| G2 | Control, Protection and SAS set for 132/33 kV Power Transformer circuits | Set | 4 | | | | |
| G3 | Control, Protection and SAS set for Busbar 132 kV | Set | 1 | | | | |
| | Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh | | | | | | |
| G4.X | and MVArh meters (accuracy class 0.2) for each line and transformer feeder. | Lot | 1 | | | | |
| | For each feeder, minimum two (2) meters (main-1 & main-2) shall be provided | | | | | | |
| G5.X | Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders | Lot | 1 | | | | |
| | Tele-control & Tele-protection & Tele-metering facilities, | | | | | | |
| | A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, | Lot | 1 | | | | |
| | modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware | | | | | | |
| G6.X | and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and | | | | | | |
| 00000 | at the back-up station at Biddut Bhaban, for integration of the complete substation. | | | | | | |
| | All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the | | | | | | |
| | substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC | | | | | | |
| | through the gateway of the substation automation system using the IEC 60870-5-104 protocol. | | | | | | |
| G10.X | All other necessary material and equipment required for completing control, protection, substation automation and | Lot | 1 | | | | |
| GIU.A | metering system. | LOI | | | | | |
| Н | Fibre Optic Multiplexer Equipment for Tele-protection and Communication | | | | | | |
| | Fibre Optic Multiplexer Equipment, a complete lot of fibre optic multiplexer equipment for protection & communication at | | | | | | |
| | substation shall be designed, supplied, delivered, installed, tested and commissioned, under this contract. Fibre optic | | | | | | |
| | multiplexer equipment is to be provided for. | | | | | | |
| | Distance relay carrier signal (main and back-up) | | | | | | |
| H1.X | Bus protection / breaker failure relay | Lot | 1 | | | | |
| | SCADA data from switchgear and control system | | | | | | |
| | VOIP system (2-IP Phone) | | | | | | |
| | 2-W remote subscriber (10 telephone sets) | | | | | | |
| | Hot-line telephone system | | | | | | |
| | A lot of underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame) | | | | | | |
| H3.X | shall be designed, supplied, delivered, installed, tested and commissioned, including supply and installation of MDF and | Lot | Lot 1 | | | | |
| | digital cables | | | | | | |
| 1 | Multicore Low Voltage Auxiliary Power and Control Cables | | | | | | |

| Schedule 4 | Installation and | d Other Services |
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| | Equipment | | 1 | Foreign Currency (in) | | Local Currency (in BDT) | |
|------|---|------|----------|-----------------------|--------------------|-------------------------|--------------------|
| No | | Unit | Quantity | Unit Price CIP | Total Price CIP | Unit Price EXW | Total Price EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| I1.X | A complete lot of multicore low voltage auxiliary power and control cables , including all other necessary material and equipment, between all items of equipment supplied under the contract shall be designed, supplied, delivered, installed, tested and commissioned | Lot | 1 | | | | |
| J | LV DC, Batteries, Chargers and DC Distribution | | | | | | |
| J1.X | A complete lot consists of two (2) sets of 110 V Ni-Cd batteries, complete with chargers and distribution switchboards, including all other necessary material and equipment, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide complete LV DC 110 V supplies for the substation. The system shall generally be as shown in the bid drawings and shall minimum include the following: (a) Two (2) sets of 100% Ni-Cd batteries, complete, each capacity shall not be less than 400 Ah at the 10-hour rate of discharge. (b) Two (2) sets of battery chargers complete, each float charge shall not be less than 100 A rating. | Lot | 1 | | | | |
| | (c) One (1) set of DC distribution switchboards. | | | | | | |
| J2.X | A complete lot consists of two (2) sets of 48V Ni-Cd batteries, complete with chargers and distribution switchboards, including all other necessary material and equipment, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide complete LV DC 48 V supplies for fibre optic multiplexer equipment for control, protection metering and communication. The system shall generally be as shown in the bid drawings and shall minimum include the following: (a) Two (2) sets of 100% Ni-Cd batteries, complete, each capacity shall not be less than 250 Ah at the 5-hour rate of discharge. | Lot | 1 | | | | |
| | (b) Two (2) sets of battery chargers complete, each float charge shall not be less than 50 A rating. | | | | | | |
| | (c) One (1) set of DC distribution switchboard. | | | | | | |
| K | LV AC Distribution | | | | | | |
| K1.X | A complete lot, including all necessary material and equipment, including a set of LV AC switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide the LV AC 400/230V, 50 Hz auxiliary power supplies for the substation | Lot | 1 | | | | |
| | The system shall generally be as shown in the bid drawings and shall include one 125A outdoor weatherproof, 3-phase with neutral and earth switched socket outlet close to the power transformers | | | | | | |
| L | Civil Works, Control Building and Foundations | | | | | | |
| L1.X | One (1) lot of complete land development of complete switchyard area by cutting, land filling, compacting up to a suitable level. The approximate total area of the substation is 3 acres | Lot | 1 | | | | |
| L2.X | One (1) lot of complete design, supply and construction of outdoor civil works including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary power transformers foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing | Lot | 1 | | | | |
| 1 | Outdoor gantry foundation 132 kV switchyard | Lot | 1 | | | | |
| 2 | Outdoor gantry foundation 33 kV switchyard | Lot | 1 | | | | |
| 3 | Outdoor equipment foundation 132 kV switchyard | Lot | 1 | | | | |

| | Equipment | Unit | | Foreign Currency (in) | | Local Currency (in BDT) | |
|--------|--|------|----------|-----------------------|------------------------|-------------------------|--------------------|
| No | | | Quantity | Unit Price | Total Price | Unit Price EXW | Total Price |
| | | | (1) | CIP (2) | CIP (3) = (1) x (2) | (4) | EXW (5)=(1)x(4) |
| 4 | Outdoor equipment foundation 33 kV switchyard | Lot | 1 | ., | | ., | |
| 5 | Power Transformer foundation including oil pit | Lot | 1 | | | | |
| 6 | Auxiliary/Station Transformer foundation. | Lot | 1 | | | | |
| 7 | Blast wall | Lot | 1 | | | | |
| 8 | Substation Main gate | Lot | 1 | | | | |
| 9 | Guard house. | Lot | 1 | | | | |
| 10 | Security Boundary Wall - extension and adaptation | Lot | 1 | | | | |
| 11 | Internal fence - extension and adaptation | Lot | 1 | | | | |
| 12 | Access road | Lot | 1 | | | | |
| 13 | Internal roads and parking, concrete culverts - extension and adaptation | Lot | 1 | | | | |
| 14 | Surface and switchyard drainage system including outfall extension and adaptation | Lot | 1 | | | | |
| 15 | Cable Trench including soak pit, PVC pipes etc extension and adaptation | Lot | 1 | | | | |
| 16 | Switchyard surface finishing. | Lot | 1 | | | | |
| 17 | Gravel surfacing. | Lot | 1 | | | | |
| | One (1) lot of complete design, supply and construction of civil works and facilities for one new GIS 132 kV and control three- | 201 | | | | | |
| L3.1X | storey building with cable basement, including foundation works, super structure works, finishing works like rendering, | Lot | 1 | | | | |
| 201174 | painting, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, etc. | 201 | - | | | | |
| 1 | Complete Foundation works. | Lot | 1 | | | | |
| 2 | Complete Super structures works. | Lot | 1 | | | | |
| 3 | Complete all finishing works like external & internal stairs, rendering, painting, water supply, sanitary, floor finish, furniture, etc. | Lot | 1 | | | | |
| 4 | EOT crane (5 tons) | Lot | 1 | | | | |
| 5 | Lift (6 persons) - ONLY CIVIL PART | Lot | 1 | | | | |
| L3.2X | One (1) lot of complete design, supply and construction of civil works and facilities for water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipe lines, etc., sewage facilities including septic tank, etc. | Lot | 1 | | | | |
| 1 | Water supply, including Pump house with deep tube well for drinking water, motor, pump, water reservoir, water pipe line, necessary fittings etc. all complete. | Lot | 1 | | | | |
| 2 | Sewage facilities, including Septic tank, soak well etc. all complete | Lot | 1 | | | | |
| L4.X | One (1) lot of complete Pile load test Individual test, payment for successful test only (applicable for building(s), power transformer foundation(s) and gantry(is) previously selected by the Employer's Engineer) | Lot | 1 | | | | |
| 1 | Comperssion test | no. | 3 | | | | |
| 2 | Uplift test | no. | 1 | | | | |
| М | Building Lighting, Small Power, Air Conditioning and Ventilation | | | | | | |
| M1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide lighting, LV power supply, air conditioning system, ventilation and emergency DC lighting for the substation control building(s). | Lot | 1 | | | | |
| N | Switchyard Lighting | | | | | | |

Schedule 4: Installation and Other Services

Name of Bidder:

| Schedule 4 | Installation and | d Other Services |
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| | | | | Foreign Currency (in) | | Local Currency (in BDT) | |
|-------|---|----------|-----------------|--------------------------|---------------------------------------|--------------------------|-----------------------------------|
| No | Equipment | Unit | Quantity (1) | Unit Price CIP (2) | Total Price CIP (3) = (1) x (2) | Unit Price EXW (4) | Total Price EXW (5)=(1)x(4) |
| N1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections. | Lot | 1 | (-) | | 19 | |
| Р | Earthing and Lightning Protection | | | | | | |
| P1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, of earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations. | Lot | 1 | | | | |
| P2 | Two (2) sets of 3-phase portable (maintenance) earthing equipment devices with connectors and telescopic glass fibre operating stick suitable for each voltage | Set | 2 | | | | |
| Q | Cable | | | | | | |
| Q.2.2 | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three single phase XLPE cables with corresponding GIS connections and Cable End Terminals; with all required equipment; 145 kV, 1,000 A, 40 kA / 1 sec, 50 Hz, for connection of one 132 kV bay. Approximate lengths are 100 meters | Lot | 12 | | | | |
| Q3.1 | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three phase or three single phase cables and cable end terminal and correspondent equipment 36 kV, 800 A, 25 kA / 1 sec, 50 Hz. Approximate lengths are 100 meters | Lot | 4 | | | | |
| Х | Installation and Other Services | | | | | | |
| X1 | Preparation works, de-installation works, packing, loading, transport and un-loading of existing equipment including power transformers at the location chosen by PGCB, no longer than 100 km; provisional and temporary solutions including equipment, works and services, for permanent power suppy during construction | Lump sum | 1 | | | | |
| X2 | Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment - General item, for all services not mentioned before | Lump sum | 1 | | | | |
| X3 | Transport of material and equipment | Lump sum | 1 | | | | |
| X4 | Insurance of material and equipment during transport | Lump sum | 1 | | | | |
| Y | Factory Acceptance Tests and Trainings - for complete package | | | | | | |
| Y1 | Cost and expenses related to the Factory Acceptance Tests | Lump sum | 1 | | | | |
| Y2 | Cost and expenses related to the Trainings | Lump sum | 1 | | | | |
| Z | ESHS services for the complete lot | | | | | | |
| Z1 | Resources allocated to ESHS management (excluding all or part of the costs of the A2, A3 and A8 item) | Lump sum | 1 | | | | |
| Z2 | Drafting and updating the ESHS documentation, reporting, inspections | Lump sum | 1 | | | | |
| Z3 | Implementation of the H&S Plan: Meetings, health care centre, medical check-ups, emergencies and evacuations, safety protective equipment, hygiene | Lump sum | 1 | | | | |
| Z4 | Accommodation, drinking water, meals and transportation of staff: The Bidder shall detail the financial conditions of the supply of accommodation, meals and transport to its staff. (The costs for site mobililization should exclude all or part of the the cost of this item) | | | | | | |
| Z4.1 | Accommodation | Lump sum | 1 | | | | |
| Z4.2 | Meals | Lump sum | 1 | | | | |
| Z4.3 | Transport | Lump sum | 1 | | | | |
| Z5 | Training and local recruitment management costs | Lump sum | 1 | | | | |

| Schedule 4: Installation a | nd Other Services |
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| | Equipment | Unit | | Foreign Currency (in) | | Local Currency (in BDT) | |
|----|--|----------|----------|-----------------------|-----------------|-------------------------|-------------|
| No | | | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| NO | | | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| Z6 | Protection of adjacent areas, biodiversity, prevention of erosion and wastewater management | Lump sum | 1 | | | | |
| Z7 | Traffic, noise and atmospheric emissions management, land take | Lump sum | 1 | | | | |
| Z8 | Waste and hazardous products management | Lump sum | 1 | | | | |
| Z9 | Vegetation clearing and site rehabilitation(The costs for site mobililization should exclude all or part of the the cost of this item) | Lump sum | 1 | | | | |
| | Renovation/New 132/33/11 kV GIS Substation SHAHJIBAZAR | | | | | | |
| | Subtotal - to Schedule 5 - Grand Total | | | | | | |

| Schedule 4: Installation and | Other Services |
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| | | | | Foreign Currency (in) | | Local Currency (in BDT) | |
|-------|--|-------|----------|-----------------------|-----------------|-------------------------|-------------|
| N.s. | Equipment (| | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| No | Equipment | Unit | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| | Renovation/Upgading of 132/33 kV AIS Subst | ation | SATHK | HIRA | | | |
| В | 132 kV switchgear, equipment connection and steel structures | | | | | | |
| | One (1) set of complete equipment for switchgear 132 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | | |
| B5 | Surge arrester 145kV, 120 kV continuous operating voltage, 10kA nominal discharge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide type | Set | 3 | | | | |
| B7.X | Conductors for connection of the 132 kV switchgear, 145 kV, 2000 A, 40 kA | Lot | 1 | | | | |
| B8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear | Lot | 1 | | | | |
| B9.X | Gantry steel structures and equipment supports required for completing 132 kV switchgear | Lot | 1 | | | | |
| B10.X | All other necessary material and equipment required for completing 132 kV switchgear. | Lot | 1 | | | | |
| С | 33 kV Switchgear, equipment connection and steel structures | | | | | | |
| | One (1) set of complete equipment for switchgear 33 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | | |
| C5 | Surge arrester 36 kV, 30 kV continuous operating voltage, 10 kA nominal discharge current, 50 Hz, single phase, gapless, metal oxide type | Set | 3 | | | | |
| C7.X | Conductors for connection of the 33 kV switchgear, 36 kV, 2000 A, 25 kA | Lot | 1 | | | | |
| C8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 33 kV switchgear | Lot | 1 | | | - | |
| C9.X | Gantry steel structures and equipment supports required for completing 33 kV switchgear | Lot | 1 | | | | |
| C10.X | All other necessary material and equipment required for completing 33 kV switchgear. | Lot | 1 | | | | |
| D | Transformers | | | | | | |
| D2 | Power transformer 132/33 kV three phase 80/120 MVA, Dyn1, ONAN/ONAF | Set | 1 | | | | |
| D9 | Water Spray System | Set | 1 | | | | |
| D10.X | All other necessary material and equipment required for completing transformers | Lot | 1 | | | | |
| G | Control, Protection, SCADA System and Metering | | | | | | |
| | Extension of the existing Control, Protection, SCADA System and Metering | | | | | | |
| | New equipment shall be integrated into the existing system. | | | | | | |
| | One (1) lot of equipment for extension of the existing control, protection, SCADA and metering for 230, 132, 33 kV as well | | | | | | |
| | as LV AC and LV DC system, for required part of substation, shall be designed, calculated, supplied, delivered, installed, | | | | | | |
| | tested and commissioned and integrated into the existing system, under this contract. | Lot | 1 | | | | |
| | The control and protection panels shall mirror the switchyard layout. | - | | | | | |
| | Enough space shall be reserved for future circuits. | | | | | | |
| | The system comprise the following: | 1 | | | | | |
| G1 | Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) | Set | 0 | | | | |
| G2 | Control, Protection and SAS set for 132/33 kV Power Transformer circuits | Set | 1 | 1 | | | |
| G3 | Control, Protection and SAS set for Busbar 132 kV | Set | 0 | | | | |
| 50 | Extension of the existing Tariff Metering | | Ť | 1 | | | |

| Schedule 4 | Installation and | d Other Services |
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| | | | | Foreign Currency (in) | | Local Currency (in BDT) | |
|-------|--|------|----------|-----------------------|------------------------|-------------------------|--------------------|
| No | Equipment | Unit | Quantity | Unit Price CIP | Total Price CIP | Unit Price EXW | Total Price EXW |
| | | | (1) | (2) | $(3) = (1) \times (2)$ | (4) | (5)=(1)x(4) |
| G4.XE | Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation. For each feeder, minimum two (2) meters (main-1 & main-2) shall be provided | Lot | 1 | | | | |
| G5.XE | Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, for required part of substation | Lot | 1 | | | | |
| | Tele-control & Tele-protection & Tele-metering facilities, | | | | | | |
| G6.X | A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut Bhaban, for integration of the complete substation. | Lot | 1 | | | | |
| | All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5-104 protocol. | | | | | | |
| G10.X | All other necessary material and equipment required for completing control, protection, substation automation and metering system. | Lot | 1 | | | | |
| Н | Fibre Optic Multiplexer Equipment for Tele-protection and Communication | | | | | | |
| H1.X | Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer equipment for protection & communication, for required part of substation, shall be designed, supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. | Lot | 1 | 1 | | | |
| 111.7 | Distance relay carrier signal (main and back-up) | LOI | | | | | |
| | Bus protection / breaker failure relay | | | | | | |
| | SCADA data from switchgear and control system | | | | | | |
| | Hot-line telephone system | | | | | | |
| H3.XE | A lot of underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame) shall be designed, supplied, delivered, installed, tested and commissioned, including supply and installation of MDF and digital cables, for required part of substation | Lot | 1 | | | | |
| - | Multicore Low Voltage Auxiliary Power and Control Cables | | | | | | |
| I1.XE | A complete lot of multicore low voltage auxiliary power and control cables , including all other necessary material and equipment, between all items of equipment supplied under the contract, and connection and integration of new equipment with existing equipment, shall be designed, supplied, delivered, installed, tested and commissioned | Lot | 1 | | | | |
| J | LV DC, Batteries, Chargers and DC Distribution | | | | | | |
| | Extension of existing LV DC 110 V Auxiliary Power Supply | | | | | | |
| J1.XE | A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV DC 110 V Auxiliary Power Supply and for connection of new equipment and integration with the existing equipment | | | | | | |
| | Extension of existing LV DC 48 V Auxiliary Power Supply | Lot | 1 | | | | |
| | | | 1 | 1 | I | 1 | 1 |

| Schedule 4 | Installation and | d Other Services |
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| No | Equipment | Unit | Quantity | Foreign Currency (in) | | Local Currency (in BDT) | |
|-------|---|------|----------|------------------------|------------------------|-------------------------|-------------|
| | | | | Unit Price Total Price | | Unit Price | Total Price |
| | | | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | $(3) = (1) \times (2)$ | (4) | (5)=(1)x(4) |
| J2.XE | A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV DC 48 V auxiliary power supply system for fibre optic multiplexer equipment for control, protection metering and communication and for connection of new equipment and integration with the existing equipment | | | | | | |
| К | LV AC Distribution | | | | | | |
| | Extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system. | | | | | | |
| K1.XE | A complete lot, including all necessary material and equipment, including a set of LV AC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system and for connection of new equipment and integration with the existing equipment | Lot | 1 | | | | |
| L | Civil Works, Control Building and Foundations | | | | | | |
| L2.XE | One (1) lot of complete design, supply and construction of outdoor civil works of required switchyard area, including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary power transformers foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing and for connection of new equipment and integration with the existing equipment | Lot | 1 | | | | |
| 1 | Outdoor gantry foundation 132 kV switchyard | Lot | 0 | | | | |
| 2 | Outdoor gantry foundation 33 kV switchyard | Lot | 0 | | | | |
| 3 | Outdoor equipment foundation 132 kV switchyard | Lot | 1 | | | | |
| 4 | Outdoor equipment foundation 33 kV switchyard | Lot | 1 | | | | |
| 5 | Power Transformer foundation including oil pit | Lot | 1 | | | | |
| 6 | Auxiliary/Station Transformer foundation. | Lot | 0 | | | | |
| 7 | Blast wall | Lot | 1 | | | | |
| 8 | Substation Main gate | Lot | 0 | | | | |
| 9 | Guard house. | Lot | 0 | | | | |
| 10 | Security Boundary Wall - extension and adaptation | Lot | 0 | | | | |
| 11 | Internal fence - extension and adaptation | Lot | 0 | | | | |
| 12 | Access road | Lot | 0 | | | | |
| 13 | Internal roads and parking, concrete culverts - extension and adaptation | Lot | 1 | | | | |
| 14 | Surface and switchyard drainage system including outfall extension and adaptation | Lot | 1 | | | | |
| 15 | Cable Trench including soak pit, PVC pipes etc extension and adaptation | Lot | 1 | | | | |
| 16 | Switchyard surface finishing. | Lot | 1 | | | | |
| 17 | Gravel surfacing. | Lot | 1 | | | | |
| L3.XE | One (1) lot of complete design, supply and construction of civil works and facilities for adaptation of the existing control building, including finishing works such as rendering, painting, floor finishing, etc. | Lot | 1 | | | | |

| Schedule 4 | Installation and | d Other Services |
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| No | | | | Foreign Currency (in) | | Local Currency (in BDT) | |
|-------|---|----------|----------|-----------------------|------------------------|-------------------------|-------------|
| | | | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| No | Equipment | Unit | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | $(3) = (1) \times (2)$ | (4) | (5)=(1)x(4) |
| L4.X | One (1) lot of complete Pile load test Individual test, payment for successful test only (applicable for building(s), power transformer foundation(s) and gantry(is) previously selected by the Employer's Engineer) | Lot | 1 | | | | |
| 1 | Comperssion test | no. | 0 | | | | |
| 2 | Uplift test | no. | 0 | | | | |
| N | Switchyard Lighting | | | | | | |
| N1.XE | One (1) lot of complete equipment for required switchyard area , shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections and for connection of new equipment and integration with the existing equipment . | Lot | 0 | | | | |
| Р | Earthing and Lightning Protection | | | | | | |
| P1.XE | One (1) lot of complete equipment for required switchyard area , shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations and for connection of new equipment and integration with the existing equipment . | Lot | 1 | | | | |
| Х | Installation and Other Services | | | | | | |
| | Preparation works, de-installation works, packing, loading, transport and un-loading of existing equipment including power transformers at the location chosen by PGCB, no longer than 100 km; provisional and temporary solutions including equipment, works and services, for permanent power suppy during construction | Lump sum | 1 | | | | |
| X2 | Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment - General item, for all services not mentioned before | Lump sum | 1 | | | | |
| X3 | Transport of material and equipment | Lump sum | 1 | | | | |
| X4 | Insurance of material and equipment during transport | Lump sum | 1 | | | | |
| | Renovation/Upgading of 132/33 kV AIS Substation SATHKHIRA | | | | | | |
| | Subtotal - to Schedule 5 - Grand Total | | | | | | |

| Schedule 4: Installation and C | Other Services |
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| | | | | Foreign Curre | ency (in) | Local Curre | ncy (in BDT) | | | | |
|------|--|---------|-------------|---------------|-----------------|-------------|--------------|--|--|--|--|
| No | Equipment | Unit | Quantity | Unit Price | Total Price | Unit Price | Total Price | | | | |
| | L qupment | onit | | CIP | CIP | EXW | EXW | | | | |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) | | | | |
| | Renovation/New 132/33 kV GIS Substat | tion SY | LHET | | | | | | | | |
| В | 132 kV switchgear, equipment connection and steel structures | | | | | | | | | | |
| | One (1) set of complete equipment for switchgear 132 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | | | | | | |
| | A complete indoor and partly outdoor GIS Line feeder 145 kV, 3150 A busbars / 2000 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | | | | | | | | | | |
| | Q0 - One (1) set of three pole, GIS type, SF6 gas circuit breaker with three spring-stored energy operating mechanism | | | | | | | | | | |
| | Q1, Q2, Q9 - Three (3) sets of three pole, three positions, motor operated, insulated disconnector with earthing switch | | | | | | | | | | |
| | Q8 - One (1) set of three pole, make-proof, motor operated earthing switch | | | | | | | | | | |
| | T1 - Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1 A, GIS type current transformers | | | | | | | | | | |
| BG.1 | T5 - Three (3) single-phase, 2-secondary winding, 132/V3 / 110/V3 / 110/V3 kV/V/V, GIS type voltage transformers | Set | 8 | | | | | | | | |
| | T6 - One (1) set of three-phase, GIS type, hand operated disconnector link | | | | | | | | | | |
| | SA - Three (3) single-phase outdoor surge arresters, GIS type | | | | | | | | | | |
| | Z1 - One (1) set of three-phase, GIS type, cable compartment | | | | | | | | | | |
| | or | | | | | | | | | | |
| | Z2 - One (1) set of three phase indoor and outdoor GIB with three outdoor GIS/AIR bushings | | | | | | | | | | |
| | GIS.X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | | | | | | | | | | |
| | A complete indoor and partly outdoor GIS Transformer feeder 145 kV, 3150A busbars / 2000 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | _ | | | | | | | | | |
| | Q0 - One (1) set of three pole, GIS type, SF6 gas circuit breaker with one spring-stored energy operating mechanism | | | | | | | | | | |
| | Q1, Q2, Q9 - Three (3) set of three pole, three position, motor operated, insulated disconnector with earthing switch | | | | | | | | | | |
| | Q8 - One (1) set of three pole, make-proof, motor operated earthing switch | | | | | | | | | | |
| BG.2 | T1 - Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1 A, GIS type current transformers | Set | 4 | | | | | | | | |
| | SA - Three (3) single-phase outdoor surge arresters, GIS type | | | | | | | | | | |
| | Z1 - One (1) set of three-phase, GIS type, cable compartment | | | | | | | | | | |
| | or | | | | | | | | | | |
| | Z2 - One (1) set of three phase indoor and outdoor GIB with three outdoor GIS/AIR bushings | | | | | | | | | | |
| | X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | | | | | | | | | | |
| | A complete indoor GIS Bus Coupler bay 145 kV, 3150A busbars / 3150 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | | | | | | | | | | |
| PC 2 | Q0 - One (1) set of three pole, GIS type, SF6 gas circuit breaker with one spring-stored energy operating mechanism | S at | 4 | | | | | | | | |
| BG.3 | Q1, Q2 - Two (2) set of three pole, three position, motor operated, insulated disconnector with earthing switch | Set | 1 | | | | | | | | |
| | T1 - Three (3) single-phase, 5-core, multi ratio, 3200-1600-800/1/1/1/1 A, GIS type current transformers | _ | - | 1 | 1 | | | | | | |
| | X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | | | | | | | | | | |
| | A complete indoor GIS Metering bay 145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | | | | | | | | | | |

| Schedule 4: | Installation a | and Other | Services |
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| | | | - | Foreign Curre | ency (in) | Local Curre | ncy (in BDT) |
|-------|---|------|----------|-------------------|------------------------|-------------------|--------------------|
| No | Equipment | Unit | Quantity | Unit Price CIP | Total Price CIP | Unit Price EXW | Total Price EXW |
| | | | (1) | (2) | $(3) = (1) \times (2)$ | (4) | (5)=(1)x(4) |
| BG.4 | Q21, Q22 - Two (2) set of three pole, three position, motor operated, insulated disconnector | Set | 1 | | | | |
| | T5 - Three (3) single-phase, 2-winding, 132/V3 / 110/V3 / 110/V3 kV/V/V, GIS type voltage transformers | | | | | | |
| | X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay | | | | | | |
| BG.5 | A complete indoor GIS Busbars Earthing bay 145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: | Set | 1 | | | | |
| DG.J | Q81, Q82 - Two (2) set of three pole, make-proof, motor operated earthing switch | Jei | 1 | | | | |
| B5 | Surge arrester 145kV, 120 kV continuous operating voltage, 10kA nominal discharge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide type | Set | 72 | | | | |
| B6 | Post Insulator 132kV, 50 Hz, 650/275 kV BIL, 10 kN | Set | 72 | | | | |
| B7.X | Conductors for connection of the 132 kV switchgear, 145 kV, 2000 A, 40 kA | Lot | 1 | | | | |
| B8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear | Lot | 1 | | | | |
| B9.X | Gantry steel structures and equipment supports required for completing 132 kV switchgear | Lot | 1 | | | | |
| B10.X | All other necessary material and equipment required for completing 132 kV switchgear. | Lot | 1 | | | | |
| С | 33 kV Switchgear, equipment connection and steel structures | | | | | | |
| | One (1) set of complete equipment for switchgear 33 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | | |
| C1 | Circuit Breaker 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, vacuum type, for outdoor installation with one spring-stored energy operating mechanism | Set | 4 | | | | |
| C2.1 | Disconnector 36 kV, 2000 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated | Set | 7 | | | | |
| C2.2 | Disconnector 36 kV, 100 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated, with integrated fuse of 10 A | Set | 2 | | | | |
| C3.1 | Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 2000/1/1/1/1 A/A, 4-core, single ratio, post type | Set | 12 | | | | |
| C3.2 | Current transformer 36 kV, 25kA, 50Hz, 170/70 kV BIL, single phase, 10/1/1/1 A/A, 3-core, single ratio, post type | Set | 6 | | | | |
| C4 | Voltage transformer 36kV, 50Hz, 170/70 kV BIL, single phase, 33/V3 / 110/V3 / 110/V3 kV/V/V, 2 secondary windings, inductive type | Set | 12 | | | | |
| C5 | Surge arrester 36 kV, 30 kV continuous operating voltage, 10 kA nominal discharge current, 50 Hz, single phase, gapless, metal oxide type | Set | 12 | | | | |
| C7.X | Conductors for single busbar system and for connection of the 33 kV switchgear, 36 kV, 2000 A, 25 kA | Lot | 1 | | | | |
| C8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 33 kV switchgear | Lot | 1 | | | | |
| C9.X | Gantry steel structures and equipment supports required for completing 33 kV switchgear | Lot | 1 | | | | |
| C10.X | All other necessary material and equipment required for completing 33 kV switchgear. | Lot | 1 | | | | |
| D | Transformers | | | | | | |
| D2 | Power transformer 132/33 kV three phase 80/120 MVA, Dyn1, ONAN/ONAF | Set | 2 | | | | |
| D9 | Water Spray System | Set | 2 | | | | |
| D10.X | All other necessary material and equipment required for completing transformers | Lot | 1 | | | | |
| F | Earthing / Auxiliary Power Transformers | | | | | | |
| F1 | Earthing / Auxiliary Power Transformer 33/0.4 kV, three phase 200 kVA, Dyn11, ONAN | Set | 2 | | | | |
| F10.X | All other necessary material and equipment required for completing Earthing / Auxiliary Power transformers. | Lot | 1 | | | | |

| Schedule 4 | Installation | and Othe | r Services |
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| | | | | Foreign Currency (in) | | Local Currency (in BDT) | |
|-------|--|------|----------|-----------------------|-----------------|-------------------------|-------------|
| | | | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| No | Equipment | Unit | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| G | Control, Protection, SCADA System and Metering | | | | | | |
| | One (1) lot of complete equipment for control, protection, SCADA System and metering for 230, 132, 33 kV as well as LV AC | | | | | | |
| | and LV DC system (for complete substation) shall be designed, calculated, supplied, delivered, installed, tested and | | | | | | |
| | commissioned, under this contract. | Lot | 1 | | | | |
| | The control and protection panels shall mirror the switchyard layout. | LOT | 1 | | | | |
| | Enough space shall be reserved for future circuits. | | | | | | |
| | The system comprise the following: | | | | | | |
| G1 | Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) | Set | 8 | | | | |
| G2 | Control, Protection and SAS set for 132/33 kV Power Transformer circuits | Set | 4 | | | | |
| G3 | Control, Protection and SAS set for Busbar 132 kV | Set | 1 | | | | |
| | Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh | | | | | | |
| G4.X | | Lot | 1 | | | | |
| | For each feeder, minimum two (2) meters (main-1 & main-2) shall be provided | | | | | | |
| G5.X | Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders | Lot | 1 | | | | |
| | Tele-control & Tele-protection & Tele-metering facilities, | | | | | | |
| | A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, | | | | | | |
| | modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware | | | | | | |
| G6.X | and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and | Lot | 1 | | | | |
| 00000 | at the back-up station at Biddut Bhaban, for integration of the complete substation. | | | | | | |
| | All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the | | | | | | |
| | substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC | | | | | | |
| | through the gateway of the substation automation system using the IEC 60870-5-104 protocol. | | | | | | |
| G10.X | All other necessary material and equipment required for completing control, protection, substation automation and | Lot | 1 | | | | |
| GIU.A | metering system. | LOI | I | | | | |
| Н | Fibre Optic Multiplexer Equipment for Tele-protection and Communication | | | | | | |
| | Fibre Optic Multiplexer Equipment, a complete lot of fibre optic multiplexer equipment for protection & communication at | | | | | | |
| | substation shall be designed, supplied, delivered, installed, tested and commissioned, under this contract. Fibre optic | | | | | | |
| | multiplexer equipment is to be provided for. | | | | | | |
| | Distance relay carrier signal (main and back-up) | | | | | | |
| H1.X | Bus protection / breaker failure relay | Lot | 1 | | | | |
| | SCADA data from switchgear and control system | | | | | | |
| | VOIP system (2-IP Phone) | | | | | | |
| | 2-W remote subscriber (10 telephone sets) | | | | | | |
| | Hot-line telephone system | | | | | | |
| | A lot of underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame) | | | | | | |
| H3.X | shall be designed, supplied, delivered, installed, tested and commissioned, including supply and installation of MDF and | Lot | 1 | | | | |
| | digital cables | | | | | | |
| 1 | Multicore Low Voltage Auxiliary Power and Control Cables | | | | | | |

| Schedule 4 | Installation and | Other Services |
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| | | | | Foreign Currency (in) | | Local Currency (in BDT) | | | | |
|------|---|------|----------|-----------------------|--------------------|-------------------------|--------------------|--|--|--|
| No | Equipment | Unit | Quantity | Unit Price CIP | Total Price CIP | Unit Price EXW | Total Price EXW | | | |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) | | | |
| I1.X | A complete lot of multicore low voltage auxiliary power and control cables , including all other necessary material and equipment, between all items of equipment supplied under the contract shall be designed, supplied, delivered, installed, tested and commissioned | Lot | 1 | | | | | | | |
| J | LV DC, Batteries, Chargers and DC Distribution | | | | | | | | | |
| J1.X | A complete lot consists of two (2) sets of 110 V Ni-Cd batteries, complete with chargers and distribution switchboards, including all other necessary material and equipment, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide complete LV DC 110 V supplies for the substation. The system shall generally be as shown in the bid drawings and shall minimum include the following: (a) Two (2) sets of 100% Ni-Cd batteries, complete, each capacity shall not be less than 400 Ah at the 10-hour rate of discharge. | Lot | 1 | | | | | | | |
| | (b) Two (2) sets of battery chargers complete, each float charge shall not be less than 100 A rating. | | | | | | | | | |
| | (c) One (1) set of DC distribution switchboards. A complete lot consists of two (2) sets of 48V Ni-Cd batteries, complete with chargers and distribution switchboards, | | | | | | | | | |
| | including all other necessary material and equipment, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide complete LV DC 48 V supplies for fibre optic multiplexer equipment for control, protection metering and communication. | I, | | 1 | | | | | | |
| J2.X | The system shall generally be as shown in the bid drawings and shall minimum include the following: (a) Two (2) sets of 100% Ni-Cd batteries, complete, each capacity shall not be less than 250 Ah at the 5-hour rate of discharge. | Lot | | | | | | | | |
| | (b) Two (2) sets of battery chargers complete, each float charge shall not be less than 50 A rating. | | | | | | | | | |
| | (c) One (1) set of DC distribution switchboard. | | | | | | | | | |
| к | LV AC Distribution | | | | | | | | | |
| K1.X | A complete lot, including all necessary material and equipment, including a set of LV AC switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide the LV AC 400/230V, 50 Hz auxiliary power supplies for the substation | Lot | 1 | | | | | | | |
| | The system shall generally be as shown in the bid drawings and shall include one 125A outdoor weatherproof, 3-phase with neutral and earth switched socket outlet close to the power transformers | | | | | | | | | |
| L | Civil Works, Control Building and Foundations | | | | | | | | | |
| L1.X | One (1) lot of complete land development of complete switchyard area by cutting, land filling, compacting up to a suitable level. | Lot | 1 | | | | | | | |
| | The approximate total area of the substation is 3 acres One (1) lot of complete design, supply and construction of outdoor civil works including 132 kV and 33 kV gantry foundation, | | | | | | | | | |
| L2.X | 132 kV and 33 kV equipment foundation, power transformers and auxiliary power transformers foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing | Lot | 1 | | | | | | | |
| 1 | Outdoor gantry foundation 132 kV switchyard | Lot | 1 | | | | | | | |
| 2 | Outdoor gantry foundation 33 kV switchyard | Lot | 1 | | | | | | | |
| 3 | Outdoor equipment foundation 132 kV switchyard | Lot | 1 | | | | | | | |

| | | | | Foreign Curre | ency (in) | Local Curre | ency (in BDT) |
|-------|---|------|----------|-------------------|--------------------|-------------------|--------------------|
| No | Equipment | Unit | Quantity | Unit Price CIP | Total Price CIP | Unit Price EXW | Total Price EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| 4 | Outdoor equipment foundation 33 kV switchyard | Lot | 1 | | | | |
| 5 | Power Transformer foundation including oil pit | Lot | 1 | | | | 1 |
| 6 | Auxiliary/Station Transformer foundation. | Lot | 1 | | | | 1 |
| 7 | Blast wall | Lot | 1 | | | | |
| 8 | Substation Main gate | Lot | 1 | | | | |
| 9 | Guard house. | Lot | 1 | | | | |
| 10 | Security Boundary Wall - extension and adaptation | Lot | 1 | | | | |
| 11 | Internal fence - extension and adaptation | Lot | 1 | | | | |
| 12 | Access road | Lot | 1 | | | | |
| 13 | Internal roads and parking, concrete culverts - extension and adaptation | Lot | 1 | | | | |
| 14 | Surface and switchyard drainage system including outfall extension and adaptation | Lot | 1 | | | | |
| 15 | Cable Trench including soak pit, PVC pipes etc extension and adaptation | Lot | 1 | | | | |
| 16 | Switchyard surface finishing. | Lot | 1 | | | | |
| 17 | Gravel surfacing. | Lot | 1 | | | | |
| L3.1X | One (1) lot of complete design, supply and construction of civil works and facilities for one new GIS 132 kV and control three- storey building with cable basement, including foundation works, super structure works, finishing works like rendering, painting, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, etc. | Lot | 1 | | | | |
| 1 | Complete Foundation works. | Lot | 1 | | | - | 1 |
| 2 | Complete Super structures works. | Lot | 1 | | | | |
| 3 | Complete all finishing works like external & internal stairs, rendering, painting, water supply, sanitary, floor finish, furniture, etc. | Lot | 1 | | | | |
| 4 | EOT crane (5 tons) | Lot | 1 | | | | |
| 5 | Lift (6 persons) - ONLY CIVIL PART | Lot | 1 | | | | |
| L3.2X | One (1) lot of complete design, supply and construction of civil works and facilities for one new warehouse, including foundation works, super structure works, finishing works like rendering, painting, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, etc. | | | | | | |
| 1 | Complete Foundation works. | Lot | 1 | | | | 1 |
| 2 | Complete Super structures works. | Lot | 1 | | | | 1 |
| 3 | Complete all finishing works like rendering, painting, water supply, sanitary, floor finish, furniture, etc. | Lot | 1 | | | | |
| L3.3X | One (1) lot of complete design, supply and construction of civil works and facilities for water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipe lines, etc., sewage facilities including septic tank, etc. | | | | | | |
| 1 | Water supply, including Pump house with deep tube well for drinking water, motor, pump, water reservoir, water pipe line, necessary fittings etc. all complete. | Lot | 1 | | | | |
| 2 | Sewage facilities, including Septic tank, soak well etc. all complete | Lot | 1 | | | | |
| L4.X | One (1) lot of complete Pile load test Individual test, payment for successful test only (applicable for building(s), power transformer foundation(s) and gantry(is) previously selected by the Employer's Engineer) | Lot | 1 | | | | |
| 1 | Comperssion test | no. | 1 | | | | |
| 2 | Uplift test | no. | 1 | | | | |

Schedule 4: Installation and Other Services

Name of Bidder:

| Schedule 4 | Installation | and Other | Services |
|------------|--------------|-----------|----------|
|------------|--------------|-----------|----------|

| | | | Quantity | Foreign Curre Unit Price | ency (in) Total Price | Local Curre Unit Price | ncy (in BDT) Total Price |
|-------|---|----------|----------|-----------------------------|--------------------------|---------------------------|-----------------------------|
| No | Equipment | Unit | - | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| М | Building Lighting, Small Power, Air Conditioning and Ventilation | | | | | | |
| M1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide lighting, LV power supply, air conditioning system, ventilation and emergency DC lighting for the substation control building(s). | Lot | 1 | | | | |
| N | Switchyard Lighting | | | | | | |
| N1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections. | Lot | 1 | | | | |
| Р | Earthing and Lightning Protection | | | | | | |
| P1.X | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, of earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations. | Lot | 1 | | | | |
| P2 | Two (2) sets of 3-phase portable (maintenance) earthing equipment devices with connectors and telescopic glass fibre operating stick suitable for each voltage | Set | 2 | | | | |
| Q | Cable | | | | | | |
| Q.2.2 | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three single phase XLPE cables with corresponding GIS connections and Cable End Terminals; with all required equipment; 145 kV, 1,000 A, 40 kA / 1 sec, 50 Hz, for connection of one 132 kV bay. Approximate lengths are 50 to 100 meters | Lot | 12 | | | | |
| Q3.1 | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three phase or three single phase cables and cable end terminal and correspondent equipment 36 kV, 800 A, 25 kA / 1 sec, 50 Hz. Approximate lengths are 20 meters | Lot | 4 | | | | |
| Х | Installation and Other Services | | | | | | |
| X1 | Preparation works, de-installation works, packing, loading, transport and un-loading of existing equipment including power transformers at the location chosen by PGCB, no longer than 100 km; provisional and temporary solutions including equipment, works and services, for permanent power suppy during construction | Lump sum | 1 | | | | |
| X2 | Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment - General item, for all services not mentioned before | Lump sum | 1 | | | | |
| Х3 | Transport of material and equipment | Lump sum | 1 | | | | |
| X4 | Insurance of material and equipment during transport | Lump sum | 1 | | | | |
| | Renovation/New 132/33 kV GIS Substation SYLHET | | | | | | |
| | Subtotal - to Schedule 5 - Grand Total | | | | | | |

| Schedule 4: | Installation an | d Other Services |
|-------------|-----------------|------------------|
|-------------|-----------------|------------------|

| | | | | Foreign Currency (in) | | Local Curre | ncy (in BDT) |
|-------|--|------|----------|-----------------------|-----------------|-------------|--------------|
| No | Farriement | Unit | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| NO | Equipment | Onic | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| | Extension of 132/33 kV AIS Substation | BHAN | DARIA | | | | |
| В | 132 kV switchgear, equipment connection and steel structures | | | | | | |
| | One (1) set of complete equipment for switchgear 132 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | | |
| B1.1 | Circuit Breaker 145 kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with three spring-stored energy operating mechanism | Set | 0 | | | | |
| B1.2 | Circuit Breaker 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with three spring-stored energy operating mechanism | Set | 2 | | | | |
| B1.3 | Circuit Breaker 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with three spring-stored energy operating mechanism | Set | 0 | | | | |
| B1.4 | Circuit Breaker 145 kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 | | | | |
| B1.5 | Circuit Breaker 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 | | | | |
| B1.6 | Circuit Breaker 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 | | | | |
| B2.1 | Disconnector with Earthing Switch 145kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch | Set | 0 | | | | |
| B2.2 | Disconnector with Earthing Switch 145kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch | Set | 2 | | | | |
| B2.3 | Disconnector with Earthing Switch 145kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch | Set | 0 | | | | |
| B2.4 | Disconnector 145kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 0 | | | | |
| B2.5 | Disconnector 145kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 6 | | | | |
| B2.6 | Disconnector 145kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 0 | | | | |
| B3.1 | Current transformer 145kV, 40kA, 50Hz, 650/275 kV BIL, single phase, 4000-2000/1/1/1/1/1 A/A, 5-core, multi ratio, post type | Set | 0 | | | | |
| B3.2 | Current transformer 145kV, 40kA, 50Hz, 650/275 kV BIL, single phase, 2000-1000/1/1/1/1/1 A/A, 5-core, multi ratio, post type | Set | 6 | | | | |
| B4 | Voltage transformer 145kV, 50Hz, 650/275 kV BIL, single phase, 132/V3 / 110/V3 / 110/V3 kV/V/V, 2 secondary windings, capacitor type | Set | 6 | | | | |
| B5 | Surge arrester 145kV, 120 kV continuous operating voltage, 10kA nominal discharge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide type | Set | 6 | | | | |
| B7.X | Conductors for busbar system and for connection of the 132 kV switchgear, 145 kV, 3150 & 2000 A, 40 kA | Lot | 1 | | | | |
| B8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear | Lot | 1 | | | | |
| B9.X | Gantry steel structures and equipment supports required for completing 132 kV switchgear | Lot | 1 | | | | |
| B10.X | All other necessary material and equipment required for completing 132 kV switchgear. | Lot | 1 | | | | |

| Schedule 4: | Installation a | and Other | Services |
|-------------|----------------|-----------|----------|
|-------------|----------------|-----------|----------|

| No Equipment Unit CIP EXW EXW | | | | | Foreign Curre | ency (in) | Local Curre | ncy (in BDT) |
|--|-------|--|-------|----------|---------------|-----------|-------------|--------------------|
| G Control, Protection, SCADA System and Metering (1) (2) (3) (4) (4) G Control, Protection, SCADA System and Metering | No | Equipment | Unit | Quantity | | | | Total Price |
| G Control, Protection, SCADA System and Metering Image: Control, Protection, SCADA System and Metering New equipment shall be integrated into the existing system. Control, Protection, Stada System, Control, Protection, SCADA and metering for 230, 132, 23 kV as well as LV AC and LV DC system, for regulard part of substation, shall be designed, calculated, supplied, delivered, installed, tested and commissioned and integrated into the existing system. under this contract. Lot 1 The control and protection panels shall minor the switching system. under this contract. Set 2 Control, Protection and SAS set for 132 kV Overhead Line circuits. Set 2 The system comprise the following: Set 0 G1 Control, Protection and SAS set for 132 kV Overhead Line circuits. Set 0 G2 Control, Protection and SAS set for 132 kV Overhead Line circuits. Set 0 0 G4 Control, Protection and SAS set for 132 kV Overhead Line circuits. Set 0 0 0 G4 Control, Protection and SAS set for 132 kV Overhead Line circuits. Set 0 <t< th=""><th></th><th></th><th></th><th>(1)</th><th></th><th></th><th></th><th>EXW (5)=(1)x(4)</th></t<> | | | | (1) | | | | EXW (5)=(1)x(4) |
| Here equipment shall be integrated into the existing system. Integrated into the existem system. In | G | Control, Protection, SCADA System and Metering | | | | | | |
| One (1) but of equipment for extension of the existing control, protection, SCADA and metering tor 230, 132, 33 kV as well to the commissioned and integrated into the existing system, under this contract. Integrate integrate integrate into the existing system, under this contract. The control and protection panels shall minor the switchyard layout. Enough space shall be reserved for future circuits. Integrate int | | Extension of the existing Control, Protection, SCADA System and Metering | | | | | | |
| One (1) but of equipment for extension of the existing control, protection, SCADA and metering tor 230, 132, 33 kV as well to the commissioned and integrated into the existing system, under this contract. Integrate integrate integrate into the existing system, under this contract. The control and protection panels shall minor the switchyard layout. Enough space shall be reserved for future circuits. Integrate int | | New equipment shall be integrated into the existing system. | | | | | | |
| as LV AC and LV DC system, for required part of substation, shall be designed, calculated, supplied, delivered, installed, The control and protection panels shall mirror the switchyard layout. Lot 1 The control and protection panels shall mirror the switchyard layout. Set 2 0 G1 Control, Protection and SAS set for 132 XV Overhead Line circuit, (including the other end) Set 0 0 G2 Control, Protection and SAS set for 132 XV Overhead Line circuit, (including the other end) Set 0 0 G4.XE Tariff metering panel(s) to accommodate programmable A recordable digital 3-phase, 4-wire import and export NWM and NVAh meters (accuracy class 0.2) for each line and transformer circuits for required part of substation. For each feedor, minimum two (2) meters (nain - 1 & main-2) shall be provided Lot 1 G4.XE Tariff metering panel(s) to accommodate programmable A recordable digital 3-phase, 4-wire import and export NWM and NVAh meters (accuracy class 0.2) for each line and transformer cleavier of substation. For each feedor, minimum two (2) meters (nain - 1 & main-2) shall be provided Lot 1 G6X.XE Digital Fault and Disturbance Recorder (ICPDR) to accommodate all feedors, for required part of substation. A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, and software of the master stations, shall be provided bot at the National Load Despatch Centre (NLDC) at Attabangar and at required electrical signals shall be transmitted to the NLDC and the back | | | | | | | | |
| Itested and commissioned and integrated into the existing system, under this contract. Ites control and protection panels shall miror the switchyaid layout. Enough space shall be reserved for future circuits. Ites control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Set 2 Item control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Set 2 Item control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Set 0 Item control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Set 0 Item control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Set 0 Item control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Set 0 Item control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Set 0 Item control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Set 0 Item control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Set 0 Item control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Set 0 Item control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Lot 1 Item control and protecticin and set set ton set set and correls (set and the cir | | | | | | | | |
| Enough space shall be reserved for future circuits. Image: circuits. | | tested and commissioned and integrated into the existing system, under this contract. | Lot | 1 | | | | |
| The system comprise the following: Image: Control, Protection and SAS set for 1323 kV Overhead Line circuit, (including the other end) Set 2 G1 Control, Protection and SAS set for 1323 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 1323 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 1323 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 1323 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 1323 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 1323 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 1323 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 1323 kV Power Transformer circuits Set 0 Image: Control, Protection and Control Set for 1323 kV Power Transformer circuits Set 0 Image: Control, Protection and Control Set for 1323 kV Power Transformer feeder, for required part of substation. Set 0 Image: Control, Protection At the set for 1323 kV Power Transformer feeder, for required part of substation Lot 1 Image: Control, Protection At the set for 1323 kV Power Transformer feeder, for required part of substation. Lot 1 Image: Control, Protection At the set set station transformer feeder, for required part of substation. Image: Control, Protection At the set set station frore the Set set stating and configuration of new and existing equip | | The control and protection panels shall mirror the switchyard layout. | | | | | | |
| G1 Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) Set 2 G2 Control, Protection and SAS set for 323 kV Power Transformer circuits Set 0 G3 Control, Protection and SAS set for 322 kV Set 0 Extension of the existing Tariff Metering Set 0 Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export NWh and MVArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation. For each feeder, minimum two (2) meters (main-1 & min-2) shall be provided Lot 1 G5.XE Digital Fault and Disturbance Recorder (DPR) to accommodate all feeders, for required part of substation Lot 1 G6.X A complete lot of hardware and software, extension of the existing equipment, necessary modification, metargation and configuration of new and existing equipment, and exessary modification, metary of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Undidue Bhaban, for integration of the complete substation Lot 1 If equired electrical signals shall be transmitted to the NLDC and the back-up station through the fautwary of the substation automation system will be [EC 60870-5-104 protocol. Lot 1 If be optic Multiplexer Equipment for Tele-protection and Communication Lot | | Enough space shall be reserved for future circuits. | | | | | | |
| G2 Control, Protection and SAS set for 132/33 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 132/33 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 132/33 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 132/33 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 132/33 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 132/33 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 132/33 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 132/33 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 132/33 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 132/33 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 132/33 kV Power Transformer circuits Image: Control, Protection 200 kiew Power Control Action 200 kPower Control Con | | The system comprise the following: | | | | | | |
| G3 Control, Protection and SAS set for Busbar 132 kV Set 0 G4.XE Extension of the existing Tariff Metering Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation. For each feeder, minimum two (2) meters (main-1 & main-2) shall be provided Lot 1 G5.XE Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, for required part of substation modification, integration and configuration of new and existing equipment, all necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment, all necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment, all necessary adjustment, adaptation, modification automation system. Shall be provided both at the National Load Despatch Centre (NLDC) at Attabnagar and and software of the master stations, shall be complete substation. Lot 1 G6.X All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breaker, disconnectors, tap changer, etc., shall be controled from the NLDC through the gateway of the substation and matter for Tele-protection and Communication Lot 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication system. Lot 1 Lot 1 H1.X Distance nelay carrier signal (main and back-up) Bus protection / breaker failu | G1 | Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) | Set | 2 | | | | |
| G4.XE Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and WArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation. For each fielder, minimum two (2) meters (main-1 & main-2) shall be provided Lot 1 G5.XE Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, for required part of substation Lot 1 Accomplete to to hardware and software, extension of the existing equipment, all necessary adjustment, adaptation, modification, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut Bhaban, for integration of the complete substation. Lot 1 G6.X All required electrical signals shall be transmitted to the NLDC and the back-up station at Biddut Bhaban, for integration of the complete substation. Lot 1 G10.X All other necessary material and equipment required for completing control, protection, substation automation system. Lot 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication the existing system, under this contract. Fibre optic multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer equipment is to be provided for. Lot 1 H Hibe Optic Multiplexer Equipment for extension of existing fibre optic multiplexer equipment is to be provided for. Lot 1 G10.X All other necessary material and equipme | G2 | Control, Protection and SAS set for 132/33 kV Power Transformer circuits | Set | 0 | | | | |
| G4.XE Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation. For each feeder, minimum two (2) meters (minimum two (2) meters (mini | G3 | Control, Protection and SAS set for Busbar 132 kV | Set | 0 | | | | |
| G4.XE and MVArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation. For each feeder, minimum two (2) meters (main-1 & main-2) shall be provided 1 1 1 G5.XE Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, for required part of substation Lot 1 1 A complete lot of hardware and software, extension of the existing equipment, all necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut Bhaban, for integration and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5-104 protocol. 1 1 1 G10.X All other necessary material and equipment for Tele-protection and Communication Lot 1 1 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication Lot 1 1 1 Bius protection & commiscicuto the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. 1 1 1 1 Distance relay carrier signal (main and back-up) ScADA data from switchgear and con | | Extension of the existing Tariff Metering | | | | | | |
| and MVArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation Image: Control & Contr | | Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh | Lat | | | | | |
| G5.XE Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, for required part of substation Lot 1 G5.XE Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, for required part of substation Lot 1 1 Resc. A complete lot of hardware and software, extension of the existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut Bhaban, for integration of the complete substation. Lot 1 All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5-104 protocol. Lot 1 G10.X All other necessary material and equipment required for completing control, protection, substation automation and metering system. Lot 1 H Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer equipment is to be provided for. Lot 1 Biss protection / breaker failure relay SCADA data from switchgear and ontrol system. Lot 1 | G4.XE | and MVArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation. For | LOT | 1 | | | | |
| Tele-control & Tele-protection & Tele-metering facilities, A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Attabnagar and at the back-up station at Biddut Bhaban, for integration of the complete substation. All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconneotors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5-104 protocol. Lot 1 G10.X All other necessary material and equipment required for completing control, protection, substation automation system. Lot 1 H Fibre Optic Multiplexer Equipment, a complete lot of existing fibre optic multiplexer equipment for protection & communication, for required part of substation, shall be designed, supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Lot 1 H1.X Distance relay carrier signal (main and back-up) SCADA data from switchgear and control system Lot 1 | | each feeder, minimum two (2) meters (main-1 & main-2) shall be provided | | | | | | |
| A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and and software of the master stations, shall be transmitted to the NLDC and the back-up station at Biddut Bhaban, for integration of the complete substation. Lot 1 G6.X All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5-104 protocol. Lot 1 G10.X All other necessary material and equipment required for completing control, protection, substation automation and metering system. Lot 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication Lot 1 1 H1.X Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer equipment is to be provided for. Lot 1 1 H1.X Extend and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Lot 1 1 Bus protection / breaker failure relay SCADA data from switchgear and control syste | G5.XE | Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, for required part of substation | Lot | 1 | | | | |
| G6.X modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut Bhaban, for integration of the complete substation. Lot 1 All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5-104 protocol. Lot 1 1 G10.X All other necessary material and equipment required for completing control, protection, substation automation and metering system. Lot 1 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication for extension of existing fibre optic multiplexer equipment for protection, substation, shall be designed, supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Lot 1 H1.X Fibre Optic on the mater signal (main and back-up) Supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Lot 1 Bus protection / breaker failure relay SCADA data from switchgear and control system ScADA data from switchgear and control | | Tele-control & Tele-protection & Tele-metering facilities, | | | | | | |
| G6.X and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut Bhaban, for integration of the complete substation. Lot 1 All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC Lot 1 G10.X All other necessary material and equipment required for completing control, protection, substation automation and metering system. Lot 1 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication Lot 1 1 H Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer equipment is to be provided for. I 1 1 H1.X Distance relay carrier signal (main and back-up) Eus protection / breaker failure relay I 1 1 Bus protection / breaker failure relay SCADA data from switchgear and control system I 1 1 1 | | A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, | | | | | | |
| G6.X at the back-up station at Biddut Bhaban, for integration of the complete substation. Lot 1 All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5-104 protocol. 1 G10.X All other necessary material and equipment required for completing control, protection, substation automation and metering system. Lot 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication Lot 1 H Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer equipment is to be provided for. Lot 1 H1.X Fibre Optic Multiplexer Equipment, and back-up) Bus protection / breaker failure relay Lot 1 K1.X Fibre Optic Multiplexer Equipment for the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Lot 1 Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay Lot 1 Bus protection / breaker failure relay SCADA data from switchgear and control system Lot 1 | | | | | | | | |
| at the back-up station at Biddut Bhaban, for integration of the complete substation. All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC Image: Control of the complete substation automation system. G10.X All other necessary material and equipment required for completing control, protection, substation automation and metering system. Lot 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication Image: Control of the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Image: Control of the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Image: Control of the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Image: Control of the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Image: Control of the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Image: Control of the existing system is to be provided for. Image: Control of the existing system is to be provided for. Image: Control of the existing system is to be provided for. Image: Control of the existing system is to be provided for. Image: Control of the existing system is to be provided for. Image: Control of the existing system is to be provided for. Image: Control of the existing system is the existing system is to the existing system relay is to be provided fo | G6 X | | Lot | 1 | | | | |
| substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC Image: Control of the substation automation system using the IEC 60870-5-104 protocol. G10.X All other necessary material and equipment required for completing control, protection, substation automation and metering system. Lot 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication Lot 1 Image: Control of equipment for required part of substation, shall be designed, supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Image: Control of the substation automation system is to be provided for. Image: Control of the substation automation system is to be provided for. Image: Control of the substation automation is the relay is control of the system. Image: Control of the substation automation is communication. Image: Control of the substation automation and control of the substation automation and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Image: Control of the substation automation is to be provided for. Image: Control of the substation automation is communication. Image: Control of the substation automation is communication. Image: Control of the substation automation is control of the substation. Image: Control of the substation automation automation automation automation. Image: Control of the substation automation automation automation automation automaticate automaticate automaticate automaticate autom | 00.7 | | Lot | | | | | |
| through the gateway of the substation automation system using the IEC 60870-5-104 protocol. Image: Content of the substation automation system using the IEC 60870-5-104 protocol. G10.X All other necessary material and equipment required for completing control, protection, substation automation and metering system. Lot 1 Image: Content of the substation automation and the substation automation and metering system. Lot 1 Image: Content of the substation automation and the substation automation and content of the substation automation and content of the substation automation and content of the substation automation of existing fibre optic multiplexer equipment for protection & communication, for required part of substation, shall be designed, supplied, delivered, installed, to be provided for. Image: Content of the substation automation and back-up) Image: Content of the substation automation and back-up) Image: Content of the substation automation and back-up) Image: Content of the substation automation aut | | | | | | | | |
| G10.X All other necessary material and equipment required for completing control, protection, substation automation and metering system. Lot 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication Image: Communication of the existing fibre optic multiplexer equipment, a complete lot of equipment for extension of existing fibre optic multiplexer equipment for protection & communication, for required part of substation, shall be designed, supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Lot 1 H1.X Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay Lot 1 SCADA data from switchgear and control system Scada data from switchgear and control system Scada data from switchgear and control system Image: Communication of the existing system | | | | | | | | |
| G10.X metering system. Lot 1 <td></td> <td>through the gateway of the substation automation system using the IEC 60870-5-104 protocol.</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> | | through the gateway of the substation automation system using the IEC 60870-5-104 protocol. | | | | | | |
| G10.X metering system. Lot 1 <td>040 V</td> <td>All other necessary material and equipment required for completing control, protection, substation automation and</td> <td>1 - 4</td> <td></td> <td></td> <td></td> <td></td> <td></td> | 040 V | All other necessary material and equipment required for completing control, protection, substation automation and | 1 - 4 | | | | | |
| H1.X Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer equipment for protection & communication, for required part of substation, shall be designed, supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Lot 1 Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay Lot 1 | G10.X | | Lot | 1 | | | | |
| H1.X Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer equipment for protection & communication, for required part of substation, shall be designed, supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Lot 1 Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay Lot 1 | Н | Fibre Optic Multiplexer Equipment for Tele-protection and Communication | | | | | | |
| H1.X equipment for protection & communication, for required part of substation, shall be designed, supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay SCADA data from switchgear and control system | | | | | | | | |
| H1.X to be provided for. Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay SCADA data from switchgear and control system | | | | | | | | |
| H1.X Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay SCADA data from switchgear and control system | | tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is | | | | | | |
| Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay SCADA data from switchgear and control system | | to be provided for. | 1 - 4 | | | | | |
| Bus protection / breaker failure relay SCADA data from switchgear and control system | пі.Х | Distance relay carrier signal (main and back-up) | LOT | 1 | | | | |
| | | | | | | | | |
| Hot-line telephone system | | SCADA data from switchgear and control system | | | | | | |
| | | Hot-line telephone system | | | | | | |

| Schedule 4 | Installation and | d Other Services |
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| | Equipment | | | Foreign Currency (in) | | Local Currency (in BDT) | |
|-------|---|------|----------|-----------------------|-----------------|-------------------------|-------------|
| No | | | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| NO | Equipment | Unit | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| H3.XE | A lot of underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame) shall be designed, supplied, delivered, installed, tested and commissioned, including supply and installation of MDF and digital cables, for required part of substation | Lot | 1 | | | | |
| 1 | Multicore Low Voltage Auxiliary Power and Control Cables | | | | | | |
| I1.XE | A complete lot of multicore low voltage auxiliary power and control cables , including all other necessary material and equipment, between all items of equipment supplied under the contract , and connection and integration of new equipment with existing equipment, shall be designed, supplied, delivered, installed, tested and commissioned | Lot | 1 | | | | |
| J | LV DC, Batteries, Chargers and DC Distribution | | | | | | |
| | Extension of existing LV DC 110 V Auxiliary Power Supply | | | | | | |
| J1.XE | A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV DC 110 V Auxiliary Power Supply and for connection of new equipment and integration with the existing equipment | Lot | 1 | | | | |
| | Extension of existing LV DC 48 V Auxiliary Power Supply | LOU | 1 | | | | |
| J2.XE | A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV DC 48 V auxiliary power supply system for fibre optic multiplexer equipment for control, protection metering and communication and for connection of new equipment and integration with the existing equipment | | | | | | |
| к | LV AC Distribution | | | | | | |
| | Extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system. | | | | | | |
| K1.XE | A complete lot, including all necessary material and equipment, including a set of LV AC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system and for connection of new equipment and integration with the existing equipment | Lot | 1 | | | | |
| L | Civil Works, Control Building and Foundations | | | | | | |
| L1.XE | One (1) lot of complete land development of required switchyard area by cutting, land filling, compacting up to a suitable level. | Lot | 0 | | | | |
| L2.XE | One (1) lot of complete design, supply and construction of outdoor civil works of required switchyard area, including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary power transformers foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing and for connection of new equipment and integration with the existing equipment | Lot | 1 | | | | |
| 1 | Outdoor gantry foundation 132 kV switchyard | Lot | 1 | | | | |
| 2 | Outdoor gantry foundation 33 kV switchyard | Lot | 0 | | | | |
| 3 | Outdoor equipment foundation 132 kV switchyard | Lot | 1 | | | | |
| 4 | Outdoor equipment foundation 33 kV switchyard | Lot | 0 | | | | |

| Schedule 4 | : Installation and | d Other Services |
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| | | | | Foreign Currency (in) | | Local Currency (in BDT) | |
|-------|--|----------|----------|-----------------------|-----------------|-------------------------|-------------|
| | | | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| No | Equipment | Unit | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| 5 | Power Transformer foundation including oil pit | Lot | 0 | | | | |
| 6 | Auxiliary/Station Transformer foundation. | Lot | 0 | | | | |
| 7 | Blast wall | Lot | 0 | | | | |
| 8 | Substation Main gate | Lot | 0 | | | | |
| 9 | Guard house. | Lot | 0 | | | | |
| 10 | Security Boundary Wall - extension and adaptation | Lot | 0 | | | | |
| 11 | Internal fence - extension and adaptation | Lot | 1 | | | | |
| 12 | Access road | Lot | 0 | | | | |
| 13 | Internal roads and parking, concrete culverts - extension and adaptation | Lot | 1 | | | | |
| 14 | Surface and switchyard drainage system including outfall extension and adaptation | Lot | 1 | | | | |
| 15 | Cable Trench including soak pit, PVC pipes etc extension and adaptation | Lot | 1 | | | | |
| 16 | Switchyard surface finishing. | Lot | 1 | | | | |
| 17 | Gravel surfacing. | Lot | 1 | | | | |
| L3.XE | One (1) lot of complete design, supply and construction of civil works and facilities for adaptation of the existing control building, including finishing works such as rendering, painting, floor finishing, etc. | Lot | 1 | | | | |
| L4.X | One (1) lot of complete Pile load test Individual test, payment for successful test only (applicable for building(s), power transformer foundation(s) and gantry(is) previously selected by the Employer's Engineer) | Lot | 1 | | | | |
| 1 | Comperssion test | no. | 0 | | | | |
| 2 | Uplift test | no. | 1 | | | | |
| Ν | Switchyard Lighting | | | | | | |
| N1.XE | One (1) lot of complete equipment for required switchyard area , shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections and for connection of new equipment and integration with the existing equipment. | Lot | 1 | | | | |
| Р | Earthing and Lightning Protection | | | | | | |
| P1.XE | One (1) lot of complete equipment for required switchyard area , shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations and for connection of new equipment and integration with the existing equipment . | Lot | 1 | | | | |
| Q | Cable | | | | | | |
| Q.2.2 | One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three single phase XLPE cables with corresponding GIS connections and Cable End Terminals; with all required equipment; 145 kV, 1,000 A, 40 kA / 1 sec, 50 Hz, for connection of one 132 kV bay. Approximate lengths are 100 meters | Lot | 2 | | | | |
| Х | Installation and Other Services | | | | | | |
| X1 | Preparation works, de-installation works, packing, loading, transport and un-loading of existing equipment including power transformers at the location chosen by PGCB, no longer than 100 km; provisional and temporary solutions including equipment, works and services, for permanent power suppy during construction | Lump sum | 1 | | | | |

| Schedule 4 | Installation an | d Other Services |
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|------------|-----------------|------------------|

| | | | | Foreign Currency (in) | | Local Currency (in BDT) | |
|--|--|----------|----------|-----------------------|-----------------|-------------------------|-------------|
| No | Equipment | Unit | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| NO | | Onit | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| X2 | Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment - General item, for all services not mentioned before | Lump sum | 1 | | | | |
| Х3 | Transport of material and equipment | Lump sum | 1 | | | | |
| X4 Insurance of material and equipment during transport Lump sum | | Lump sum | 1 | | | | |
| | Extension of 132/33 kV AIS Substation BHANDARIA | | | | | | |
| | Subtotal - to Schedule 5 - Grand Total | | | | | | |

| Schedule 4 | Installation | and Other | Services |
|------------|--------------|-----------|----------|
|------------|--------------|-----------|----------|

| | | | | Foreign Curre | ency (in) | Local Currency (in BDT | |
|-------|--|-------|----------|---------------|-----------------|------------------------|-------------|
| N - | | | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| No | Equipment | Unit | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| | Extension of 230/132/33 kV AIS Substation | n BAR | ISAL (| N) | | | |
| В | 132 kV switchgear, equipment connection and steel structures | | | | | | |
| | One (1) set of complete equipment for switchgear 132 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following: | Set | 1 | | | | |
| B1.1 | Circuit Breaker 145 kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with three spring-stored energy operating mechanism | Set | 0 | | | | |
| B1.2 | Circuit Breaker 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with three spring-stored energy operating mechanism | Set | 2 | | | | |
| B1.3 | Circuit Breaker 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with three spring-stored energy operating mechanism | Set | 0 | | | | |
| B1.4 | Circuit Breaker 145 kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 | | | | |
| B1.5 | Circuit Breaker 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 | | | | |
| B1.6 | Circuit Breaker 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF6 gas, with one spring-stored energy operating mechanism | Set | 0 | | | | |
| B2.1 | Disconnector with Earthing Switch 145kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch | Set | 0 | | | | |
| B2.2 | Disconnector with Earthing Switch 145kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch | Set | 2 | | | | |
| B2.3 | Disconnector with Earthing Switch 145kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch | Set | 0 | | | | |
| B2.4 | Disconnector 145kV, 3150A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 0 | | | | |
| B2.5 | Disconnector 145kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 4 | | | | |
| B2.6 | Disconnector 145kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated | Set | 0 | | | | |
| B3.1 | Current transformer 145kV, 40kA, 50Hz, 650/275 kV BIL, single phase, 4000-2000/1/1/1/1/1 A/A, 5-core, multi ratio, post type | Set | 0 | | | | |
| B3.2 | Current transformer 145kV, 40kA, 50Hz, 650/275 kV BIL, single phase, 2000-1000/1/1/1/1/1 A/A, 5-core, multi ratio, post type | Set | 6 | | | | |
| B4 | Voltage transformer 145kV, 50Hz, 650/275 kV BIL, single phase, 132/V3 / 110/V3 / 110/V3 kV/V/V, 2 secondary windings, capacitor type | Set | 6 | | | | |
| B5 | Surge arrester 145kV, 120 kV continuous operating voltage, 10kA nominal discharge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide type | Set | 6 | | | | |
| B7.X | Conductors for busbar system and for connection of the 132 kV switchgear, 145 kV, 3150 & 2000 A, 40 kA | Lot | 1 | | | | |
| B8.X | Insulators and fittings incl. all necessary clamps and connectors required for completing 132 kV switchgear | Lot | 1 | | | | |
| B9.X | Gantry steel structures and equipment supports required for completing 132 kV switchgear | Lot | 1 | | | | |
| B10.X | All other necessary material and equipment required for completing 132 kV switchgear. | Lot | 1 | | | | |

| Schedule 4: | Installation a | and Other | Services |
|-------------|----------------|-----------|----------|
|-------------|----------------|-----------|----------|

| No Equipment Unit CIP EXW EXW | | | | | Foreign Curre | ency (in) | Local Curre | ncy (in BDT) |
|--|-------|--|-------|----------|---------------|-----------|-------------|--------------------|
| G Control, Protection, SCADA System and Metering (1) (2) (3) (4) (4) G Control, Protection, SCADA System and Metering | No | Equipment | Unit | Quantity | | | | Total Price |
| G Control, Protection, SCADA System and Metering Image: Control, Protection, SCADA System and Metering New equipment shall be integrated into the existing system. Control, Protection, Stada System, Control, Protection, SCADA and metering for 230, 132, 23 kV as well as LV AC and LV DC system, for regulard part of substation, shall be designed, calculated, supplied, delivered, installed, tested and commissioned and integrated into the existing system. under this contract. Lot 1 The control and protection panels shall minor the switching system. under this contract. Set 2 Control, Protection and SAS set for 132 kV Overhead Line circuits. Set 2 The system comprise the following: Set 0 G1 Control, Protection and SAS set for 132 kV Overhead Line circuits. Set 0 G2 Control, Protection and SAS set for 132 kV Overhead Line circuits. Set 0 0 G4 Control, Protection and SAS set for 132 kV Overhead Line circuits. Set 0 0 0 G4 Control, Protection and SAS set for 132 kV Overhead Line circuits. Set 0 <t< th=""><th></th><th></th><th></th><th>(1)</th><th></th><th></th><th></th><th>EXW (5)=(1)x(4)</th></t<> | | | | (1) | | | | EXW (5)=(1)x(4) |
| Here equipment shall be integrated into the existing system. Integrated into the existem system. In | G | Control, Protection, SCADA System and Metering | | | | | | |
| One (1) but of equipment for extension of the existing control, protection, SCADA and metering tor 230, 132, 33 kV as well to the commissioned and integrated into the existing system, under this contract. Integrate integrate integrate into the existing system, under this contract. The control and protection panels shall minor the switchyard layout. Enough space shall be reserved for future circuits. Integrate int | | Extension of the existing Control, Protection, SCADA System and Metering | | | | | | |
| One (1) but of equipment for extension of the existing control, protection, SCADA and metering tor 230, 132, 33 kV as well to the commissioned and integrated into the existing system, under this contract. Integrate integrate integrate into the existing system, under this contract. The control and protection panels shall minor the switchyard layout. Enough space shall be reserved for future circuits. Integrate int | | New equipment shall be integrated into the existing system. | | | | | | |
| as LV AC and LV DC system, for required part of substation, shall be designed, calculated, supplied, delivered, installed, The control and protection panels shall mirror the switchyard layout. Lot 1 The control and protection panels shall mirror the switchyard layout. Set 2 0 G1 Control, Protection and SAS set for 132 XV Overhead Line circuit, (including the other end) Set 0 0 G2 Control, Protection and SAS set for 132 XV Overhead Line circuit, (including the other end) Set 0 0 G4.XE Extension of the existing Tariff Metering Set 0 0 0 G4.XE Tariff metering panel(s) to accommodate programmable A recordable digital 3-phase, 4-wire import and export NWM and NVAh meters (accuracy class 0.2) for each line and transformer feduer, for required part of substation. For each fedeer, minimum two (2) meters (nain - 1 & main-2) shall be provided Lot 1 G6X.XE Digital Fault and Disturbance Recorder (DFDR) to accommodate all fedeers, for required part of substation. For each software, extension of the existing equipment, necessary adjustment, adaptation, A complete lot of hardware and software, extension of the back-up station of the maker symmetication works in the hardware and software of the master stations, shall be provided bot at the National Load Despatch Centre (NLDC) at Attabagar and at frequired electrical signals shall be transmitted to the back-up station through the back-up station at the back-up station of the complete substation. Attheretion and software, ex | | | | | | | | |
| Itested and commissioned and integrated into the existing system, under this contract. Ites control and protection panels shall miror the switchyaid layout. Enough space shall be reserved for future circuits. Ites control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Set 2 Item control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Set 2 Item control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Set 0 Item control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Set 0 Item control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Set 0 Item control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Set 0 Item control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Set 0 Item control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Set 0 Item control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Set 0 Item control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Set 0 Item control and protection and SAS set tor 132 kV Overhead Line circuit, (including the other end) Lot 1 Item control and protecticin and set set ton set set and correls (set and the cir | | | | | | | | |
| Enough space shall be reserved for future circuits. Image: circuits. | | tested and commissioned and integrated into the existing system, under this contract. | Lot | 1 | | | | |
| The system comprise the following: Image: Control, Protection and SAS set for 1323 kV Overhead Line circuit, (including the other end) Set 2 G1 Control, Protection and SAS set for 1323 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 1323 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 1323 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 1323 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 1323 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 1323 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 1323 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 1323 kV Power Transformer circuits Set 0 Image: Control, Protection and Control Set for 1323 kV Power Transformer circuits Set 0 Image: Control, Protection and Control Set for 1323 kV Power Transformer feeder, for required part of substation. Image: Control, Protection and Control Set for 1323 kV Power Transformer feeder, for required part of substation Lot 1 Image: Control, Protection and Control Power Transformer feeder, for required part of substation. Lot 1 Image: Control, Protection and Control Power | | The control and protection panels shall mirror the switchyard layout. | | | | | | |
| G1 Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) Set 2 G2 Control, Protection and SAS set for 323 kV Power Transformer circuits Set 0 G3 Control, Protection and SAS set for 322 kV Set 0 Extension of the existing Tariff Metering Set 0 Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export NWh and MVArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation. For each feeder, minimum two (2) meters (main-1 & min-2) shall be provided Lot 1 G5.XE Digital Fault and Disturbance Recorder (DPR) to accommodate all feeders, for required part of substation Lot 1 G6.X A complete lot of hardware and software, extension of the existing equipment, necessary modification, metagration and configuration of new and existing equipment, and exessary modification, metagration and to fudue Bhaban, for integration of complete substation. Lot 1 All required electrical signals shall be transmitted to the NLDC and the back-up station attomation system will be [EC 60870-5-104 protocol. Lot 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication Lot 1 H Fibre Optic Multiplexer Equipment for rele-protectin on existing fibre optic multiplexer equipmen | | Enough space shall be reserved for future circuits. | | | | | | |
| G2 Control, Protection and SAS set for 132/33 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 132/33 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 132/33 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 132/33 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 132/33 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 132/33 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 132/33 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 132/33 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 132/33 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 132/33 kV Power Transformer circuits Set 0 Image: Control, Protection and SAS set for 132/33 kV Power Transformer circuits Image: Control, Protection 200 kiew Power Control Action 200 kPower Control Con | | The system comprise the following: | | | | | | |
| G3 Control, Protection and SAS set for Busbar 132 kV Set 0 G4.XE Extension of the existing Tariff Metering Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation. For each feeder, minimum two (2) meters (main-1 & main-2) shall be provided Lot 1 G5.XE Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, for required part of substation modification, integration and configuration of new and existing equipment, all necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment, all necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment, all necessary adjustment, adaptation, modification automation system. Shall be provided both at the National Load Despatch Centre (NLDC) at Attabnagar and and software of the master stations, shall be complete substation. Lot 1 G6.X All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breaker, disconnectors, tap changer, etc., shall be controled from the NLDC through the gateway of the substation and matter for Tele-protection and Communication Lot 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication system. Lot 1 Lot 1 H1.X Distance nelay carrier signal (main and back-up) Bus protection / breaker failu | G1 | Control, Protection and SAS set for 132 kV Overhead Line circuit, (including the other end) | Set | 2 | | | | |
| G4.XE Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and WArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation. For each fielder, minimum two (2) meters (main-1 & main-2) shall be provided Lot 1 G5.XE Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, for required part of substation Lot 1 Accomplete to to hardware and software, extension of the existing equipment, all necessary adjustment, adaptation, modification, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut Bhaban, for integration of the complete substation. Lot 1 G6.X All required electrical signals shall be transmitted to the NLDC and the back-up station at Biddut Bhaban, for integration of the complete substation. Lot 1 G10.X All other necessary material and equipment required for completing control, protection, substation automation system. Lot 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication the existing system, under this contract. Fibre optic multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer equipment is to be provided for. Lot 1 H Hibe Optic Multiplexer Equipment for extension of existing fibre optic multiplexer equipment is to be provided for. Lot 1 G10.X All other necessary material and equipme | G2 | Control, Protection and SAS set for 132/33 kV Power Transformer circuits | Set | 0 | | | | |
| G4.XE Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation. For each feeder, minimum two (2) meters (minimum two (2) meters (mini | G3 | Control, Protection and SAS set for Busbar 132 kV | Set | 0 | | | | |
| G4.XE and MVArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation. For each feeder, minimum two (2) meters (main-1 & main-2) shall be provided 1 1 1 G5.XE Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, for required part of substation Lot 1 1 A complete lot of hardware and software, extension of the existing equipment, all necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut Bhaban, for integration and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5-104 protocol. 1 1 1 G10.X All other necessary material and equipment for Tele-protection and Communication Lot 1 1 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication Lot 1 1 1 Bib provided for. Distance relay carrier signal (main and back-up) ScADA data from switchgear and contract. Fibre optic multiplexer equipment is to be provided for. 1 1 1 | | Extension of the existing Tariff Metering | | | | | | |
| and MVArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation Image: Control & Contr | | Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh | Lat | 4 | | | | |
| G5.XE Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, for required part of substation Lot 1 G5.XE Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, for required part of substation Lot 1 1 Resc. A complete lot of hardware and software, extension of the existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut Bhaban, for integration of the complete substation. Lot 1 All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5-104 protocol. Lot 1 G10.X All other necessary material and equipment required for completing control, protection, substation automation and metering system. Lot 1 H Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer equipment is to be provided for. Lot 1 Biss protection / breaker failure relay SCADA data from switchgear and ontrol system. Lot 1 | G4.XE | and MVArh meters (accuracy class 0.2) for each line and transformer feeder, for required part of substation. For | LOU | 1 | | | | |
| Tele-control & Tele-protection & Tele-metering facilities, A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Attabnagar and at the back-up station at Biddut Bhaban, for integration of the complete substation. All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconneotors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5-104 protocol. Lot 1 G10.X All other necessary material and equipment required for completing control, protection, substation automation system. Lot 1 H Fibre Optic Multiplexer Equipment, a complete lot of existing fibre optic multiplexer equipment for protection & communication, for required part of substation, shall be designed, supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Lot 1 H1.X Distance relay carrier signal (main and back-up) SCADA data from switchgear and control system Lot 1 | | each feeder, minimum two (2) meters (main-1 & main-2) shall be provided | | | | | | |
| A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and and software of the master stations, shall be transmitted to the NLDC and the back-up station at Biddut Bhaban, for integration of the complete substation. Lot 1 G6.X All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5-104 protocol. Lot 1 G10.X All other necessary material and equipment required for completing control, protection, substation automation and metering system. Lot 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication Lot 1 1 H1.X Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer equipment is to be provided for. Lot 1 1 H1.X Extend and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Lot 1 1 Bus protection / breaker failure relay SCADA data from switchgear and control syste | G5.XE | Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders, for required part of substation | Lot | 1 | | | | |
| G6.X modification, integration and configuration of new and existing equipment, all necessary modification works in the hardware and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut Bhaban, for integration of the complete substation. Lot 1 All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5-104 protocol. Lot 1 1 G10.X All other necessary material and equipment required for completing control, protection, substation automation and metering system. Lot 1 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication for extension of existing fibre optic multiplexer equipment for protection, substation, shall be designed, supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Lot 1 H1.X Fibre Optic on the mater signal (main and back-up) Supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Lot 1 Bus protection / breaker failure relay SCADA data from switchgear and control system ScADA data from switchgear and control | | Tele-control & Tele-protection & Tele-metering facilities, | | | | | | |
| G6.X and software of the master stations, shall be provided both at the National Load Despatch Centre (NLDC) at Aftabnagar and at the back-up station at Biddut Bhaban, for integration of the complete substation. Lot 1 All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC Lot 1 G10.X All other necessary material and equipment required for completing control, protection, substation automation and metering system. Lot 1 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication Lot 1 1 H Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer equipment is to be provided for. I 1 1 H1.X Distance relay carrier signal (main and back-up) Eus protection / breaker failure relay I 1 Bus protection / breaker failure relay SCADA data from switchgear and control system I 1 1 | | A complete lot of hardware and software, extension of the existing equipment, necessary adjustment, adaptation, | | | | | | |
| G6.X at the back-up station at Biddut Bhaban, for integration of the complete substation. Lot 1 All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5-104 protocol. 1 G10.X All other necessary material and equipment required for completing control, protection, substation automation and metering system. Lot 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication Lot 1 H Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer equipment is to be provided for. Lot 1 H1.X Fibre Optic Multiplexer Equipment, and back-up) Bus protection / breaker failure relay Lot 1 K1.X Fibre Optic Multiplexer Equipment for the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Lot 1 Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay Lot 1 Bus protection / breaker failure relay SCADA data from switchgear and control system Lot 1 | | | | | | | | |
| at the back-up station at Biddut Bhaban, for integration of the complete substation. All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC Image: Control of the complete substation automation system. G10.X All other necessary material and equipment required for completing control, protection, substation automation and metering system. Lot 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication Image: Control of the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Image: Control of the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Image: Control of the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Image: Control of the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Image: Control of the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Image: Control of the existing system is to be provided for. Image: Control of the existing system is to be provided for. Image: Control of the existing system is to be provided for. Image: Control of the existing system is to be provided for. Image: Control of the existing system is to be provided for. Image: Control of the existing system is to be provided for. Image: Control of the existing system is the existing system is to the existing system relay is to be provided fo | G6 X | | Lot | 1 | | | | |
| substation automation system. All HV circuit breakers, disconnectors, tap changer, etc., shall be controlled from the NLDC Image: Control of the substation automation system using the IEC 60870-5-104 protocol. G10.X All other necessary material and equipment required for completing control, protection, substation automation and metering system. Lot 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication Lot 1 Image: Control of equipment for required part of substation, shall be designed, supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Image: Control of the substation of the substation and back-up) Lot 1 Bus protection / breaker failure relay SCADA data from switchgear and control system ScADA data from switchgear and control system Image: Control of the system Image: Control of the system | 00.7 | | Lot | | | | | |
| through the gateway of the substation automation system using the IEC 60870-5-104 protocol. Image: Constant in the substation automation system using the IEC 60870-5-104 protocol. G10.X All other necessary material and equipment required for completing control, protection, substation automation and metering system. Lot 1 Image: Constant in the substation automation and the substation automation and metering system. Lot 1 Image: Constant in the substation automation and communication automation and communication automation and communication in the substation, shall be designed, supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Image: Constant in the substation automation and back-up) Image: Constant in the substation automation and back-up) Image: Constant in the substation automation automation automation in the substation automation automation in the substation automation and back-up) Image: Constant in the substation automation automatin automaticon automation automation automation automa | | | | | | | | |
| G10.X All other necessary material and equipment required for completing control, protection, substation automation and metering system. Lot 1 H Fibre Optic Multiplexer Equipment for Tele-protection and Communication Image: Communication of the existing fibre optic multiplexer equipment, a complete lot of equipment for extension of existing fibre optic multiplexer equipment for protection & communication, for required part of substation, shall be designed, supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Lot 1 H1.X Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay Lot 1 SCADA data from switchgear and control system Scada data from switchgear and control system Scada data from switchgear and control system Image: Communication of the switchgear and control system | | | | | | | | |
| G10.X metering system. Lot 1 <td></td> <td>through the gateway of the substation automation system using the IEC 60870-5-104 protocol.</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> | | through the gateway of the substation automation system using the IEC 60870-5-104 protocol. | | | | | | |
| G10.X metering system. Lot 1 <td>040 V</td> <td>All other necessary material and equipment required for completing control, protection, substation automation and</td> <td>1 - 4</td> <td></td> <td></td> <td></td> <td></td> <td></td> | 040 V | All other necessary material and equipment required for completing control, protection, substation automation and | 1 - 4 | | | | | |
| H1.X Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer equipment for protection & communication, for required part of substation, shall be designed, supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Lot 1 Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay Lot 1 | G10.X | | Lot | 1 | | | | |
| H1.X Fibre Optic Multiplexer Equipment, a complete lot of equipment for extension of existing fibre optic multiplexer equipment for protection & communication, for required part of substation, shall be designed, supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Lot 1 Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay Lot 1 | н | Fibre Optic Multiplexer Equipment for Tele-protection and Communication | | | | | | |
| H1.X equipment for protection & communication, for required part of substation, shall be designed, supplied, delivered, installed, tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is to be provided for. Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay SCADA data from switchgear and control system | | | | | | | | |
| H1.X to be provided for. Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay SCADA data from switchgear and control system | | | | | | | | |
| H1.X Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay SCADA data from switchgear and control system | | tested and commissioned and integrated into the existing system, under this contract. Fibre optic multiplexer equipment is | | | | | | |
| Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay SCADA data from switchgear and control system | | to be provided for. | 1 - 4 | | | | | |
| Bus protection / breaker failure relay SCADA data from switchgear and control system | пі.Х | Distance relay carrier signal (main and back-up) | LOT | 1 | | | | |
| | | | | | | | | |
| Hot-line telephone system | | SCADA data from switchgear and control system | | | | | | |
| | | Hot-line telephone system | | | | | | |

| Schedule 4: | Installation | and Other | Services |
|-------------|--------------|-----------|----------|
|-------------|--------------|-----------|----------|

| | | | | Foreign Curre | ency (in) | Local Curre | ncy (in BDT) |
|-------|--|------|----------|---------------|-----------------|-------------|--------------|
| | | | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| No | Equipment | Unit | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| | A lot of underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame) | | | | | | |
| H3.XE | shall be designed, supplied, delivered, installed, tested and commissioned, including supply and installation of MDF and | Lot | 1 | | | | |
| | digital cables, for required part of substation | | | | | | |
| - I | Multicore Low Voltage Auxiliary Power and Control Cables | | | | | | |
| | A complete lot of multicore low voltage auxiliary power and control cables, including all other necessary material and | | | | | | |
| I1.XE | equipment, between all items of equipment supplied under the contract, and connection and integration of new | Lot | 1 | | | | |
| | equipment with existing equipment, shall be designed, supplied, delivered, installed, tested and commissioned | | | | | | |
| J | LV DC, Batteries, Chargers and DC Distribution | | | | | | |
| | Extension of existing LV DC 110 V Auxiliary Power Supply | | | | | | |
| | A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be | | | | | | |
| J1.XE | designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing | | | | | | |
| | LV DC 110 V Auxiliary Power Supply and for connection of new equipment and integration with the existing equipment | | | | | | |
| | Extension of existing LV DC 49 V Auviliant Device Supply | Lot | 1 | | | | |
| | Extension of existing LV DC 48 V Auxiliary Power Supply | | | | | | |
| J2.XE | A complete lot, including all necessary material and equipment, including a set of LV DC distribution switchboards, shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing | | | | | | |
| 52.AL | LV DC 48 V auxiliary power supply system for fibre optic multiplexer equipment for control, protection metering and | | | | | | |
| | communication and for connection of new equipment and integration with the existing equipment | | | | | | |
| К | LV AC Distribution | | | | | | |
| | Extension of the existing LV AC 400/230 V 50 Hz auxiliary power supply system. | | | | | | |
| | A complete lot, including all necessary material and equipment, including a set of LV AC distribution switchboards, shall be | | | | | | |
| K1.XE | designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide extension of the existing | Lot | 1 | | | | |
| | LV AC 400/230 V 50 Hz auxiliary power supply system and for connection of new equipment and integration with the | | | | | | |
| | existing equipment | | | | | | |
| L | Civil Works, Control Building and Foundations | | | | | | |
| | One (1) lot of complete land development of required switchyard area by cutting, land filling, compacting up to a suitable | | | | | | |
| L1.XE | level. | Lot | 0 | | | | |
| | | | | | | | |
| | One (1) lot of complete design, supply and construction of outdoor civil works of required switchyard area, including 132 kV | | | | | | |
| | and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary power transformers | Lot | | | | | |
| L2.XE | foundation, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, | | 1 | | | | |
| | internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing and for connection of new equipment and | | | | | | |
| | integration with the existing equipment | | | | | | |
| 1 | Outdoor gantry foundation 132 kV switchyard | Lot | 1 | | | | |
| 2 | Outdoor gantry foundation 33 kV switchyard | Lot | 0 | | | | |
| 3 | Outdoor equipment foundation 132 kV switchyard | Lot | 1 | | | | |
| 4 | Outdoor equipment foundation 33 kV switchyard | Lot | 0 | | | | |

| Schedule 4: Installation and Other | Services |
|------------------------------------|-----------------|
|------------------------------------|-----------------|

| | | | | Foreign Curre | ency (in) | Local Curre | ncy (in BDT) |
|-------|---|----------|----------|---------------|-----------------|-------------|--------------|
| | | | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| No | Equipment | Unit | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| 5 | Power Transformer foundation including oil pit | Lot | 0 | | | | |
| 6 | Auxiliary/Station Transformer foundation. | Lot | 0 | | | | |
| 7 | Blast wall | Lot | 0 | | | | |
| 8 | Substation Main gate | Lot | 0 | | | | |
| 9 | Guard house. | Lot | 0 | | | | |
| 10 | Security Boundary Wall - extension and adaptation | Lot | 0 | | | | |
| 11 | Internal fence - extension and adaptation | Lot | 1 | | | | |
| 12 | Access road | Lot | 0 | | | | |
| 13 | Internal roads and parking, concrete culverts - extension and adaptation | Lot | 1 | | | | |
| 14 | Surface and switchyard drainage system including outfall extension and adaptation | Lot | 1 | | | | |
| 15 | Cable Trench including soak pit, PVC pipes etc extension and adaptation | Lot | 1 | | | | |
| 16 | Switchyard surface finishing. | Lot | 1 | | | | |
| 17 | Gravel surfacing. | Lot | 1 | | | | |
| L3.XE | One (1) lot of complete design, supply and construction of civil works and facilities for adaptation of the existing control building, including finishing works such as rendering, painting, floor finishing, etc. | Lot | 1 | | | | |
| L4.X | One (1) lot of complete Pile load test Individual test, payment for successful test only (applicable for building(s), power transformer foundation(s) and gantry(is) previously selected by the Employer's Engineer) | Lot | 1 | | | | |
| 1 | Compension test | no. | 0 | | | | |
| 2 | Uplift test | no. | 1 | | | | |
| Ν | Switchyard Lighting | | | | | | |
| N1.XE | One (1) lot of complete equipment for required switchyard area , shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections and for connection of new equipment and integration with the existing equipment. | Lot | 1 | | | | |
| Р | Earthing and Lightning Protection | | | | | | |
| P1.XE | One (1) lot of complete equipment for required switchyard area , shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations and for connection of new equipment and integration with the existing equipment . | Lot | 1 | | | | |
| Х | Installation and Other Services | | | | | | |
| X1 | Preparation works, de-installation works, packing, loading, transport and un-loading of existing equipment including power transformers at the location chosen by PGCB, no longer than 100 km; provisional and temporary solutions including equipment, works and services, for permanent power suppy during construction | Lump sum | 1 | | | | |
| X2 | Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment - General item, for all services not mentioned before | Lump sum | 1 | | | | |

| | | | | Foreign Curre | ncy (in) | Local Curre | ncy (in BDT) |
|----|--|----------|----------|---------------|-----------------|-------------|--------------|
| No | Equipment | Unit | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| | -4-4 | | | CIP | CIP | EXW | EXW |
| | | | (1) | (2) | (3) = (1) x (2) | (4) | (5)=(1)x(4) |
| Х3 | Transport of material and equipment | Lump sum | 1 | | | | |
| X4 | Insurance of material and equipment during transport | Lump sum | 1 | | | | |
| | Extension of 230/132/33 kV AIS Substation BARISAL (N |) | | | | | |
| | Subtotal - to Schedule 5 - Grand Total | | | | | | |

| Schedule 5: Grand Summary | (Schedules 1 to 4) |
|---------------------------|--------------------|
|---------------------------|--------------------|

| | | Total price | | | |
|-----------------|---|------------------|----------------|--|--|
| | | Foreign Currency | Local Currency | | |
| | | (in) | (in BDT) | | |
| | Renovation/New 132/33 kV GIS Substation SHAJI | BAZAR | | | |
| Schedule No. 1: | Plant & Equipment (including Mandatory Spare Parts) Supplied from Abroad | | | | |
| Schedule No. 2: | Plant & Equipment (including Mandatory Spare Parts) Supplied from within the Employer's Country | | | | |
| Schedule No. 3: | Design Services | | | | |
| Schedule No. 4: | Installation and Other Services | | | | |
| | Renovation/New 132/33 kV GIS Substation SHAJIBAZAR Grand Total | | | | |

| | Renovation/Upgrading of 132/33 kV AIS Substation SATHKHIRA | | | | | |
|-----------------|---|--|--|--|--|--|
| Schedule No. 1: | Plant & Equipment (including Mandatory Spare Parts) Supplied from Abroad | | | | | |
| Schedule No. 2: | Plant & Equipment (including Mandatory Spare Parts) Supplied from within the Employer's Country | | | | | |
| Schedule No. 3: | Design Services | | | | | |
| Schedule No. 4: | Installation and Other Services | | | | | |
| | Renovation/New 132/33 kV AIS Substation SATHKHIRA | | | | | |
| | Grand Total | | | | | |

| | Renovation/New 132/33 kV GIS Substation SYLHET | | | | | |
|-----------------|---|--|--|--|--|--|
| Schedule No. 1: | Plant & Equipment (including Mandatory Spare Parts) Supplied from Abroad | | | | | |
| Schedule No. 2: | Plant & Equipment (including Mandatory Spare Parts) Supplied from within the Employer's Country | | | | | |
| Schedule No. 3: | Design Services | | | | | |
| Schedule No. 4: | Installation and Other Services | | | | | |
| | Renovation/New 132/33 kV GIS Substation SYLHET | | | | | |
| | Grand Total | | | | | |

| | Extension of 132/33 kV AIS Substation BHANDARIA | | | | | |
|-----------------|---|--|--|--|--|--|
| Schedule No. 1: | Plant & Equipment (including Mandatory Spare Parts) Supplied from Abroad | | | | | |
| Schedule No. 2: | Plant & Equipment (including Mandatory Spare Parts) Supplied from within the Employer's Country | | | | | |
| Schedule No. 3: | Design Services | | | | | |
| Schedule No. 4: | Installation and Other Services | | | | | |
| | Extension of 132/33 kV AIS Substation BHANDARIA | | | | | |
| | Grand Total | | | | | |

Name of Bidder: Signature of Bidder:

| Total | price | |
|------------------|----------------|--|
| Foreign Currency | Local Currency | |
| (in) | (in BDT) | |

| Extension of 132/33 kV AIS Substation BARISAL (N) | | | | | | |
|---|---|--|--|--|--|--|
| Schedule No. 1: | Plant & Equipment (including Mandatory Spare Parts) Supplied from Abroad | | | | | |
| Schedule No. 2: | Plant & Equipment (including Mandatory Spare Parts) Supplied from within the Employer's Country | | | | | |
| Schedule No. 3: | Design Services | | | | | |
| Schedule No. 4: | Installation and Other Services | | | | | |
| | Extension of 132/33 kV AIS Substation BARISAL (N) | | | | | |
| | Grand Total | | | | | |

| GRAND Total | |
|-------------|--|
|-------------|--|

Country of Origin

| Item | Country | Code |
|------|---------|------|
| | | |
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| | | |

Name of Bidder:

| | | | | Foreign Curre | ncy (in) | Local Curre | ncy (in BDT) |
|----|-------------|------|----------|---------------|-------------|-------------|--------------|
| No | Description | Unit | Quantity | Unit Price | Total Price | Unit Price | Total Price |
| | | | | EXW | EXW | EXW | EXW |
| | | | (1) | (2) | (3)=(1)x(2) | (4) | (5)=(1)x(4) |
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Schedule 6: Recommended Spare Parts

Name of Bidder:

3. Schedule C: Bar Chart Program of Key Activities - Delivery & Completion Time Schedule

Schedule C shall be filled by the Bidder and shall be attached to the bid.

Bidders may use the attached excel file.



| New 132/33 kV GIS Substation SHAHAJIBAZAR | | | | | | | | | | | | | | | | | | | | |
|--|----------|---------------|-----|---|--------------------|-----|----|------------------------|------|-------|------------------|-------|------------------------|------|-------|------------------------|------|------------------|-------|----------|
| Activity | Duration | 1 | 2 3 | 4 | 5 | 6 7 | 89 | 10 1 | 1 12 | 13 14 | 15 | 16 17 | 18 | 19 2 | 20 21 | 22 2 | 3 24 | 25 | 26 27 | 28 2 |
| DESIGN | | | | | | | | | | | | | | | | | | | | |
| Site survey | | \square | | | | | | | | | | | | | | | | | | |
| Geotechnical survey I GENERAL | | ++ | | | | | | | | | | | | | | | | | | |
| EG0-General documentation | | | | | | | | | | | | | | | | | | | | |
| EG1-Main design of fire protection | | | | | | | | | | | | _ | | | _ | | _ | | | |
| II ELECTRICAL DESIGN E1-Technical description and calculation of 132 kV switchyard | | | | | | | | | | | | | | | | | | | | |
| E2-Technical description and calculation of 33 kV switchyard | | | | | | | | | | | | | | | | | | | | |
| E3-Electro installation part of 132 kV switchyard E4-Electro installation part of 33 kV switchyard | | | | _ | | | | | | | | _ | $\left \right $ | | _ | $\left \right $ | | | | |
| E5-Electro installation part of 132/33 kV transformation | | | | | | | | | | | | | | | | | | | | |
| E6-Earthing and lightning protection | | | | | | | | | | | | | | | | | | | | |
| E7-Installation of outdoor lighting E8-Auxiliary power supply | | \rightarrow | | _ | | | | | | | | | | | _ | | | | | |
| E9-Protection and control system | | | | | | | | | | | | | | | | | | | | |
| E10-Telecomunications | | | | | | | | | | | | | | | | | | | | |
| E11-Fire alarm system E12-Earthing installation, lighting protection, Installation of control building | | ++ | | | | | | | | | | | | | _ | | | | | |
| III CIVIL DESIGN | | | | | | | | | | | | | | | | | | | | |
| G1-Sinhro plan | | \rightarrow | | | | | | | | | | | | | | | | | | |
| G2-Site levelling, cable duct, path and internal fence G3-Foundations for 132 kV switchyard | | ++ | + | + | \vdash | + | + | ++ | + | + | $\left \right $ | + | $\left \right $ | + | + | $\left \cdot \right $ | + | $\left \right $ | + | \vdash |
| G4-Foundations for 33 kV switchyard | | | | | | | | | | | | | | | | | | | | |
| G5-Transformation tub and foundation | | ++ | | - | \vdash | + | | \square | + | | $\left \right $ | _ | $\left \right $ | - | | $\left \cdot \right $ | | \square | + | \vdash |
| G6-Oil pit and oil sewerage G7-Steel structure for 132 kV equipment | | ++ | + | + | ╞┼┤ | + | | ++ | | | ┢┼ | + | $\left \right $ | + | + | $\left \right $ | + | \square | | \vdash |
| G8-Steel structure for 33 kV equipment | | | | 1 | | | | | | | | | | | 1 | | | \square | | |
| G9-Control building & relay houses G10-Lightning and reflector poles | | ++ | + | _ | $\left - \right $ | + | + | $\left \cdot \right $ | + | + | $\left \right $ | + | $\left \cdot \right $ | + | | $\left \cdot \right $ | + | \vdash | + | \vdash |
| G11-Water supply and sewerage | | | | | | | | | | | | - | | | | | | | | |
| IV MECHANICAL DESIGN | | | | | | | | | | | | | | | | | | | | |
| M1-Air conditioning and ventilation of control building | | | | | | | | | | | | | | | | | | | | |
| MANUFACTURING of the EQUIPMENT | | | | | | | | | | | | | | | | | | | | |
| Design of the equipment | | \square | | | | | | | | | | | | | | | | | | |
| Manufacturing Training | | ++ | | | | | | | | | | _ | | | | $\left \right $ | | | | |
| Factory Acceptance Test | | | | | | | | | | | | | | | | | | | | |
| Delivery | | | | | | | | | | | | | | | | | | | | |
| CIVIL WORKS | | | | | | | | | | | | | | | | | | | | |
| Mobilization and preparation works | | | | | | | | | | | | | | | | | | | | |
| De-installation of the existing civil structures Site levelling | | | | | | | | | | | | | | | | | | | | |
| Gate and fence | | | | | | | | | | | | | | | | | | | | |
| Access and internal roads | | | | | | | | | | | | | | | | | | | | |
| Earthing system Cable trenches | | \rightarrow | | _ | | | | | | | | | | | _ | | | | | |
| Transformer foundations and oil pit | | | | | | | | | | | | | | | | | | | | |
| Control building | | | | | | | | | | | | | | | | | | | | |
| | | ++ | | _ | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation, outdoor | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation, outdoor Installation of metal support structure Installation of switchgear 132 kV Installation of switchgear 33 kV | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation, outdoor Installation, outdoor Installation of metal support structure Installation of switchgear 132 kV Installation of switchgear 33 kV Installation of power transformers | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation, outdoor Installation of metal support structure Installation of switchgear 132 kV Installation of switchgear 33 kV | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation, outdoor Installation, outdoor Installation of metal support structure Installation of switchgear 132 kV Installation of switchgear 33 kV Installation of power transformers Installation of auxiliary power transformers Primary connections Installation of cables | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation, outdoor Installation, outdoor Installation of metal support structure Installation of switchgear 132 kV Installation of switchgear 33 kV Installation of power transformers Installation of auxiliary power transformers Primary connections | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation, outdoor Installation of metal support structure Installation of switchgear 132 kV Installation of switchgear 33 kV Installation of power transformers Installation of auxiliary power transformers Primary connections Earthing/Grounding of the equipment Outdoor lighting | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation, outdoor Installation, outdoor Installation of metal support structure Installation of switchgear 132 kV Installation of switchgear 33 kV Installation of power transformers Installation of auxiliary power transformers Primary connections Installation of cables Secondary connections Earthing/Grounding of the equipment Outdoor lighting Testing of the equipment | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation, outdoor Installation of metal support structure Installation of switchgear 132 kV Installation of switchgear 33 kV Installation of power transformers Installation of auxiliary power transformers Primary connections Earthing/Grounding of the equipment Outdoor lighting | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation, outdoor Installation, outdoor Installation of metal support structure Installation of switchgear 132 kV Installation of switchgear 33 kV Installation of power transformers Installation of auxiliary power transformers Primary connections Installation of cables Secondary connections Earthing/Grounding of the equipment Outdoor lighting Testing of the equipment Commissioning Installation, indoor Installation of control, Relay protection, SCADA and Metering equipment | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation, outdoor Installation of metal support structure Installation of switchgear 132 kV Installation of power transformers Installation of power transformers Installation of auxiliary power transformers Primary connections Installation of cables Secondary connections Earthing/Grounding of the equipment Outdoor lighting Testing of the equipment Commissioning Installation, indoor Installation of control, Relay protection, SCADA and Metering equipment Installation of AC and DC Auxiliary Power Supply equipment | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation, outdoor Installation, outdoor Installation of metal support structure Installation of switchgear 132 kV Installation of switchgear 33 kV Installation of power transformers Installation of auxiliary power transformers Primary connections Installation of cables Secondary connections Earthing/Grounding of the equipment Outdoor lighting Testing of the equipment Commissioning Installation, indoor Installation of control, Relay protection, SCADA and Metering equipment | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation, outdoor Installation of metal support structure Installation of switchgear 132 kV Installation of switchgear 33 kV Installation of power transformers Installation of auxiliary power transformers Primary connections Installation of cables Secondary connections Earthing/Grounding of the equipment Outdoor lighting Testing of the equipment Commissioning Installation of control, Relay protection, SCADA and Metering equipment Installation of AC and DC Auxiliary Power Supply equipment Installation of ACU Batteries Installation of Cable channels | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation, outdoor Installation of metal support structure Installation of switchgear 132 kV Installation of power transformers Installation of power transformers Installation of auxiliary power transformers Primary connections Installation of cables Secondary connections Earthing/Grounding of the equipment Outdoor lighting Testing of the equipment Commissioning Installation of control, Relay protection, SCADA and Metering equipment Installation of AC and DC Auxiliary Power Supply equipment Installation of ACU Batteries Installation of cables | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation, outdoor Installation of metal support structure Installation of switchgear 132 kV Installation of switchgear 33 kV Installation of power transformers Installation of auxiliary power transformers Primary connections Installation of cables Secondary connections Earthing/Grounding of the equipment Outdoor lighting Testing of the equipment Commissioning Installation of control, Relay protection, SCADA and Metering equipment Installation of AC and DC Auxiliary Power Supply equipment Installation of ACU Batteries Installation of Cable channels | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation, outdoor Installation of metal support structure Installation of switchgear 132 kV Installation of switchgear 33 kV Installation of power transformers Installation of auxiliary power transformers Primary connections Installation of cables Secondary connections Earthing/Grounding of the equipment Outdoor lighting Testing of the equipment Commissioning Installation of AC and DC Auxiliary Power Supply equipment Installation of control, Relay protection, SCADA and Metering equipment Installation of AC and DC Auxiliary Power Supply equipment Installation of ACU Batteries Installation of cable channels Installation of cables Secondary connections Earthing/Grounding of equipment Installation of ACU Batteries Installation of cable channels Installation of cables Secondary connections | | | | | | | | | | | | | | | | | | | | |
| Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation, outdoor Installation of metal support structure Installation of switchgear 132 kV Installation of power transformers Installation of auxiliary power transformers Primary connections Installation of cables Secondary connections Earthing/Grounding of the equipment Outdoor lighting Testing of the equipment Commissioning Installation of AC and DC Auxiliary Power Supply equipment Installation of ACU Batteries Installation of cables Secondary connections Earthing/Grounding of the equipment Outdoor lighting Testing of the equipment Installation, indoor Installation of ACU Batteries Installation of ACU Batteries Installation of cables Secondary connections Earthing/Grounding of equipment Installation of cables Secondary connections </td <td></td> | | | | | | | | | | | | | | | | | | | | |

| Name of Bidder: | |
|----------------------|--|
| Signature of Bidder: | |

Shahajibazar

| Activity Duration 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 14 15 14 15 14 15 14 15 14 15 14 15 14 15 14 15 16 15 15 15 15 15 15 15 16 15 16 |
|--|
| Site survey Image: Site surv |
| Geotechnical survey In Cheneral documentation In Cheneral |
| IGENERAL Image: Comparison of the protection Image: Comparison of the protection of the protection Image: Comparison of the protection Image: Comparison the protect |
| EG1-Main design of fire protection II III III III III III III III |
| If ELECTRICAL DESIGN If a base base base base base base base ba |
| E2-Technical description and calculation of 33 kV switchyard Image: Constant of 132 kV switchyard Image: Constant |
| E3-Electro installation part of 132 kV switchyard Image: Constallation part of 33 kV switchyard Image: Constallation part of 32 kV switchyard Image: Constalation part of 32 kV switchyard <td< th=""></td<> |
| E5-Electro installation part of 132/33 kV transformation Image: Constallation of add constant of the constant of |
| E6-Earthing and lightning protection I |
| E8-Auxiliary power supply E8-Auxiliary power supply I |
| E10-Telecomunications Image: Stress of the stress of t |
| E11-Fire alarm system Image: Control building Image: Contron building Image: Control building |
| III CIVIL DESIGN IIII CIVIL DESIGN <t< th=""></t<> |
| G1-Sinhro plan G2-Site levelling, cable duct, path and internal fence G2 |
| G3-Foundations for 132 kV switchyardG4-Foundations for 33 kV switchyardG4 |
| G4-Foundations for 33 kV switchyardG4-FoundationGGG |
| G6-Oil pit and oil sewerage G6 G7-Steel structure for 132 kV equipment G7 |
| G7-Steel structure for 132 kV equipment G8-Steel structure for 33 kV equipment G8-Steel structure for 34 kV equipment G8-Steel structu |
| G9-Control building & relay houses G9-Control building a relay houses G10-Lightning and reflector poles G10- |
| G10-Lightning and reflector poles |
| |
| G11-Water supply and severage IV MECHANICAL DESIGN |
| M1-Air conditioning and ventilation of control building |
| MANUFACTURING of the EQUIPMENT |
| Design of the equipment |
| Manufacturing Image: Constraint of the second sec |
| Factory Acceptance Test Image: Constraint of the second |
| |
| CIVIL WORKS Mobilization and preparation works Image: Constraint of the second |
| De-installation of the existing civil structures |
| Site levelling Gate and fence Gate and fenc |
| Access and internal roads |
| Earthing system Cable trenches Cable trench |
| Transformer foundations and oil pit |
| Control building Image: Control building Gantry and equipment foundations Image: Control building |
| Steel structure Image: Construction Finishing works and demobilization Image: Construction |
| |
| ELECTRICAL WORKS Mobilization and preparation works Image: Constraint of the second s |
| De-installation of the existing equipment |
| Installation, outdoor Installation of metal support structure Installation of metal support str |
| Installation of switchgear 132 kV |
| |
| Installation of switchgear 33 kV Installation of power transformers Installation of |
| Installation of power transformers Installation of auxiliary power transformers< |
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| Installation of power transformers Imstallation of power transformers Imstallatingower transformers Imstallation of powe |
| Installation of power transformers Image: Condent formers |
| Installation of power transformers Image: Comparison of the equipment Image: Comparis |
| Installation of power transformers Image: Marrian Stress Imag |
| Installation of power transformers Image: Constraint of a willing power transformers Image: Constrai |
| Installation of power transformers Installation of auxiliary power supply equipm |
| Installation of power transformers Image: Marrier State Imarir State Image: Marrier State |
| Installation of power transformers Image: Secondary connections Image: Secondary connections< |
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| Name of Bidder: | |
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| Signature of Bidder: | |

Satkhira

| New 132/33 kV GIS Substation SYLHET | | | | | | | | | | | | | | | | | | | | | |
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| DESIGN | | | | | | | | | | | | | | | | | | | | | |
| Site survey | | | | | | _ | | _ | | | | | | | | | | | | | |
| Geotechnical survey I GENERAL | | | | | | | | | | | | | | | | | | | | | |
| EG0-General documentation | | | | | | | | | | | | | | | | | | | | | |
| EG1-Main design of fire protection | | | | | _ | | | | | | | | | _ | | | | | | | |
| II ELECTRICAL DESIGN E1-Technical description and calculation of 132 kV switchyard | | | | | | | | | | | | | | | | | | | | | |
| E2-Technical description and calculation of 33 kV switchyard | | | | | | | | | | | | | | | | | | | | | |
| E3-Electro installation part of 132 kV switchyard | | | _ | | | _ | | | | | | | | | | _ | | | | | |
| E4-Electro installation part of 33 kV switchyard E5-Electro installation part of 132/33 kV transformation | | | | | | _ | | | | | | | | _ | | | | | | | |
| E6-Earthing and lightning protection | | | | | | | | | | | | | | | | | | | | | |
| E7-Installation of outdoor lighting | | | | | | | | | | | | | | | | | | | | | |
| E8-Auxiliary power supply | | | _ | | _ | _ | | | | | | | | _ | | _ | | | + | _ | |
| E9-Protection and control system E10-Telecomunications | | | | | | | | | | | | | | | | | | | | | |
| E11-Fire alarm system | | | | | | | | | | | | | | | | | | | | | |
| E12-Earthing installation, lighting protection, Installation of control building | | | | | | _ | | _ | | | | _ | | _ | | | | | | | |
| III CIVIL DESIGN G1-Sinhro plan | | ++ | + | $\left \right $ | -+ | + | \vdash | + | \vdash | | $\left \cdot \right $ | _ | \vdash | + | \vdash | + | + | + | ++ | + | ++ |
| G2-Site levelling, cable duct, path and internal fence | | | | | | | | | | | | | | | | | | | | | |
| G3-Foundations for 132 kV switchyard | | ļТ | \top | \square | \top | | μŢ | | \square | | $ \top$ | | \square | | $ \downarrow \downarrow$ | \top | Ц | \square | \square | \square | |
| G4-Foundations for 33 kV switchyard | | $\left \cdot \right $ | + | ┝╌┤ | + | + | \vdash | + | | | $\left \cdot \right $ | _ | \vdash | _ | \vdash | + | + | + | ++ | + | ++ |
| G5-Transformation tub and foundation G6-Oil pit and oil sewerage | | \vdash | + | $\left \right $ | + | + | \vdash | + | \vdash | + | \vdash | _ | \vdash | + | \vdash | + | $\left \right $ | + | + | + | ++ |
| G7-Steel structure for 132 kV equipment | | | | \square | | Ţ | | | | | | | | | | | | | $\downarrow \downarrow$ | | |
| G8-Steel structure for 33 kV equipment | | | + | $\left \right $ | -+ | + | \vdash | + | \square | | | | | _ | \square | + | $\left \right $ | + | + | | ++ |
| G9-Control building & relay houses G10-Lightning and reflector poles | | ++ | + | $\left \cdot \right $ | + | + | \vdash | + | \vdash | | \vdash | | \vdash | + | \vdash | + | + | | ++ | + | |
| G11-Water supply and sewerage | | | | | | | | | | | | | | | <u> </u> | | | | | | |
| IV MECHANICAL DESIGN | | F | 1 | | | \square | I | | | | F | | | | | 1 | Π | - | \square | | T T |
| M1-Air conditioning and ventilation of control building | | | | | | | | | | | | | | | | | | | | | |
| MANUFACTURING of the EQUIPMENT | | | | | | | | | | | | | | | | | | | | | |
| Design of the equipment | | | | | | | | | | | | | | | | | | | | | |
| Manufacturing | | | _ | | _ | _ | | | | | | | | _ | | _ | | | + | _ | |
| Training Factory Acceptance Test | | | + | | | + | | | | | | | | | | + | | | | | |
| Delivery | | | | | | | | | | | | | | | | | | | | | |
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| CIVIL WORKS | | | | | | | | | | | | | | | | | | | | | |
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| Name of Bidder: | |
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| Installation of metal support structureImage: Solution of switchgeer 132 kVImage: Solution of switchgeer 132 kVIm | | | | | | | | | | | | | | | | | | | | | |
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| Installation of Telecommunication equipment Image: Secondary connections Image: Secondary con | Secondary connections Earthing/Grounding of the equipment Outdoor lighting Testing of the equipment Commissioning Installation, indoor | | | | | | | | | | | | | | | | | | | | |
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| Name of Bidder: | |
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| Signature of Bidder: | |

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| Installation of power transformersImage: Solution of auxiliary power transformersImage: Solution of auxiliar | Access and internal roads Earthing system Cable trenches Transformer foundations and oil pit Control building Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation, outdoor | | | | | | | | | | | | | | | | | | |
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| Installation of AC and DC Auxiliary Power Supply equipment Image: Amage: Am | Access and internal roads Earthing system Cable trenches Transformer foundations and oil pit Control building Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation, outdoor Installation of metal support structure Installation of switchgear 132 kV Installation of switchgear 33 kV Installation of auxiliary power transformers Primary connections Installation of cables Secondary connections Earthing/Grounding of the equipment Outdoor lighting Testing of the equipment Coundoor lighting | | | | | | | | | | | | | | | | | | |
| Installation of Telecommunication equipment Image: Secondary connections Image: Secondary con | Access and internal roads Earthing system Cable trenches Transformer foundations and oil pit Control building Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation, outdoor Installation of metal support structure Installation of switchgear 132 kV Installation of power transformers Primary connections Installation of auxiliary power transformers Primary connections Installation of cables Secondary connections Earthing/Grounding of the equipment Outdoor lighting Testing of the equipment Commissioning Installation, indoor | | | | | | | | | | | | | | | | | | |
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| Commissioning | Access and internal roads Earthing system Cable trenches Transformer foundations and oil pit Control building Gantry and equipment foundations Steel structure Finishing works and demobilization ELECTRICAL WORKS Mobilization and preparation works De-installation of the existing equipment Installation of metal support structure Installation of metal support structure Installation of switchgear 132 kV Installation of power transformers Installation of auxiliary power transformers Primary connections Installation of cables Secondary connections Earthing/Grounding of the equipment Outdoor lighting Testing of the equipment Commissioning Installation in do control, Relay protection, SCADA and Metering equipment Installation of AC and DC Auxiliary Power Supply equipment Installation of AC and DC Auxiliary Power Supply equipment Installation of cable channels Installation of cable channels | | | | | | | | | | | | | | | | | | |
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| Name of Bidder: | |
|----------------------|--|
| Signature of Bidder: | |

4. Schedule D: Manufacturers, Places of Manufacture and Testing

The following form shall be filled and attached to the bid.

Bidders are free to propose/list more than one Manufacturer for each item. Quoted rates and prices shall be deemed to apply to whichever Manufacturer is appointed, and no adjustment of the rates and prices will be permitted. Their participation shall be confirmed with the Manufacturer's Authorization letter(s), as required. In case that more than one Manufacturer has been proposed, the Employer have right to choose one or more of them, or can ask for replacement.

Should a Manufacturer be determined to be unacceptable, the Bid will not be rejected, but the Bidder will be required to substitute an acceptable manufacturer without any change to the bid price.

Prior to signing the contract, the corresponding appendix to the contract agreement shall be completed, listing the approved manufacturers for each item concerned.

Manufacturers

| ltem | Equipment | Type of Equipment | Manufacturer's Name and Address | Place of Manufacture and Testing | Nationality | | | | | | |
|-----------------------------|--|----------------------|------------------------------------|--|-------------|--|--|--|--|--|--|
| | | Power Tr | ansformer | | | | | | | | |
| 1.1. | Power transformer 132/33 kV | | | | | | | | | | |
| Auxiliary Power Transformer | | | | | | | | | | | |
| 2 | Auxiliary power transformer 33/0.4 kV | | | | | | | | | | |
| | 132 kV Equipment | | | | | | | | | | |
| 3.1. | GIS 132 kV | | | | | | | | | | |
| 3.2. | Circuit breakers 132 kV | | | | | | | | | | |
| 3.3. | Disconnectors 132 kV | | | | | | | | | | |
| 3.4. | Current transformers 132 kV | | | | | | | | | | |
| 3.5. | Voltage transformers 132 kV | | | | | | | | | | |
| 3.6. | Surge arresters 132 kV | | | | | | | | | | |
| | | 33 kV E | quipment | | · | | | | | | |
| 4.1. | Circuit breakers 33 kV | | | | | | | | | | |
| 4.2. | Disconnectors 33 kV | | | | | | | | | | |
| 4.3. | Current transformers 33 kV | | | | | | | | | | |
| 4.4. | Voltage transformers 33 kV | | | | | | | | | | |

The following Manufacturers are proposed for carrying out the facilities:



| ltem | Equipment | Type of Equipment | Manufacturer's Name and Address | Place of Manufacture and Testing | Nationality | | | | | |
|------|----------------------------------|----------------------|------------------------------------|--|-------------|--|--|--|--|--|
| 4.5. | Surge arresters 33 kV | | | | | | | | | |
| | Control, | Protection, a | nd Metering Equipme | nt | | | | | | |
| 5.1. | Control & monitoring equipment | | | | | | | | | |
| 5.2. | Relay protection equipment | | | | | | | | | |
| 5.3. | Control & protection panels | | | | | | | | | |
| 5.4. | Metering equipment | | | | | | | | | |
| 5.5. | Metering panels | | | | | | | | | |
| 5.6. | DFDR | | | | | | | | | |
| | Telecommunication Equipment | | | | | | | | | |
| 6. | Communication equipment | | | | | | | | | |
| | Auxiliary Power Supply Equipment | | | | | | | | | |
| 7.1. | ACU battery | | | | | | | | | |
| 7.2. | Charger | | | | | | | | | |
| 7.3. | DC distribution switchboard | | | | | | | | | |
| 7.4. | AC distribution switchboard | | | | | | | | | |
| | Co | nductors, Ins | ulators & Fittings | | | | | | | |
| 8.1. | Conductors | | | | | | | | | |
| 8.2. | Insulators | | | | | | | | | |
| 8.3 | Fittings | | | | | | | | | |
| | Multicore L | .V Auxiliary F | ower and Control Cat | oles | | | | | | |
| 9. | Cables | | | | | | | | | |
| Name | e of Bidder: | | | | | | | | | |
| Sign | Signature of Bidder: | | | | | | | | | |



5. Schedule E: Technical Particulars and Guarantees

5.1 General

The technical data schedules hereafter provide more details on the specific technical criteria and complement the Information given in the Bidding documents.

They form an essential part of bid submission and will be used in bid evaluation.

They should be fully completed and submitted with the bid.

5.2 Technical Data Schedules

Please find hereafter the technical data schedules.

5.2.1 B: Switchgear 132 kV

5.2.1.1 BG: GIS Switchgear 132 kV

| Na | Description | Minin | Minimum Requirements | | | |
|------|--|-------------------|----------------------|------------|--|--|
| No. | Description | Unit | Data | Guaranteed | | |
| 1. | Switchgear 1320 kV - General | | | | | |
| 1.1. | Manufacturer | | Insert | | | |
| 1.2 | Туре | | Insert | | | |
| 1.3 | Model designation | | Insert | | | |
| 1.4 | Country of origin | | Insert | | | |
| 1.5 | Nominal system voltage | kV _{rms} | 132 | | | |
| 1.6 | Highest voltage for equipment Un | kV _{rms} | 145 | | | |
| 1.7 | Rated lightning impulse withstand voltage | kV peak | 650 | | | |
| 1.8 | Rated short duration power frequency voltage | kV | 275 | | | |
| 1.9 | Rated frequency fr | Hz | 50 | | | |
| 1.10 | Rated current Ir | | | | | |
| | Busbars | А | ≥ 3150 | | | |
| | Line bay | А | ≥ 2000 | | | |
| | Transformer bay | А | ≥ 2000 | | | |
| | Bus Coupler bay | А | ≥ 3150 | | | |
| 1.11 | Rated short-circuit breaking current Isc | kA _{rms} | ≥ 40 | | | |
| 1.12 | Duration of short-circuit | S | ≥1 | | | |



| | | Mini | mum Requirements | |
|------|---|-------|--------------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| | Rated peak withstand current Ip (equal short- | | | |
| 1.13 | circuit making current) | kA | ≥ 100 | |
| | Control voltage | V. DC | 110 | |
| | Motor - auxiliary supply voltage | V. DC | 110 | |
| | Heater supply voltage | V. Hz | 230. 50 | |
| 1.14 | Type of busbars | - | Double, sectionalize | |
| 2. | Circuit Breaker | | | |
| 2.1 | Isolating and quenching medium | | SF ₆ | |
| 2.2 | Type of circuit breaker | | GIS / Indoor | |
| 2.3 | Design | | Single breaking | |
| 2.4 | Operating mechanism | | Motor-wound spring | |
| 2.5 | Number of poles | pcs. | 3 | |
| 2.6 | Number of operating mechanisms per circuit breaker | | | |
| | Line bay | pcs. | 3 | |
| | Transformer bay | pcs. | 1 | |
| | Bus Coupler bay | pcs. | 1 | |
| | D.C. component of the rated short-circuit breaking | | | |
| 2.7 | current | % | > 30 | |
| 2.8 | Rated operating sequence | | 0-0.3 s-CO-3 min-CO | |
| 2.9 | Auto reclosing | | | |
| | Line bay | | 1p+3p | |
| | Transformer bay | | 3p | |
| | Bus Coupler bay | | 3p | |
| | Maximum total break time (trip initiation to final | | | |
| 2.10 | arc extinction) pos.3.7.135 acc. to IEC 62271- 100) | ms | ≤ 60 | |
| 2.11 | Time of final arc extinction (3.7134 acc. IEC 62271-100) | ms | 20 ± 5 | |
| 2.12 | Restrike performance during capacitive current switching | Class | C2 | |
| 2.13 | Number of operations without maintenance CO at no-load CO at rated current CO at rated breaking current lsc | | ≥ 10000 ≥ 2500 ≥ 5 | |
| 2.14 | The frequency of mechanical operations | Class | M2 | |
| 2.15 | Rated electrical endurance | Class | Min E1 | |
| | Operating mechanism | | | |
| 2.13 | Number of making coils | pcs. | 1 | |
| 2.14 | Number of breaking coils | pcs. | 2 | |
| 2.15 | Minimum number of available contacts (NO/NC) | | 12NO+12NC | |
| | Accessories in central control panel | | | |
| 2.16 | Anti-pumping relay | | Yes | |
| 2.17 | Local/remote control selector switch | | Yes | |
| 2.18 | Local operation push buttons | | Yes | |
| 2.19 | Minimum pressure lock-out and alarm relays | | Yes | |
| 2.20 | Operation counter | | Yes | |



| | | | mum Requirements | | | |
|-----|---|------|--------------------|------------|--|--|
| No. | Description | Unit | Data | Guaranteed | | |
| • | | | | 1 | | |
| 3. | Disconnector | | | | | |
| 3.1 | Туре | | GIS / Indoor | | | |
| 3.2 | Type of disconnector | | | | | |
| | • Three pole, | | | | | |
| | three position (close/open/earthed), | | | | | |
| | motor operated, | | Yes | | | |
| | insulated, | | | | | |
| | with earthing switch | | | | | |
| | • Three pole, | | | | | |
| | make-proof, | | Yes | | | |
| | motor operated earthing switch | | | | | |
| | Three pole, | | | | | |
| | Disconnector Link, | | Yes | | | |
| | hand operated | | | | | |
| 3.3 | Number of poles | pcs. | 3 | | | |
| 3.4 | Number of operating mechanism | pcs. | 1 | | | |
| 3.5 | Type of operating mechanism | | | | | |
| | Three position | | Motor driven | | | |
| | Make-proof | | Motor-wound spring | | | |
| | Disconnector Link | | Manual | | | |
| 4. | Current Transformer | | · | • | | |
| 4.1 | | | | | | |
| 4.1 | | | GIS / Indoor | | | |
| | Characteristics of Current Transformers are pre- | | | | | |
| | liminary and for Tender purpose only. | | | | | |
| | The Contractor has to make Engineering and to | | Yes | | | |
| | provide detail calculation and detail design, which | | | | | |
| | will be subject of the PGCB's approval | | | | | |
| | Rated continuous thermal current (40°C): | 04.1 | | | | |
| | • I core | % In | 200 | | | |
| 4.2 | • Il core | % In | 200 | | | |
| | • III core | % In | 120 | | | |
| | • IV core | % In | 120 | | | |
| | V core | % In | 120 | | | |
| | Rated transformer ratio: | | | | | |
| | • I core | A/A | 3200-1600-800/1 | | | |
| 4.3 | • Il core | A/A | 3200-1600-800/1 | | | |
| | III core | A/A | 3200-1600-800/1 | | | |
| | IV core | A/A | 3200-1600-800/1 | | | |
| | V core | A/A | 3200-1600-800/1 | | | |
| | Accuracy class: | | | | | |
| | I core | | 0.2 | | | |
| 4.4 | Il core | | 0.2 | | | |
| | III core | | 5P20 | | | |
| | IV core | | 5P20 | | | |
| | V core | | 5P20 | | | |



| Na | Description | Minim | um Requirements | Guarantaa | | |
|-----|---|--------------------|-----------------|------------|--|--|
| No. | Description | Unit | Data | Guaranteed | | |
| | Security factor: | | | | | |
| 4.5 | I core | | Fs=10 | | | |
| | Il core | | Fs=10 | | | |
| | Rated power: | | | | | |
| | I core | VA | 10 | | | |
| 4.6 | Il core | VA | 15 | | | |
| 4.0 | III core | VA | 30 | | | |
| | IV core | VA | 30 | | | |
| | V core | VA | 30 | | | |
| 5. | Voltage Transformer | | | | | |
| 5.1 | Туре | | GIS / Indoor | | | |
| 5.2 | Rated primary voltage | kV | 132/√3 | | | |
| | Rated secondary voltage | | | | | |
| 5.3 | I winding | V | 110√3 | | | |
| | Il winding | V | 110√3 | | | |
| | Accuracy class: | | | | | |
| 5.4 | I winding | | 0.2 | | | |
| | Il winding | | 1/3P | | | |
| | Rated power: | | | | | |
| 5.5 | I winding | VA | 25 | | | |
| | Il winding | VA | 75 | | | |
| 5.6 | Load | | Simultaneously | | | |
| 6. | Surge Arresters | | | | | |
| 6.1 | Туре | | GIS / outdoor | | | |
| | Quantity, Position & Characteristic of Surge Ar- | | | | | |
| | resters are preliminary and for Tender purpose on- | | | | | |
| | ly. | | Yes | | | |
| | The Contractor has to make Engineering and to | | res | | | |
| | provide detail calculation and detail design, which | | | | | |
| | will be subject of the PGCB's approval | | | | | |
| 6.2 | Rated voltage of surge arrester Ur | kV _{rms} | 120 | | | |
| 6.3 | Max. continuous operating voltage U_c | kV _{rms} | 96 | | | |
| 6.4 | Nominal discharge current In (8/20 µs) | kA _{peak} | 10 | | | |
| 6.5 | High current impulse of an arrester (4/10 µs) | kA _{peak} | 100 | | | |
| 6.6 | Line discharge class | Class | 3 | | | |
| 6.7 | Energy dissipation capacity (per kV of rated volt- | kJ/ kV | ≥ 6.5 | | | |
| | age) | | | | | |
| 6.8 | Long duration current impulse (2000 µs) | A | ≥ 850 | | | |
| 6.9 | Maximum residual voltage U _{res} | | - 005 | | | |
| | For switching impulse current 30/60 µs at 0,5 kA | kV _{peak} | ≤ 235 | | | |
| | For switching impulse current 30/60 µs at 1 kA | kV _{peak} | ≤ 240 | | | |
| | For switching impulse current 30/60 µs at 2 kA | kV _{peak} | ≤ 255 | + | | |
| | For lightning impulse current 8/20 µs at 5 kA | kV _{peak} | ≤ 280 | | | |
| | For lightning impulse current 8/20 µs at 10 kA | kV _{peak} | ≤ 300 | 1 | | |

| N | Description | Minim | Cuerenteed | |
|-----|---|--------------------|-------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| | For lightning impulse current 8/20 µs at 20 kA | kV _{peak} | ≤ 320 | |
| 7. | Connection | | | |
| 7.1 | Type: GIB - Gas Insulated Busbars, Outdoor | | Yes | |
| 7.2 | Type: Single phase or Three phase, according to the design | | Yes | |
| 7.3 | Insulator, Single phase, SF6 / Air | | Yes | |
| 7.4 | Insulating material | | Composite/Silicon | |
| 7.5 | Minimum creepage distance | mm/ kV | ≥ 25 mm/ kV | |
| 8. | Maintenance requirement | | | |
| 8.1 | Maintenance of any circuit breaker shall be pos- sible without interruption of adjacent bays | | Yes | |
| | Overall compliance with the requirements | (yes/no) | | |



| No. | Description | Mini | mum Requirements | Guaranteed |
|------|---|----------------------|--|------------|
| NO. | Description | Unit | Data | Guaranteeu |
| 1. | Circuit Breaker - General | | | |
| 1.1. | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 62271-100 IEC 60273 IEC 60694 IEC 60815 | |
| 1.6 | Quality control | | ISO 9001 ISO 14001 ISO 18001 | |
| 1.7 | Isolating and quenching medium | | SF ₆ | |
| 1.8 | Type of circuit breaker | | Outdoor | |
| 1.9 | Design | | Single breaking | |
| 1.10 | Operating mechanism | | Motor-wound spring | |
| 1.11 | Number of poles | pcs. | 3 | |
| 1.12 | Number of operating mechanisms per circuit breaker | pcs. | 3 | |
| 2. | Circuit Breaker - Characteristics | | | |
| 2.1 | Nominal system voltage | kV _{rms} | 132 | |
| 2.2 | Highest voltage for equipment U _n | kV _{rms} | 145 | |
| 2.3 | Rated lightning impulse withstand voltage | kV peak | 650 | |
| 2.4 | Rated short duration power frequency voltage | kV | 275 | |
| 2.5 | Rated frequency fr | Hz | 50 | |
| 2.6 | Rated current I _r | А | ≥ 3150 | |
| 2.7 | Rated short-circuit breaking current Isc | kA _{rms} | ≥ 40 | |
| 2.8 | Rated peak withstand current Ip (equal short-circuit making current) | kA | ≥ 100 | |
| 2.9 | D.C. component of the rated short-circuit breaking current | % | > 30 | |
| 2.10 | First-pole-to-clear factor Terminal fault Short-line fault Out-of-phase | p.u. p.u. p.u. | 1.3 1.0 2.0 | |
| 2.11 | Standard value of transient recovery voltage (T100) | kV | Insert | |
| 2.12 | Rate of rise recovery voltage | kV/µs | Insert | |
| 2.13 | Rated operating sequence | • | O-0.3 s-CO-3 min-CO | |
| 2.14 | Duration of short-circuit | S | ≥ 1 | |
| 2.15 | Rated out-of-phase breaking current | kA | Insert | |
| 2.16 | Auto reclosing | | 1p+3p | |

5.2.1.2 B1.1: Circuit Breaker 132 kV, 3150 A, Three OM



| No. | Description | Minimum Requirements | | |
|---------|--|----------------------|---------------|------------|
| | | Unit | Data | Guaranteed |
| | Maximum total break time (trip initiation to final | • | 2010 | |
| 2.17 | arc extinction) pos.3.7.135 acc. to IEC 62271- | ms | ≤ 60 | |
| | 100) | | | |
| | Time of final arc extinction (3.7.134 acc. IEC | | | |
| 2.18 | 62271-100) | ms | 20 ± 5 | |
| | Opening time (trip initiation to contact separation) | | | |
| 2.19 | Without current | ms | Insert | |
| | With 100 % rated breaking current | ms | Insert | |
| 2.20 | Maximum time interval between opening inter- | | | |
| | rupters | ms | Insert | |
| 0.04 | Maximum time interval between opening of first | | 0 | |
| 2.21 | and last phase of three-phase circuit breakers | ms | 3 | |
| | Time for making (trip initiation to contact touch) | | | |
| 2.22 | Without current | ms | Insert | |
| | 100 % making current | ms | Insert | |
| 2.23 | Minimum dead time | ms | Insert | |
| | Restrike performance during capacitive current | | 00 | |
| 2.24 | switching | Class | C2 | |
| | Number of operations without maintenance | | | |
| 0.05 | CO at no-load | | ≥ 10000 | |
| 2.25 | CO at rated current | | ≥ 2500 | |
| | CO at rated breaking current lsc | | ≥ 5 | |
| 2.26 | The frequency of mechanical operations | Class | M2 | |
| 2.27 | Rated electrical endurance | Class | Min E1 | |
| 2.28 | Rated pressure of a circuit breaker | Мра | Insert | |
| 2.29 | Total mass of SF ₆ gas in a circuit breaker | kg | Insert | |
| 3. | Circuit Breaker - Design and Construction | | | |
| | Circuit Breaker | | | |
| 3.1 | | | Doroalain | |
| 3.1.1 | Insulator material | mm/4/ | Porcelain | |
| 3.1.2 | Minimum creepage distance | mm/ kV | Min. ≥ 25 | |
| | HV terminal | pcs. | 2 | |
| 3.1.3.1 | | | Flat | |
| | Dimensions | mm x mm | Min 100 x 100 | |
| | Number of holes | | Min 4 | |
| | Dimensions of holes | mm | Ø 14 | |
| | Distance between holes | mm | 50 | |
| | Material suitable for | | Al terminal | |
| 3.2 | Operating mechanism | | lacart | |
| 3.2.1 | Type | | Insert | |
| 3.2.2 | Motor - auxiliary supply voltage | V. DC | <u>110</u> | |
| 3.2.3 | Rated power of motor | W DC | Insert | |
| 3.2.4 | Control voltage | V. DC | 110 | |
| 3.2.5 | Number of making coils | pcs. | <u> </u> | |
| 3.2.6 | Rated power of making coils | W | Insert | |
| 3.2.7 | Number of breaking coils | pcs. | 2 | |
| 3.2.8 | Rated power of breaking coils | W | Insert | |
| 3.2.9 | Heater | | Yes | |



| No. | Description | Minimum Requirements | | | |
|--------|---|----------------------|-----------------------|------------|--|
| | | Unit | Data | Guaranteed | |
| 3.2.10 | Heater supply voltage | V. Hz | 230. 50 | | |
| 3.2.11 | Total heater power | W | Insert | | |
| 3.2.12 | Minimum number of available contacts (NO/NC/V) | | 12NO+12NC+1V | | |
| 3.2.15 | Water-tight corrosion-resistant housing | | IP54 | | |
| 3.2.17 | Operating mechanism material | | Al or stainless steel | | |
| 3.2.19 | A crank for manual spring loading | | Yes | | |
| 3.4 | Accessories in central control panel | | | | |
| 3.4.1 | Anti-pumping relay | | Yes | | |
| 3.4.2 | Local/remote control selector switch | | Yes | | |
| 3.4.3 | Local operation push buttons | | Yes | | |
| 3.4.4 | Minimum pressure lock-out and alarm relays | | Yes | | |
| 3.4.5 | Service outlet (socket) - 230 V, 50 Hz | | Yes | | |
| 3.4.6 | Lighting switch | | Yes | | |
| 3.4.7 | Lighting - 230 V, 50 Hz | | Yes | | |
| 3.4.8 | Heater - 230 V, 50 HZ | | Yes | | |
| 3.4.9 | Operation counter | | Yes | | |
| 3.4.10 | Motor MCB (miniature circuit breakers) (for all op- erating mechanisms) | | Yes | | |
| 3.4.11 | Time phase discrepancy relay | | Yes | | |
| 3.4.12 | Weatherproof, corrosion resistance enclosure, Al or stainless steel | | IP54 | | |
| 3.2.16 | Cu earthing rails inside central control cabinet | | Yes | | |
| 3.2.18 | Detachable plates, the bottom of central control cabinet | | Yes | | |
| 3.4.13 | Set of cables for connection of operating mecha- nism and central control panel of circuit breaker | | Yes | | |
| 3.4.14 | Galvanized horizontal and vertical metal structure with minimum 70 µm zinc layer | | Yes | | |
| | Overall compliance with the requirements (yes/no) | | | | |



| Na | Description | Mini | mum Requirements | Guarantaad |
|------|---|----------------------|--|------------|
| No. | | Unit | Data | Guaranteed |
| 1. | Circuit Breaker - General | | | |
| 1.1. | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 62271-100 IEC 60273 IEC 60694 IEC 60815 | |
| 1.6 | Quality control | | ISO 9001 ISO 14001 ISO 18001 | |
| 1.7 | Isolating and quenching medium | | SF ₆ | |
| 1.8 | Type of circuit breaker | | Outdoor | |
| 1.9 | Design | | Single breaking | |
| 1.10 | Operating mechanism | | Motor-wound spring | |
| 1.11 | Number of poles | pcs. | 3 | |
| 1.12 | Number of operating mechanisms per circuit breaker | pcs. | 3 | |
| 2. | Circuit Breaker - Characteristics | | | |
| 2.1 | Nominal system voltage | kV _{rms} | 132 | |
| 2.2 | Highest voltage for equipment U _n | kV _{rms} | 145 | |
| 2.3 | Rated lightning impulse withstand voltage | kV peak | 650 | |
| 2.4 | Rated short duration power frequency voltage | kV | 275 | |
| 2.5 | Rated frequency fr | Hz | 50 | |
| 2.6 | Rated current I _r | А | ≥ 20000 | |
| 2.7 | Rated short-circuit breaking current Isc | kA _{rms} | ≥ 40 | |
| 2.8 | Rated peak withstand current Ip (equal short-circuit making current) | kA | ≥ 100 | |
| 2.9 | D.C. component of the rated short-circuit breaking current | % | > 30 | |
| 2.10 | First-pole-to-clear factor Terminal fault Short-line fault Out-of-phase | p.u. p.u. p.u. | 1.3 1.0 2.0 | |
| 2.11 | Standard value of transient recovery voltage (T100) | kV | Insert | |
| 2.12 | Rate of rise recovery voltage | kV/µs | Insert | |
| 2.13 | Rated operating sequence | • | O-0.3 s-CO-3 min-CO | |
| 2.14 | Duration of short-circuit | S | ≥ 1 | |
| 2.15 | Rated out-of-phase breaking current | kA | Insert | |
| 2.16 | Auto reclosing | | 1p+3p | |

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5.2.1.3 B1.2: Circuit Breaker 132 kV, 2000 A, three OM

| | | Minin | num Requirements | |
|---------|--|-----------|------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| | Maximum total break time (trip initiation to final | | 2010 | |
| 2.17 | arc extinction) pos.3.7.135 acc. to IEC 62271- | ms | ≤ 60 | |
| | 100) | _ | | |
| | Time of final arc extinction (3.7.134 acc. IEC | | | |
| 2.18 | 62271-100) | ms | 20 ± 5 | |
| | Opening time (trip initiation to contact separation) | | | |
| 2.19 | Without current | ms | Insert | |
| | With 100 % rated breaking current | ms | Insert | |
| | Maximum time interval between opening inter- | | | |
| 2.20 | rupters | ms | Insert | |
| 0.04 | Maximum time interval between opening of first | | 0 | |
| 2.21 | and last phase of three-phase circuit breakers | ms | 3 | |
| | Time for making (trip initiation to contact touch) | | | |
| 2.22 | Without current | ms | Insert | |
| | 100 % making current | ms | Insert | |
| 2.23 | Minimum dead time | ms | Insert | |
| 0.04 | Restrike performance during capacitive current | 0 | 00 | |
| 2.24 | switching | Class | C2 | |
| | Number of operations without maintenance | | | |
| 2.25 | CO at no-load | | ≥ 10000 | |
| 2.25 | CO at rated current | | ≥ 2500 | |
| | CO at rated breaking current lsc | | ≥ 5 | |
| 2.26 | The frequency of mechanical operations | Class | M2 | |
| 2.27 | Rated electrical endurance | Class | Min E1 | |
| 2.28 | Rated pressure of a circuit breaker | Мра | Insert | |
| 2.29 | Total mass of SF ₆ gas in a circuit breaker | kg | Insert | |
| 3. | Circuit Breaker - Design and Construction | | | |
| 3.1 | Circuit Breaker | | | |
| 3.1.1 | Insulator material | | Porcelain | |
| | | mm/ kV | Min. ≥ 25 | |
| 3.1.2 | HV terminal | | 2 | |
| | | pcs. | 2 | |
| 3.1.3.1 | Dimensions | | Min 100 x 100 | |
| | Number of holes | mm x mm | Min 4 | |
| | Dimensions of holes | mm | Ø 14 | |
| | Distance between holes | mm | 50 | |
| | Material suitable for | mm | Al terminal | |
| 3.1.3.0 | Operating mechanism | ┨ | ALICITIIIIdi | |
| 3.2 | | | Incort | |
| 3.2.1 | Type Motor - auxiliary supply voltage | V. DC | Insert 110 | + |
| 3.2.2 | Rated power of motor | V.DC W | | |
| 3.2.3 | Control voltage | V. DC | Insert 110 | |
| | | | 1 | |
| 3.2.5 | Number of making coils | pcs. | | |
| 3.2.6 | Rated power of making coils | W | Insert | |
| 3.2.7 | Number of breaking coils | pcs. | 2 | |
| 3.2.8 | Rated power of breaking coils | W | Insert | |
| 3.2.9 | Heater | | Yes | |



| | | Minii | mum Requirements | |
|--------|---|-------|-----------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 3.2.10 | Heater supply voltage | V. Hz | 230. 50 | |
| 3.2.11 | Total heater power | W | Insert | |
| 3.2.12 | Minimum number of available contacts (NO/NC/V) | | 12NO+12NC+1V | |
| 3.2.15 | Water-tight corrosion-resistant housing | | IP54 | |
| 3.2.17 | Operating mechanism material | | Al or stainless steel | |
| 3.2.19 | A crank for manual spring loading | | Yes | |
| 3.4 | Accessories in central control panel | | | |
| 3.4.1 | Anti-pumping relay | | Yes | |
| 3.4.2 | Local/remote control selector switch | | Yes | |
| 3.4.3 | Local operation push buttons | | Yes | |
| 3.4.4 | Minimum pressure lock-out and alarm relays | | Yes | |
| 3.4.5 | Service outlet (socket) - 230 V, 50 Hz | | Yes | |
| 3.4.6 | Lighting switch | | Yes | |
| 3.4.7 | Lighting - 230 V, 50 Hz | | Yes | |
| 3.4.8 | Heater - 230 V, 50 HZ | | Yes | |
| 3.4.9 | Operation counter | | Yes | |
| 3.4.10 | Motor MCB (miniature circuit breakers) (for all op- erating mechanisms) | | Yes | |
| 3.4.11 | Time phase discrepancy relay | | Yes | |
| 3.4.12 | Weatherproof, corrosion resistance enclosure, Al or stainless steel | | IP54 | |
| 3.2.16 | Cu earthing rails inside central control cabinet | | Yes | |
| 3.2.18 | Detachable plates, the bottom of central control cabinet | | Yes | |
| 3.4.13 | Set of cables for connection of operating mecha- nism and central control panel of circuit breaker | | Yes | |
| 3.4.14 | Galvanized horizontal and vertical metal structure with minimum 70 µm zinc layer | | Yes | |
| | Overall compliance with the requirements (yes/no) | | | |



| Na | Description | Mini | mum Requirements | Guarantaad |
|------|---|----------------------|--|------------|
| No. | | Unit | Data | Guaranteed |
| 1. | Circuit Breaker - General | | | |
| 1.1. | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 62271-100 IEC 60273 IEC 60694 IEC 60815 | |
| 1.6 | Quality control | | ISO 9001 ISO 14001 ISO 18001 | |
| 1.7 | Isolating and quenching medium | | SF ₆ | |
| 1.8 | Type of circuit breaker | | Outdoor | |
| 1.9 | Design | | Single breaking | |
| 1.10 | Operating mechanism | | Motor-wound spring | |
| 1.11 | Number of poles | pcs. | 3 | |
| 1.12 | Number of operating mechanisms per circuit breaker | pcs. | 3 | |
| 2. | Circuit Breaker - Characteristics | | | |
| 2.1 | Nominal system voltage | kV _{rms} | 132 | |
| 2.2 | Highest voltage for equipment U _n | kV _{rms} | 145 | |
| 2.3 | Rated lightning impulse withstand voltage | kV peak | 650 | |
| 2.4 | Rated short duration power frequency voltage | kV | 275 | |
| 2.5 | Rated frequency fr | Hz | 50 | |
| 2.6 | Rated current I _r | А | ≥ 1250 | |
| 2.7 | Rated short-circuit breaking current Isc | kA _{rms} | ≥ 40 | |
| 2.8 | Rated peak withstand current Ip (equal short-circuit making current) | kA | ≥ 100 | |
| 2.9 | D.C. component of the rated short-circuit breaking current | % | > 30 | |
| 2.10 | First-pole-to-clear factor Terminal fault Short-line fault Out-of-phase | p.u. p.u. p.u. | 1.3 1.0 2.0 | |
| 2.11 | Standard value of transient recovery voltage (T100) | kV | Insert | |
| 2.12 | Rate of rise recovery voltage | kV/µs | Insert | |
| 2.13 | Rated operating sequence | | 0-0.3 s-CO-3 min-CO | |
| 2.14 | Duration of short-circuit | S | ≥ 1 | |
| 2.15 | Rated out-of-phase breaking current | kA | Insert | |
| 2.16 | Auto reclosing | | 1p+3p | |

5.2.1.4 B1.3: Circuit Breaker 132 kV, 1250 A, three OM

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| | Description | Minin | Minimum Requirements | |
|--------------|--|----------|--------------------------|------------|
| No. | | Unit | Data | Guaranteed |
| 2.17 | Maximum total break time (trip initiation to final arc extinction) pos.3.7.135 acc. to IEC 62271- 100) | ms | ≤ 60 | |
| 2.18 | Time of final arc extinction (3.7.134 acc. IEC 62271-100) | ms | 20 ± 5 | |
| 2.19 | Opening time (trip initiation to contact separation) Without current With 100 % rated breaking current | ms ms | Insert Insert | |
| 2.20 | Maximum time interval between opening inter- rupters | ms | Insert | |
| 2.21 | Maximum time interval between opening of first and last phase of three-phase circuit breakers | ms | 3 | |
| 2.22 | Time for making (trip initiation to contact touch)Without current100 % making current | ms ms | Insert Insert | |
| 2.23 | Minimum dead time | ms | Insert | |
| 2.24 | Restrike performance during capacitive current switching | Class | C2 | |
| 2.25 | Number of operations without maintenance CO at no-load CO at rated current CO at rated breaking current lsc | | ≥ 10000 ≥ 2500 ≥ 5 | |
| 2.26 | | Class | <u>2 5</u> M2 | |
| | The frequency of mechanical operations | | Min E1 | |
| 2.27 2.28 | Rated electrical endurance | Class | | |
| 2.20 | Rated pressure of a circuit breaker | Mpa | Insert | |
| 3. | Total mass of SF ₆ gas in a circuit breaker Circuit Breaker - Design and Construction | kg | Insert | |
| 3.1 | Circuit Breaker | | | |
| 3.1.1 | Insulator material | | Porcelain | |
| 3.1.2 | Minimum creepage distance | mm/ kV | Min. ≥ 25 | |
| 3.1.3 | HV terminal | pcs. | 2 | |
| | Shape | | Flat | |
| 3.1.3.2 | Dimensions | mm x mm | Min 100 x 100 | |
| 3.1.3.3 | Number of holes | | Min 4 | |
| 3.1.3.4 | Dimensions of holes | mm | Ø 14 | |
| 3.1.3.5 | Distance between holes | mm | 50 | |
| | Material suitable for | | Al terminal | |
| 3.2 | Operating mechanism | | | |
| 3.2.1 | Туре | | Insert | |
| 3.2.2 | Motor - auxiliary supply voltage | V. DC | 110 | |
| 3.2.3 | Rated power of motor | W | Insert | |
| 3.2.4 | Control voltage | V. DC | 110 | |
| 3.2.5 | Number of making coils | pcs. | 1 | |
| 3.2.6 | Rated power of making coils | W | Insert | |
| 3.2.7 | Number of breaking coils | pcs. | 2 | |
| 3.2.8 | Rated power of breaking coils | W | Insert | |
| 3.2.9 | Heater | | Yes | |



| | | Miniı | mum Requirements | | |
|--------|---|-------|-----------------------|------------|--|
| No. | Description | Unit | Data | Guaranteed | |
| 3.2.10 | Heater supply voltage | V. Hz | 230. 50 | | |
| 3.2.11 | Total heater power | W | Insert | | |
| 3.2.12 | Minimum number of available contacts (NO/NC/V) | | 12NO+12NC+1V | | |
| 3.2.15 | Water-tight corrosion-resistant housing | | IP54 | | |
| 3.2.17 | Operating mechanism material | | Al or stainless steel | | |
| 3.2.19 | A crank for manual spring loading | | Yes | | |
| 3.4 | Accessories in central control panel | | | | |
| 3.4.1 | Anti-pumping relay | | Yes | | |
| 3.4.2 | Local/remote control selector switch | | Yes | | |
| 3.4.3 | Local operation push buttons | | Yes | | |
| 3.4.4 | Minimum pressure lock-out and alarm relays | | Yes | | |
| 3.4.5 | Service outlet (socket) - 230 V, 50 Hz | | Yes | | |
| 3.4.6 | Lighting switch | | Yes | | |
| 3.4.7 | Lighting - 230 V, 50 Hz | | Yes | | |
| 3.4.8 | Heater - 230 V, 50 HZ | | Yes | | |
| 3.4.9 | Operation counter | | Yes | | |
| 3.4.10 | Motor MCB (miniature circuit breakers) (for all op- erating mechanisms) | | Yes | | |
| 3.4.11 | Time phase discrepancy relay | | Yes | | |
| 3.4.12 | Weatherproof, corrosion resistance enclosure, Al or stainless steel | | IP54 | | |
| 3.2.16 | Cu earthing rails inside central control cabinet | | Yes | | |
| 3.2.18 | Detachable plates, the bottom of central control cabinet | | Yes | | |
| 3.4.13 | Set of cables for connection of operating mecha- nism and central control panel of circuit breaker | | Yes | | |
| 3.4.14 | Galvanized horizontal and vertical metal structure with minimum 70 µm zinc layer | | Yes | | |
| | Overall compliance with the requirements (yes/no) | | | | |



| Ne | Description | Mini | mum Requirements | Cuerenteed |
|------|---|----------------------|--|------------|
| No. | | Unit | Data | Guaranteed |
| 1. | Circuit Breaker - General | | | |
| 1.1. | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 62271-100 IEC 60273 IEC 60694 IEC 60815 | |
| 1.6 | Quality control | | ISO 9001 ISO 14001 ISO 18001 | |
| 1.7 | Isolating and quenching medium | | SF_6 | |
| 1.8 | Type of circuit breaker | | Outdoor | |
| 1.9 | Design | | Single breaking | |
| 1.10 | Operating mechanism | | Motor-wound spring | |
| 1.11 | Number of poles | pcs. | 3 | |
| 1.12 | Number of operating mechanisms per circuit breaker | pcs. | 1 | |
| 2. | Circuit Breaker - Characteristics | | | |
| 2.1 | Nominal system voltage | kV _{rms} | 132 | |
| 2.2 | Highest voltage for equipment Un | kV _{rms} | 145 | |
| 2.3 | Rated lightning impulse withstand voltage | kV peak | 650 | |
| 2.4 | Rated short duration power frequency voltage | kV | 275 | |
| 2.5 | Rated frequency fr | Hz | 50 | |
| 2.6 | Rated current I _r | А | ≥ 3150 | |
| 2.7 | Rated short-circuit breaking current Isc | kA _{rms} | ≥ 40 | |
| 2.8 | Rated peak withstand current I_p (equal short- circuit making current) | kA | ≥ 100 | |
| 2.9 | D.C. component of the rated short-circuit breaking current | % | > 30 | |
| 2.10 | First-pole-to-clear factor Terminal fault Short-line fault Out-of-phase | p.u. p.u. p.u. | 1.3 1.0 2.0 | |
| 2.11 | Standard value of transient recovery voltage (T100) | kV | Insert | |
| 2.12 | Rate of rise recovery voltage | kV/µs | Insert | |
| 2.13 | Rated operating sequence | · · | O-0.3 s-CO-3 min-CO | |
| 2.14 | Duration of short-circuit | S | ≥ 1 | |
| 2.15 | Rated out-of-phase breaking current | kA | Insert | |
| 2.16 | Auto reclosing | | No | |

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5.2.1.5 B1.4: Circuit Breaker 132 kV, 3150 A, one OM

| | | Minir | num Requirements | |
|---------|--|----------|--------------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 2.17 | Maximum total break time (trip initiation to final arc extinction) pos.3.7.135 acc. to IEC 62271- 100) | ms | ≤ 60 | |
| 2.18 | Time of final arc extinction (3.7134 acc. IEC 62271-100) | ms | 20 ± 5 | |
| 2.19 | Opening time (trip initiation to contact separation)Without currentWith 100 % rated breaking current | ms ms | Insert Insert | |
| 2.20 | Maximum time interval between opening inter- rupters | ms | Insert | |
| 2.21 | Maximum time interval between opening of first and last phase of three-phase circuit breakers | ms | 3 | |
| 2.22 | Time for making (trip initiation to contact touch)Without current100 % making current | ms ms | Insert Insert | |
| 2.23 | Minimum dead time | ms | Insert | |
| 2.24 | Restrike performance during capacitive current switching | Class | C2 | |
| 2.25 | Number of operations without maintenance CO at no-load CO at rated current CO at rated breaking current lsc | | ≥ 10000 ≥ 2500 ≥ 5 | |
| 2.26 | The frequency of mechanical operations | Class | M2 | |
| 2.27 | Rated electrical endurance | Class | Min E1 | |
| 2.28 | Rated pressure of a circuit breaker | Мра | Insert | |
| 2.29 | Total mass of SF ₆ gas in a circuit breaker | kg | Insert | |
| 2.30 | Rated mechanical terminal loads | | | |
| 2.30.1 | Static horizontal force, longitudinal F _{thA} | Ν | ≥ 1750 | |
| 2.30.2 | Static horizontal force, transversal F _{thB} | Ν | ≥ 1250 | |
| 2.30.3 | Static vertical force F _{tv} | Ν | ≥ 1500 | |
| 2.30.4 | Dynamic horizontal force, longitudinal F _{wx} | Ν | Insert | |
| 2.30.5 | Dynamic horizontal force, transversal | Ν | Insert | |
| 3. | Circuit Breaker - Design and Construction | | | 1 |
| 3.1 | Circuit Breaker | | | |
| 3.1.1 | Insulator material | | Porcelain | |
| 3.1.2 | Minimum creepage distance | mm/ kV | Min. ≥ 25 | |
| 3.1.3 | HV terminal | pcs. | 2 | |
| 3.1.3.1 | • | | Flat | |
| | Dimensions | mm x mm | Min 100 x 100 | |
| | Number of holes | | Min 4 | |
| | Dimensions of holes | mm | Ø 14 | |
| | Distance between holes | mm | 50 | |
| | Material suitable for | | Al terminal | |
| 3.1.5 | Weight and dimensions | | | |
| | Support insulator height | mm | Insert | |
| | Total height | mm | Insert | |
| 3.1.5.3 | Pole weight | kg | Insert | |

| No. | Description | Minii | mum Requirements | Guaranteed |
|---------|---|---------|-----------------------|------------|
| NO. | | Unit | Data | |
| 3.1.5.4 | Weight of operating mechanism | kg | Insert | |
| 3.1.5.5 | Total weight (with metal structure) | kg | Insert | |
| 3.1.6 | Minimum distance | | | |
| 3.1.6.1 | Between poles | mm | Insert | |
| | To ground | mm | Insert | |
| 3.2 | Operating mechanism | | | |
| 3.2.1 | Туре | | Insert | |
| 3.2.2 | Motor - auxiliary supply voltage | V. DC | 110 | |
| 3.2.3 | Rated power of motor | W | Insert | |
| 3.2.4 | Control voltage | V. DC | 110 | |
| 3.2.5 | Number of making coils | pcs. | 1 | |
| 3.2.6 | Rated power of making coils | W | Insert | |
| 3.2.7 | Number of breaking coils | pcs. | 2 | |
| 3.2.8 | Rated power of breaking coils | W | Insert | |
| 3.2.9 | Heater | | Yes | |
| | Heater supply voltage | V. Hz | 230. 50 | |
| | Total heater power | W. 112 | Insert | |
| 3.2.12 | Minimum number of available contacts (NO/NC/V) | VV | 12NO+12NC+1V | |
| 3.2.12 | | | IP54 | |
| | | | | |
| 3.2.17 | Operating mechanism material | | Al or stainless steel | |
| 3.2.19 | A crank for manual spring loading | | Yes | |
| 3.4 | Accessories in central control panel | | N | |
| 3.4.1 | Anti-pumping relay | | Yes | |
| 3.4.2 | Local/remote control selector switch | | Yes | |
| 3.4.3 | Local operation push buttons | | Yes | |
| 3.4.4 | Minimum pressure lock-out and alarm relays | | Yes | |
| 3.4.5 | Service outlet (socket) - 230 V, 50 Hz | | Yes | |
| 3.4.6 | Lighting switch | | Yes | |
| 3.4.7 | Lighting - 230 V, 50 Hz | | Yes | |
| 3.4.8 | Heater - 230 V, 50 HZ | | Yes | |
| 3.4.9 | Operation counter | | Yes | |
| 3.4.10 | Motor MCB (miniature circuit breakers) (for all op- erating mechanisms) | | Yes | |
| 3.4.11 | Time phase discrepancy relay | | Yes | |
| 3.4.12 | Weatherproof, corrosion resistance enclosure, Al or stainless steel | | IP54 | |
| 3.2.16 | Cu earthing rails inside central control cabinet | | Yes | |
| 3.2.18 | Detachable plates, the bottom of central control cabinet | | Yes | |
| 3.4.13 | Set of cables for connection of operating mecha- nism and central control panel of circuit breaker | | Yes | |
| 3.4.14 | Galvanized horizontal and vertical metal structure with minimum 70 µm zinc layer | | Yes | |
| | Overall compliance with the requirements (| yes/no) | | |

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| No | Description | Mini | mum Requirements | Cuerenteed |
|------|--|----------------------|--|------------|
| No. | Description | Unit | Data | Guaranteed |
| 1. | Circuit Breaker - General | | | |
| 1.1. | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 62271-100 IEC 60273 IEC 60694 IEC 60815 | |
| 1.6 | Quality control | | ISO 9001 ISO 14001 ISO 18001 | |
| 1.7 | Isolating and quenching medium | | SF ₆ | |
| 1.8 | Type of circuit breaker | | Outdoor | |
| 1.9 | Design | | Single breaking | |
| 1.10 | Operating mechanism | | Motor-wound spring | |
| 1.11 | Number of poles | pcs. | 3 | |
| 1.12 | Number of operating mechanisms per circuit breaker | pcs. | 1 | |
| 2. | Circuit Breaker - Characteristics | | | |
| 2.1 | Nominal system voltage | kV _{rms} | 132 | |
| 2.2 | Highest voltage for equipment Un | kV _{rms} | 145 | |
| 2.3 | Rated lightning impulse withstand voltage | kV peak | 650 | |
| 2.4 | Rated short duration power frequency voltage | kV | 275 | |
| 2.5 | Rated frequency fr | Hz | 50 | |
| 2.6 | Rated current Ir | А | ≥ 2000 | |
| 2.7 | Rated short-circuit breaking current Isc | kA _{rms} | ≥ 40 | |
| 2.8 | Rated peak withstand current I _p (equal short- circuit making current) | kA | ≥ 100 | |
| 2.9 | D.C. component of the rated short-circuit breaking current | % | > 30 | |
| 2.10 | First-pole-to-clear factor Terminal fault Short-line fault Out-of-phase | p.u. p.u. p.u. | 1.3 1.0 2.0 | |
| 2.11 | Standard value of transient recovery voltage (T100) | kV | Insert | |
| 2.12 | Rate of rise recovery voltage | kV/µs | Insert | |
| 2.13 | Rated operating sequence | | O-0.3 s-CO-3 min-CO | |
| 2.14 | Duration of short-circuit | s | ≥ 1 | |
| 2.15 | Rated out-of-phase breaking current | kA | Insert | |
| 2.16 | Auto reclosing | | No | |

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5.2.1.6 B1.5: Circuit Breaker 132 kV, 2000 A, one OM

| | | Minir | num Requirements | |
|---------|--|----------|--------------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 2.17 | Maximum total break time (trip initiation to final arc extinction) pos.3.7.135 acc. to IEC 62271- 100) | ms | ≤ 60 | |
| 2.18 | Time of final arc extinction (3.7134 acc. IEC 62271-100) | ms | 20 ± 5 | |
| 2.19 | Opening time (trip initiation to contact separation)Without currentWith 100 % rated breaking current | ms ms | Insert Insert | |
| 2.20 | Maximum time interval between opening inter- rupters | ms | Insert | |
| 2.21 | Maximum time interval between opening of first and last phase of three-phase circuit breakers | ms | 3 | |
| 2.22 | Time for making (trip initiation to contact touch)Without current100 % making current | ms ms | Insert Insert | |
| 2.23 | Minimum dead time | ms | Insert | |
| 2.24 | Restrike performance during capacitive current switching | Class | C2 | |
| 2.25 | Number of operations without maintenance CO at no-load CO at rated current CO at rated breaking current lsc | | ≥ 10000 ≥ 2500 ≥ 5 | |
| 2.26 | The frequency of mechanical operations | Class | M2 | |
| 2.27 | Rated electrical endurance | Class | Min E1 | |
| 2.28 | Rated pressure of a circuit breaker | Мра | Insert | |
| 2.29 | Total mass of SF ₆ gas in a circuit breaker | kg | Insert | |
| 2.30 | Rated mechanical terminal loads | | | |
| 2.30.1 | Static horizontal force, longitudinal F _{thA} | Ν | ≥ 1750 | |
| 2.30.2 | Static horizontal force, transversal F _{thB} | Ν | ≥ 1250 | |
| 2.30.3 | Static vertical force F _{tv} | Ν | ≥ 1500 | |
| 2.30.4 | Dynamic horizontal force, longitudinal F _{wx} | Ν | Insert | |
| 2.30.5 | Dynamic horizontal force, transversal | Ν | Insert | |
| 3. | Circuit Breaker - Design and Construction | | | 1 |
| 3.1 | Circuit Breaker | | | |
| 3.1.1 | Insulator material | | Porcelain | |
| 3.1.2 | Minimum creepage distance | mm/ kV | Min. ≥ 25 | |
| 3.1.3 | HV terminal | pcs. | 2 | |
| 3.1.3.1 | • | | Flat | |
| | Dimensions | mm x mm | Min 100 x 100 | |
| | Number of holes | | Min 4 | |
| | Dimensions of holes | mm | Ø 14 | |
| | Distance between holes | mm | 50 | |
| | Material suitable for | | Al terminal | |
| 3.1.5 | Weight and dimensions | | | |
| | Support insulator height | mm | Insert | |
| | Total height | mm | Insert | |
| 3.1.5.3 | Pole weight | kg | Insert | |

| No. | Description | Mini | mum Requirements | Guaranteed |
|----------------|--|---------|-----------------------|------------|
| NO. | | Unit | Data | |
| 3.1.5.4 | Weight of operating mechanism | kg | Insert | |
| 3.1.5.5 | Total weight (with metal structure) | kg | Insert | |
| 3.1.6 | Minimum distance | | | |
| 3.1.6.1 | Between poles | mm | Insert | |
| 3.1.6.2 | To ground | mm | Insert | |
| 3.2 | Operating mechanism | | | |
| 3.2.1 | Туре | | Insert | |
| 3.2.2 | Motor - auxiliary supply voltage | V. DC | 110 | |
| 3.2.3 | Rated power of motor | W | Insert | |
| 3.2.4 | Control voltage | V. DC | 110 | |
| 3.2.5 | Number of making coils | pcs. | 1 | |
| 3.2.6 | Rated power of making coils | W | Insert | |
| 3.2.7 | Number of breaking coils | pcs. | 2 | |
| 3.2.8 | Rated power of breaking coils | W | Insert | |
| 3.2.9 | Heater | | Yes | |
| | Heater supply voltage | V. Hz | 230. 50 | |
| | Total heater power | W | Insert | |
| | Minimum number of available contacts (NO/NC/V) | | 12NO+12NC+1V | |
| | Water-tight corrosion-resistant housing | | IP54 | |
| | Operating mechanism material | | Al or stainless steel | |
| | A crank for manual spring loading | | Yes | |
| 3.4 | Accessories in central control panel | | 103 | |
| 3.4.1 | Anti-pumping relay | | Yes | |
| 3.4.2 | Local/remote control selector switch | | Yes | |
| 3.4.2 | | | Yes | |
| | Local operation push buttons | | Yes | |
| 3.4.4 3.4.5 | Minimum pressure lock-out and alarm relays Service outlet (socket) - 230 V, 50 Hz | | | |
| | | | Yes | |
| 3.4.6 | Lighting switch | | Yes | |
| | Lighting - 230 V, 50 Hz | | Yes | |
| | Heater - 230 V, 50 HZ | | Yes | |
| 3.4.9 | Operation counter | | Yes | |
| 3.4.10 | Motor MCB (miniature circuit breakers) (for all op- erating mechanisms) | | Yes | |
| 3.4.11 | Time phase discrepancy relay | | Yes | |
| 3.4.12 | Weatherproof, corrosion resistance enclosure, Al or stainless steel | | IP54 | |
| 3.2.16 | Cu earthing rails inside central control cabinet | | Yes | |
| 3.2.18 | Detachable plates, the bottom of central control | | Yes | |
| 3.4.13 | cabinet Set of cables for connection of operating mecha- nism and central control panel of circuit breaker | | Yes | |
| 3.4.14 | Galvanized horizontal and vertical metal structure with minimum 70 µm zinc layer | | Yes | |
| | Overall compliance with the requirements (| yes/no) | | |



| Ne | Description | Mini | mum Requirements | Guaranteed |
|------|---|----------------------|--|------------|
| No. | | Unit | Data | Guaranteed |
| 1. | Circuit Breaker - General | | | |
| 1.1. | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 62271-100 IEC 60273 IEC 60694 IEC 60815 | |
| 1.6 | Quality control | | ISO 9001 ISO 14001 ISO 18001 | |
| 1.7 | Isolating and quenching medium | | SF ₆ | |
| 1.8 | Type of circuit breaker | | Outdoor | |
| 1.9 | Design | | Single breaking | |
| 1.10 | Operating mechanism | | Motor-wound spring | |
| 1.11 | Number of poles | pcs. | 3 | |
| 1.12 | Number of operating mechanisms per circuit breaker | pcs. | 1 | |
| 2. | Circuit Breaker - Characteristics | | | |
| 2.1 | Nominal system voltage | kV _{rms} | 132 | |
| 2.2 | Highest voltage for equipment Un | kV _{rms} | 145 | |
| 2.3 | Rated lightning impulse withstand voltage | kV peak | 650 | |
| 2.4 | Rated short duration power frequency voltage | kV | 275 | |
| 2.5 | Rated frequency fr | Hz | 50 | |
| 2.6 | Rated current I _r | А | ≥ 1250 | |
| 2.7 | Rated short-circuit breaking current Isc | kA _{rms} | ≥ 40 | |
| 2.8 | Rated peak withstand current I_p (equal short- circuit making current) | kA | ≥ 100 | |
| 2.9 | D.C. component of the rated short-circuit breaking current | % | > 30 | |
| 2.10 | First-pole-to-clear factor Terminal fault Short-line fault Out-of-phase | p.u. p.u. p.u. | 1.3 1.0 2.0 | |
| 2.11 | Standard value of transient recovery voltage (T100) | kV | Insert | |
| 2.12 | Rate of rise recovery voltage | kV/µs | Insert | |
| 2.13 | Rated operating sequence | | 0-0.3 s-CO-3 min-CO | |
| 2.14 | Duration of short-circuit | S | ≥ 1 | |
| 2.15 | Rated out-of-phase breaking current | kA | Insert | |
| 2.16 | Auto reclosing | | No | |

5.2.1.7 B1.6: Circuit Breaker 132 kV, 1250 A, one OM



| | Description | Minir | num Requirements | |
|--------------|---|---------|------------------|------------|
| No. | | Unit | Data | Guaranteed |
| | Maximum total break time (trip initiation to final | | | |
| 2.17 | arc extinction) pos.3.7.135 acc. to IEC 62271- | ms | ≤ 60 | |
| | 100) | | | |
| 2.18 | Time of final arc extinction (3.7134 acc. IEC | | 20 ± 5 | |
| 2.10 | 62271-100) | ms | 20 ± 5 | |
| | Opening time (trip initiation to contact separation) | | | |
| 2.19 | Without current | ms | Insert | |
| | With 100 % rated breaking current | ms | Insert | |
| 2.20 | Maximum time interval between opening inter- | ms | Insert | |
| | rupters | | | |
| 2.21 | Maximum time interval between opening of first | ms | 3 | |
| | and last phase of three-phase circuit breakers | | | |
| | Time for making (trip initiation to contact touch) | | | |
| 2.22 | Without current | ms | Insert | |
| | 100 % making current | ms | Insert | |
| 2.23 | Minimum dead time | ms | Insert | |
| 2.24 | Restrike performance during capacitive current | Class | C2 | |
| | switching | | | |
| | Number of operations without maintenance | | × 40000 | |
| 2.25 | CO at no-load | | ≥ 10000 | |
| | CO at rated current | | ≥ 2500 | |
| 2.26 | CO at rated breaking current lsc | Class | ≥ 5 | |
| 2.26 | The frequency of mechanical operations | Class | M2 | |
| 2.27 2.28 | Rated electrical endurance | Class | Min E1 | |
| | Rated pressure of a circuit breaker | Mpa | Insert | |
| 2.29 2.30 | Total mass of SF ₆ gas in a circuit breaker Rated mechanical terminal loads | kg | Insert | |
| | | N | ≥ 1750 | |
| 2.30.1 | Static horizontal force, longitudinal F _{thA} | N | ≥ 1750 | |
| | Static horizontal force, transversal F _{thB} Static vertical force F _{tv} | N | ≥ 1250 | |
| | | N | | |
| 2.30.4 | Dynamic horizontal force, longitudinal F _{wx} Dynamic horizontal force, transversal | N | Insert | |
| | | IN | Insert | |
| 3. | Circuit Breaker - Design and Construction | | | I |
| 3.1 | Circuit Breaker | | | |
| 3.1.1 | Insulator material | | Porcelain | |
| 3.1.2 | Minimum creepage distance | mm/ kV | Min. ≥ 25 | |
| 3.1.3 | HV terminal | pcs. | 2 | |
| 3.1.3.1 | Shape | | Flat | |
| | Dimensions | mm x mm | Min 100 x 100 | |
| | Number of holes | | Min 4 | |
| | Dimensions of holes | mm | Ø 14 | |
| | Distance between holes | mm | 50 | |
| | Material suitable for | | Al terminal | |
| | Weight and dimensions | | | |
| | Support insulator height | mm | Insert | |
| | Total height | mm | Insert | |
| 3.1.5.3 | Pole weight | kg | Insert | |

| | | Minii | Ainimum Requirements | |
|---------|---|---------|-----------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 3.1.5.4 | Weight of operating mechanism | kg | Insert | |
| 3.1.5.5 | Total weight (with metal structure) | kg | Insert | |
| 3.1.6 | Minimum distance | | | |
| 3.1.6.1 | Between poles | mm | Insert | |
| 3.1.6.2 | To ground | mm | Insert | |
| 3.2 | Operating mechanism | | | |
| 3.2.1 | Туре | | Insert | |
| 3.2.2 | Motor - auxiliary supply voltage | V. DC | 110 | |
| 3.2.3 | Rated power of motor | W | Insert | |
| 3.2.4 | Control voltage | V. DC | 110 | |
| 3.2.5 | Number of making coils | pcs. | 1 | |
| 3.2.6 | Rated power of making coils | W | Insert | |
| 3.2.7 | Number of breaking coils | pcs. | 2 | |
| 3.2.8 | Rated power of breaking coils | W | Insert | |
| 3.2.9 | Heater | | Yes | |
| 3.2.10 | Heater supply voltage | V. Hz | 230. 50 | |
| | Total heater power | W | Insert | |
| | Minimum number of available contacts (NO/NC/V) | | 12NO+12NC+1V | |
| | Water-tight corrosion-resistant housing | | IP54 | |
| | Operating mechanism material | | Al or stainless steel | |
| | A crank for manual spring loading | | Yes | |
| 3.4 | Accessories in central control panel | | | |
| 3.4.1 | Anti-pumping relay | | Yes | |
| 3.4.2 | Local/remote control selector switch | | Yes | |
| 3.4.3 | Local operation push buttons | | Yes | |
| 3.4.4 | Minimum pressure lock-out and alarm relays | | Yes | |
| 3.4.5 | Service outlet (socket) - 230 V, 50 Hz | | Yes | |
| 3.4.6 | Lighting switch | | Yes | |
| - | Lighting - 230 V, 50 Hz | | Yes | |
| | Heater - 230 V, 50 HZ | | Yes | |
| | Operation counter | | Yes | |
| 3.4.10 | Motor MCB (miniature circuit breakers) (for all operating mechanisms) | | Yes | |
| 3.4.11 | Time phase discrepancy relay | | Yes | |
| 3.4.12 | Weatherproof, corrosion resistance enclosure, Al | | IP54 | |
| | or stainless steel | | | |
| 3.2.16 | Cu earthing rails inside central control cabinet | | Yes | |
| 3.2.18 | Detachable plates, the bottom of central control cabinet | | Yes | |
| 3.4.13 | Set of cables for connection of operating mecha- nism and central control panel of circuit breaker | | Yes | |
| 3.4.14 | Galvanized horizontal and vertical metal structure with minimum 70 µm zinc layer | | Yes | |
| | Overall compliance with the requirements (| yes/no) | L | |



| Ne | Description | Minim | um Requirements | |
|--------|---|--------------------|--|------------|
| No. | Description | Unit | Data | Guaranteed |
| 1. | Disconnector- General | | | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 62271-102 IEC 60273 IEC 60694 IEC 60815 | |
| 1.6 | Quality control | | ISO 9001 ISO 14001 ISO 18001 | |
| 1.7 | Type of disconnector | | Outdoor | |
| 1.8 | Design | | Centre break | |
| 1.9 | Number of poles | pcs. | 3 | |
| 1.10 | Type of main blade operating mechanism | | Motor driven | |
| 1.11 | Number of main blade operating mechanisms | pcs. | 1 | |
| 1.12 | Type of earthing blade operating mechanism | | Motor driven | |
| 1.13 | Number of earthing blade operating mechanism | | 1 | |
| 2. | Disconnector - Characteristics | | | |
| 2.1 | Nominal system voltage | kV _{rms} | 132 | |
| 2.2 | Highest voltage for equipment Un | kV _{rms} | 145 | |
| 2.3 | Rated lightning impulse withstand voltage | kV _{peak} | 650 | |
| 2.4 | Rated short duration power frequency voltage | kV | 275 | |
| 2.5 | Rated frequency fr | Hz | 50 | |
| 2.7 | Rated current Ir | А | ≥ 3150 | |
| 2.8 | Rated short withstand current Ik | kA _{rms} | ≥ 40 | |
| 2.9 | Rated duration of short-circuit on main blades | S | 3 | |
| 2.10 | Rated duration of short-circuit on earthing blades | S | 3 | |
| 2.11 | Rated maximum withstand current lp | kA | ≥ 100 | |
| 2.12 | Capacity of making and breaking transfer load of busbar system at 300 V (rms) | А | 1600 | |
| 2.13 | Nominal supply voltage | | | |
| 2.13.1 | Controls and alarm (signalling) circuits | V d.c. | 110 | |
| 2.13.2 | Motors | V d.c. | 110 | |
| 2.13.3 | Heaters | V a.c. / Hz | 230 / 50 | |
| 2.14 | Opening time | s | Insert | |
| 2.15 | Closing time | s | Insert | |
| 2.16 | Mechanical endurance | Class | M2 | |
| 3. | Disconnector - Design and Construction | | | |
| 3.1 | Disconnector | | | |
| 3.1.1 | Insulator material | | Porcelain, brown | |
| 3.1.2 | Minimum creepage distance | mm/ kV | Min. ≥ 25 mm/ kV | |
| 3.1.3 | Quality of insulator | | Min. C130 | |

5.2.1.8 B2.1: Disconnector 132 kV, 3150 A, with Earthing Switch



| | | Minim | um Requirements | |
|---------|---|------------|-----------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 3.1.4 | Rated failing load of insulator (C10) | N | Min. 10000 | |
| 3.1.5 | HV terminals | | | |
| 3.1.5.1 | Shape | | Flat | |
| 3.1.5.2 | Dimensions | mm x mm | Min 100 x 100 | |
| 3.1.5.3 | Number of holes | | Min 4 | |
| 3.1.5.4 | Dimensions of holes | mm | Ø 14 | |
| 3.1.5.5 | Distance between holes | mm | 50 | |
| 3.1.5.6 | Material suitable for | | Al terminal | |
| 3.2 | Operating mechanism | | | |
| 3.2.1 | Number of operating mechanism | pcs. | 1+1 | |
| 3.2.2 | Туре | | Insert | |
| 3.2.3 | Rated power of motor | W | Insert | |
| 3.2.4 | Total heater power | W | Insert | |
| 3.2.5 | Minimum number of available contacts (NO/NC/V) | | 12NO+12NC | |
| 3.2.9 | Motor - auxiliary supply voltage | V, DC | 110 | |
| 3.2.10 | Heater, 230 V, 50 Hz | | Yes | |
| 3.2.11 | Water-tight corrosion-resistant housing | | IP54 | |
| 3.2.12 | Selection switch (local/neutral/remote) | | Yes | |
| 3.2.13 | Manual closing button | | Yes | |
| 3.2.14 | Manual opening button | | Yes | |
| 3.2.15 | Anti-condensation heater inside the operating mechanism cabinet | | Yes | |
| 3.2.16 | Single-phase socket | | Yes | |
| 3.2.17 | Voltage presence controller | | Yes | |
| 3.2.18 | | | Yes | |
| 3.2.19 | Heater MCB (miniature circuit breaker) | | Yes | |
| 3.2.20 | Single-phase socket MCB (miniature circuit breaker) | | Yes | |
| 3.2.21 | Equipotential bonding rails | | Yes | |
| 3.2.22 | Housing of AI or stainless steel | | Yes | |
| | Overall compliance with the requirements | s (yes/no) | | |



| Na | Description | Minim | num Requirements | Guanantaad |
|--------|---|--------------------|--|------------|
| No. | Description | Unit | Data | Guaranteed |
| 1. | Disconnector- General | | | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 62271-102 IEC 60273 IEC 60694 IEC 60815 | |
| 1.6 | Quality control | | ISO 9001 ISO 14001 ISO 18001 | |
| 1.7 | Type of disconnector | | Outdoor | |
| 1.8 | Design | | Centre break | |
| 1.9 | Number of poles | pcs. | 3 | |
| 1.10 | Type of main blade operating mechanism | | Motor driven | |
| 1.11 | Number of main blade operating mechanisms | pcs. | 1 | |
| 1.12 | Type of earthing blade operating mechanism | | Motor driven | |
| 1.13 | Number of earthing blade operating mechanism | | 1 | |
| 2. | Disconnector - Characteristics | | | |
| 2.1 | Nominal system voltage | kV _{rms} | 132 | |
| 2.2 | Highest voltage for equipment Un | kV _{rms} | 145 | |
| 2.3 | Rated lightning impulse withstand voltage | kV _{peak} | 650 | |
| 2.4 | Rated short duration power frequency voltage | kV | 275 | |
| 2.5 | Rated frequency fr | Hz | 50 | |
| 2.7 | Rated current I _r | А | ≥ 2000 | |
| 2.8 | Rated short withstand current Ik | kA _{rms} | ≥ 40 | |
| 2.9 | Rated duration of short-circuit on main blades | S | 3 | |
| 2.10 | Rated duration of short-circuit on earthing blades | S | 3 | |
| 2.11 | Rated maximum withstand current lp | kA | ≥ 100 | |
| 2.12 | Capacity of making and breaking transfer load of busbar system at 300 V (rms) | А | 1600 | |
| 2.13 | Nominal supply voltage | | | |
| 2.13.1 | Controls and alarm (signalling) circuits | V d.c. | 110 | |
| 2.13.2 | Motors | V d.c. | 110 | |
| 2.13.3 | Heaters | V a.c. / Hz | 230 / 50 | |
| 2.14 | Opening time | s | Insert | |
| 2.15 | Closing time | S | Insert | |
| 2.16 | Mechanical endurance | Class | M2 | |
| 3. | Disconnector - Design and Construction | | | |
| 3.1 | Disconnector | | | |
| 3.1.1 | Insulator material | | Porcelain, brown | |
| 3.1.2 | Minimum creepage distance | mm/ kV | Min. ≥ 25 mm/ kV | |
| 3.1.3 | Quality of insulator | | Min. C130 | |

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5.2.1.9 B2.2: Disconnector 132 kV, 2000 A, with Earthing Switch

| N | | Minimu | um Requirements | 0 |
|---------|---|------------|-----------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 3.1.4 | Rated failing load of insulator (C10) | N | Min. 10000 | |
| 3.1.5 | HV terminals | | | |
| 3.1.5.1 | Shape | | Flat | |
| 3.1.5.2 | Dimensions | mm x mm | Min 100 x 100 | |
| 3.1.5.3 | Number of holes | | Min 4 | |
| 3.1.5.4 | Dimensions of holes | mm | Ø 14 | |
| 3.1.5.5 | Distance between holes | mm | 50 | |
| 3.1.5.6 | Material suitable for | | Al terminal | |
| 3.2 | Operating mechanism | | | |
| 3.2.1 | Number of operating mechanism | pcs. | 1+1 | |
| 3.2.2 | Туре | | Insert | |
| 3.2.3 | Rated power of motor | W | Insert | |
| 3.2.4 | Total heater power | W | Insert | |
| 3.2.5 | Minimum number of available contacts | | 12NO+12NC | |
| | (NO/NC/V) | | | |
| 3.2.9 | Motor - auxiliary supply voltage | V, DC | 110 | |
| | Heater, 230 V, 50 Hz | | Yes | |
| | Water-tight corrosion-resistant housing | | IP54 | |
| 3.2.12 | | | Yes | |
| | Manual closing button | | Yes | |
| 3.2.14 | Manual opening button | | Yes | |
| 3.2.15 | Anti-condensation heater inside the operating mechanism cabinet | | Yes | |
| 3.2.16 | Single-phase socket | | Yes | |
| 3.2.17 | Voltage presence controller | | Yes | |
| 3.2.18 | Motor MCB (miniature circuit breakers) | | Yes | |
| 3.2.19 | Heater MCB (miniature circuit breaker) | | Yes | |
| 3.2.20 | Single-phase socket MCB (miniature circuit breaker) | | Yes | |
| 3.2.21 | Equipotential bonding rails | | Yes | |
| 3.2.22 | | | Yes | |
| | Overall compliance with the requirements | s (yes/no) | | |



| No. | Description | Minimum Requirements | | Guarantood |
|--------|---|----------------------|--|------------|
| NO. | Description | Unit | Data | Guaranteed |
| 1. | Disconnector- General | | | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 62271-102 IEC 60273 IEC 60694 IEC 60815 | |
| 1.6 | Quality control | | ISO 9001 ISO 14001 ISO 18001 | |
| 1.7 | Type of disconnector | | Outdoor | |
| 1.8 | Design | | Centre break | |
| 1.9 | Number of poles | pcs. | 3 | |
| 1.10 | Type of main blade operating mechanism | | Motor driven | |
| 1.11 | Number of main blade operating mechanisms | pcs. | 1 | |
| 1.12 | Type of earthing blade operating mechanism | | Motor driven | |
| 1.13 | Number of earthing blade operating mechanism | | 1 | |
| 2. | Disconnector - Characteristics | · · · · · | | · |
| 2.1 | Nominal system voltage | kV _{rms} | 132 | |
| 2.2 | Highest voltage for equipment Un | kV _{rms} | 145 | |
| 2.3 | Rated lightning impulse withstand voltage | kV _{peak} | 650 | |
| 2.4 | Rated short duration power frequency voltage | kV | 275 | |
| 2.5 | Rated frequency fr | Hz | 50 | |
| 2.7 | Rated current Ir | А | ≥ 1250 | |
| 2.8 | Rated short withstand current Ik | kA _{rms} | ≥ 40 | |
| 2.9 | Rated duration of short-circuit on main blades | S | 3 | |
| 2.10 | Rated duration of short-circuit on earthing blades | S | 3 | |
| 2.11 | Rated maximum withstand current lp | kA | ≥ 100 | |
| 2.12 | Capacity of making and breaking transfer load of busbar system at 300 V (rms) | А | 1600 | |
| 2.13 | Nominal supply voltage | | | |
| 2.13.1 | Controls and alarm (signalling) circuits | V d.c. | 110 | |
| 2.13.2 | Motors | V d.c. | 110 | |
| 2.13.3 | Heaters | V a.c. / Hz | 230 / 50 | |
| 2.14 | Opening time | S | Insert | |
| 2.15 | Closing time | S | Insert | |
| 2.16 | Mechanical endurance | Class | M2 | |
| 3. | Disconnector - Design and Construction | | | |
| 3.1 | Disconnector | | | |
| 3.1.1 | Insulator material | | Porcelain, brown | |
| 3.1.2 | Minimum creepage distance | mm/ kV | Min. ≥ 25 mm/ kV | |
| 3.1.3 | Quality of insulator | | Min. C130 | |

5.2.1.10 B2.3: Disconnector 132 kV, 1250 A, with Earthing Switch

| | D escription | Minimu | um Requirements | |
|---------|---|------------|-----------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 3.1.4 | Rated failing load of insulator (C10) | N | Min. 10000 | |
| 3.1.5 | HV terminals | | | |
| 3.1.5.1 | Shape | | Flat | |
| 3.1.5.2 | Dimensions | mm x mm | Min 100 x 100 | |
| 3.1.5.3 | Number of holes | | Min 4 | |
| 3.1.5.4 | Dimensions of holes | mm | Ø 14 | |
| 3.1.5.5 | Distance between holes | mm | 50 | |
| 3.1.5.6 | Material suitable for | | Al terminal | |
| 3.2 | Operating mechanism | | | |
| 3.2.1 | Number of operating mechanism | pcs. | 1+1 | |
| 3.2.2 | Туре | | Insert | |
| 3.2.3 | Rated power of motor | W | Insert | |
| 3.2.4 | Total heater power | W | Insert | |
| 3.2.5 | Minimum number of available contacts (NO/NC/V) | | 12NO+12NC | |
| 3.2.9 | Motor - auxiliary supply voltage | V, DC | 110 | |
| 3.2.10 | Heater, 230 V, 50 Hz | | Yes | |
| 3.2.11 | Water-tight corrosion-resistant housing | | IP54 | |
| 3.2.12 | Selection switch (local/neutral/remote) | | Yes | |
| 3.2.13 | Manual closing button | | Yes | |
| 3.2.14 | Manual opening button | | Yes | |
| 3.2.15 | Anti-condensation heater inside the operating mechanism cabinet | | Yes | |
| 3.2.16 | Single-phase socket | | Yes | |
| 3.2.17 | Voltage presence controller | | Yes | |
| 3.2.18 | Motor MCB (miniature circuit breakers) | | Yes | |
| 3.2.19 | Heater MCB (miniature circuit breaker) | | Yes | |
| 3.2.20 | Single-phase socket MCB (miniature circuit breaker) | | Yes | |
| 3.2.21 | Equipotential bonding rails | | Yes | |
| 3.2.22 | Housing of AI or stainless steel | | Yes | |
| | Overall compliance with the requirement | s (yes/no) | | |



5.2.1.11 B2.4: Disconnector 132 kV, 3150 A

| Na | Description | Minim | imum Requirements | |
|--------|---|--------------------|--|------------|
| No. | Description | Unit | Data | Guaranteed |
| 1. | Disconnector- General | | | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 62271-102 IEC 60273 IEC 60694 IEC 60815 | |
| 1.6 | Quality control | | ISO 9001 ISO 14001 ISO 18001 | |
| 1.7 | Type of disconnector | | Outdoor | |
| 1.8 | Design | | Centre break | |
| 1.9 | Number of poles | pcs. | 3 | |
| 1.10 | Type of main blade operating mechanism | | Motor driven | |
| 1.11 | Number of main blade operating mechanisms | pcs. | 1 | |
| 1.12 | Type of earthing blade operating mechanism | | Not applicable | |
| 1.13 | Number of earthing blade operating mechanism | | Not applicable | |
| 2. | Disconnector - Characteristics | · · · · · · | | |
| 2.1 | Nominal system voltage | kV _{rms} | 132 | |
| 2.2 | Highest voltage for equipment Un | kV _{rms} | 145 | |
| 2.3 | Rated lightning impulse withstand voltage | kV _{peak} | 650 | |
| 2.4 | Rated short duration power frequency voltage | kV | 275 | |
| 2.5 | Rated frequency fr | Hz | 50 | |
| 2.7 | Rated current Ir | А | ≥ 3150 | |
| 2.8 | Rated short withstand current Ik | kA _{rms} | ≥ 40 | |
| 2.9 | Rated duration of short-circuit on main blades | s | 3 | |
| 2.10 | Rated duration of short-circuit on earthing blades | s | Not applicable | |
| 2.11 | Rated maximum withstand current lp | kA | ≥ 100 | |
| 2.12 | Capacity of making and breaking transfer load of busbar system at 300 V (rms) | А | 1600 | |
| 2.13 | Nominal supply voltage | | | |
| 2.13.1 | Controls and alarm (signalling) circuits | V d.c. | 110 | |
| 2.13.2 | Motors | V d.c. | 110 | |
| 2.13.3 | Heaters | V a.c. / Hz | 230 / 50 | |
| 2.14 | Opening time | s | Insert | |
| 2.15 | Closing time | s | Insert | |
| 2.16 | Mechanical endurance | Class | M2 | |
| 3. | Disconnector - Design and Construction | | | 1 |
| 3.1 | Disconnector | | | |
| 3.1.1 | Insulator material | | Porcelain, brown | |
| 3.1.2 | Minimum creepage distance | mm/ kV | Min. ≥ 25 mm/ kV | |
| 3.1.3 | Quality of insulator | | Min. C130 | |



| | | Minim | um Requirements | | |
|---------|---|----------|-----------------|------------|--|
| No. | Description | Unit | Data | Guaranteed | |
| 3.1.4 | Rated failing load of insulator (C10) | Ν | Min. 10000 | | |
| 3.1.5 | HV terminals | | | | |
| 3.1.5.1 | Shape | | Flat | | |
| 3.1.5.2 | Dimensions | mm x mm | Min 100 x 100 | | |
| 3.1.5.3 | Number of holes | | Min 4 | | |
| 3.1.5.4 | Dimensions of holes | mm | Ø 14 | | |
| 3.1.5.5 | Distance between holes | mm | 50 | | |
| 3.1.5.6 | Material suitable for | | Al terminal | | |
| 3.2 | Operating mechanism | | | | |
| 3.2.1 | Number of operating mechanism | pcs. | 1 | | |
| 3.2.2 | Туре | | Insert | | |
| 3.2.3 | Rated power of motor | W | Insert | | |
| 3.2.4 | Total heater power | W | Insert | | |
| 3.2.5 | Minimum number of available contacts (NO/NC/V) | | 12NO+12NC | | |
| 3.2.9 | Motor - auxiliary supply voltage | V, DC | 110 | | |
| 3.2.10 | Heater, 230 V, 50 Hz | | Yes | | |
| 3.2.11 | Water-tight corrosion-resistant housing | | IP54 | | |
| 3.2.12 | Selection switch (local/neutral/remote) | | Yes | | |
| 3.2.13 | Manual closing button | | Yes | | |
| 3.2.14 | Manual opening button | | Yes | | |
| 3.2.15 | Anti-condensation heater inside the operating mechanism cabinet | | Yes | | |
| 3.2.16 | Single-phase socket | | Yes | | |
| 3.2.17 | Voltage presence controller | | Yes | | |
| 3.2.18 | Motor MCB (miniature circuit breakers) | | Yes | | |
| 3.2.19 | Heater MCB (miniature circuit breaker) | | Yes | | |
| 3.2.20 | Single-phase socket MCB (miniature circuit breaker) | | Yes | | |
| 3.2.21 | Equipotential bonding rails | | Yes | | |
| 3.2.22 | Housing of AI or stainless steel | | Yes | | |
| | Overall compliance with the requirements | (yes/no) | | | |



5.2.1.12 B2.5: Disconnector 132 kV, 2000 A

| Na | Description | Minim | num Requirements | |
|--------|---|--------------------|--|------------|
| No. | Description | Unit | Data | Guaranteed |
| 1. | Disconnector- General | | | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 62271-102 IEC 60273 IEC 60694 IEC 60815 | |
| 1.6 | Quality control | | ISO 9001 ISO 14001 ISO 18001 | |
| 1.7 | Type of disconnector | | Outdoor | |
| 1.8 | Design | | Centre break | |
| 1.9 | Number of poles | pcs. | 3 | |
| 1.10 | Type of main blade operating mechanism | | Motor driven | |
| 1.11 | Number of main blade operating mechanisms | pcs. | 1 | |
| 1.12 | Type of earthing blade operating mechanism | | Not applicable | |
| 1.13 | Number of earthing blade operating mechanism | | Not applicable | |
| 2. | Disconnector - Characteristics | | | 1 |
| 2.1 | Nominal system voltage | kV _{rms} | 132 | |
| 2.2 | Highest voltage for equipment Un | kV _{rms} | 145 | |
| 2.3 | Rated lightning impulse withstand voltage | kV _{peak} | 650 | |
| 2.4 | Rated short duration power frequency voltage | kV | 275 | |
| 2.5 | Rated frequency fr | Hz | 50 | |
| 2.7 | Rated current Ir | А | ≥ 2000 | |
| 2.8 | Rated short withstand current Ik | kA _{rms} | ≥ 40 | |
| 2.9 | Rated duration of short-circuit on main blades | s | 3 | |
| 2.10 | Rated duration of short-circuit on earthing blades | s | Not applicable | |
| 2.11 | Rated maximum withstand current lp | kA | ≥ 100 | |
| 2.12 | Capacity of making and breaking transfer load of busbar system at 300 V (rms) | А | 1600 | |
| 2.13 | Nominal supply voltage | | | |
| 2.13.1 | Controls and alarm (signalling) circuits | V d.c. | 110 | |
| 2.13.2 | Motors | V d.c. | 110 | |
| 2.13.3 | Heaters | V a.c. / Hz | 230 / 50 | |
| 2.14 | Opening time | s | Insert | |
| 2.15 | Closing time | s | Insert | |
| 2.16 | Mechanical endurance | Class | M2 | |
| 3. | Disconnector - Design and Construction | , | | 1 |
| 3.1 | Disconnector | | | |
| 3.1.1 | Insulator material | | Porcelain, brown | |
| 3.1.2 | Minimum creepage distance | mm/ kV | Min. ≥ 25 mm/ kV | |
| 3.1.3 | Quality of insulator | | Min. C130 | |



| | | Minim | um Requirements | |
|---------|---|---------|-----------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 3.1.4 | Rated failing load of insulator (C10) | N | Min. 10000 | |
| 3.1.5 | HV terminals | | | |
| 3.1.5.1 | Shape | | Flat | |
| 3.1.5.2 | Dimensions | mm x mm | Min 100 x 100 | |
| 3.1.5.3 | Number of holes | | Min 4 | |
| 3.1.5.4 | Dimensions of holes | mm | Ø 14 | |
| 3.1.5.5 | Distance between holes | mm | 50 | |
| 3.1.5.6 | Material suitable for | | Al terminal | |
| 3.2 | Operating mechanism | | | |
| 3.2.1 | Number of operating mechanism | pcs. | 1 | |
| 3.2.2 | Туре | | Insert | |
| 3.2.3 | Rated power of motor | W | Insert | |
| 3.2.4 | Total heater power | W | Insert | |
| 3.2.5 | Minimum number of available contacts | | 12NO+12NC | |
| | (NO/NC/V) | | | |
| 3.2.9 | Motor - auxiliary supply voltage | V, DC | 110 | |
| 3.2.10 | Heater, 230 V, 50 Hz | | Yes | |
| 3.2.11 | Water-tight corrosion-resistant housing | | IP54 | |
| 3.2.12 | Selection switch (local/neutral/remote) | | Yes | |
| 3.2.13 | Manual closing button | | Yes | |
| 3.2.14 | Manual opening button | | Yes | |
| 3.2.15 | Anti-condensation heater inside the operating mechanism cabinet | | Yes | |
| 3.2.16 | Single-phase socket | | Yes | |
| 3.2.17 | Voltage presence controller | | Yes | |
| 3.2.18 | Motor MCB (miniature circuit breakers) | | Yes | |
| 3.2.19 | Heater MCB (miniature circuit breaker) | | Yes | |
| 3.2.20 | Single-phase socket MCB (miniature circuit breaker) | | Yes | |
| 3.2.21 | Equipotential bonding rails | | Yes | |
| | | | | |

Yes

3.2.22

Housing of AI or stainless steel

Overall compliance with the requirements (yes/no)



5.2.1.13 B2.6: Disconnector 132 kV, 1250 A

| Ne | Description | Minim | um Requirements | Guarantaad |
|--------|---|--------------------|--|------------|
| No. | Description | Unit | Data | Guaranteed |
| 1. | Disconnector- General | | | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 62271-102 IEC 60273 IEC 60694 IEC 60815 | |
| 1.6 | Quality control | | ISO 9001 ISO 14001 ISO 18001 | |
| 1.7 | Type of disconnector | | Outdoor | |
| 1.8 | Design | | Centre break | |
| 1.9 | Number of poles | pcs. | 3 | |
| 1.10 | Type of main blade operating mechanism | | Motor driven | |
| 1.11 | Number of main blade operating mechanisms | pcs. | 1 | |
| 1.12 | Type of earthing blade operating mechanism | | Not applicable | |
| 1.13 | Number of earthing blade operating mechanism | | Not applicable | |
| 2. | Disconnector - Characteristics | | | |
| 2.1 | Nominal system voltage | kV _{rms} | 132 | |
| 2.2 | Highest voltage for equipment Un | kV _{rms} | 145 | |
| 2.3 | Rated lightning impulse withstand voltage | kV _{peak} | 650 | |
| 2.4 | Rated short duration power frequency voltage | kV | 275 | |
| 2.5 | Rated frequency f _r | Hz | 50 | |
| 2.7 | Rated current Ir | А | ≥ 1250 | |
| 2.8 | Rated short withstand current Ik | kA _{rms} | ≥ 40 | |
| 2.9 | Rated duration of short-circuit on main blades | S | 3 | |
| 2.10 | Rated duration of short-circuit on earthing blades | S | Not applicable | |
| 2.11 | Rated maximum withstand current lp | kA | ≥ 100 | |
| 2.12 | Capacity of making and breaking transfer load of busbar system at 300 V (rms) | А | 1600 | |
| 2.13 | Nominal supply voltage | | | |
| 2.13.1 | Controls and alarm (signalling) circuits | V d.c. | 110 | |
| 2.13.2 | Motors | V d.c. | 110 | |
| 2.13.3 | Heaters | V a.c. / Hz | 230 / 50 | |
| 2.14 | Opening time | s | Insert | |
| 2.15 | Closing time | S | Insert | |
| 2.16 | Mechanical endurance | Class | M2 | |
| 3. | Disconnector - Design and Construction | | | 1 |
| 3.1 | Disconnector | | | |
| 3.1.1 | Insulator material | | Porcelain, brown | |
| 3.1.2 | Minimum creepage distance | mm/ kV | Min. ≥ 25 mm/ kV | |
| 3.1.3 | Quality of insulator | | Min. C130 | |



| Na | N N | | m Requirements | |
|---------|---|------------|----------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 3.1.4 | Rated failing load of insulator (C10) | Ν | Min. 10000 | |
| 3.1.5 | HV terminals | | | |
| 3.1.5.1 | Shape | | Flat | |
| 3.1.5.2 | Dimensions | mm x mm | Min 100 x 100 | |
| 3.1.5.3 | Number of holes | | Min 4 | |
| 3.1.5.4 | Dimensions of holes | mm | Ø 14 | |
| 3.1.5.5 | Distance between holes | mm | 50 | |
| 3.1.5.6 | Material suitable for | | AI terminal | |
| 3.2 | Operating mechanism | | | |
| 3.2.1 | Number of operating mechanism | pcs. | 1 | |
| 3.2.2 | Туре | | Insert | |
| 3.2.3 | Rated power of motor | W | Insert | |
| 3.2.4 | Total heater power | W | Insert | |
| 3.2.5 | Minimum number of available contacts | | 12NO+12NC | |
| 3.2.3 | (NO/NC/V) | | 12INO+12INC | |
| 3.2.9 | Motor - auxiliary supply voltage | V, DC | 110 | |
| 3.2.10 | Heater, 230 V, 50 Hz | | Yes | |
| 3.2.11 | Water-tight corrosion-resistant housing | | IP54 | |
| 3.2.12 | Selection switch (local/neutral/remote) | | Yes | |
| 3.2.13 | Manual closing button | | Yes | |
| 3.2.14 | Manual opening button | | Yes | |
| 3.2.15 | Anti-condensation heater inside the operating mechanism cabinet | | Yes | |
| 3.2.16 | Single-phase socket | | Yes | |
| 3.2.17 | Voltage presence controller | | Yes | |
| 3.2.18 | Motor MCB (miniature circuit breakers) | | Yes | |
| 3.2.19 | Heater MCB (miniature circuit breaker) | | Yes | |
| 3.2.20 | Single-phase socket MCB (miniature circuit breaker) | | Yes | |
| 3.2.21 | Equipotential bonding rails | | Yes | |
| 3.2.22 | Housing of Al or stainless steel | | Yes | |
| | Overall compliance with the requirement | s (yes/no) | | |



| | Description | Minin | num Requirements | |
|------------------|---|-------------------|---------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 1. | Current Transformers - General | | | |
| 1.1. | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 60044-1 | |
| 1.6 | Quality control | | ISO 9001 | |
| 1.7 | Туре | | Outdoor | |
| 1.8 | Shape / design | | Head type | |
| 1.9 | Sealing | | Hermetically closed | |
| | | | | |
| 2. 2.1 | Current Transformers - Characteristics Nominal system voltage | kV _{rms} | 132 | |
| 2.2 | Highest voltage for equipment U _n | kV rms | 145 | |
| 2.3 | Rated lightning impulse withstand voltage | kV peak | 650 | |
| 2.4 | Rated short duration power frequency voltage | kV | 275 | |
| 2.5 | Rated frequency fr | Hz | 50 | |
| 2.6 | Rated short-time thermal current lth, 1 s | kA | 40 | |
| 2.7 | Rated dynamic current I _{dyn} | kV peak | 100 | |
| 2.1 | Rated continuous thermal current (40°C): | kv pouk | 100 | |
| | I core | % In | 200 | |
| | Il core | % In | 200 | |
| 2.8 | III core | % In | 120 | |
| | IV core | % In | 120 | |
| | V core | % In | 120 | |
| | Rated transformer ratio: | | | |
| | I core | A/A | 4000-2000/1 | |
| | Il core | A/A | 4000-2000/1 | |
| 2.9 | III core | A/A | 4000-2000/1 | |
| | IV core | A/A | 4000-2000/1 | |
| | V core | A/A | 4000-2000/1 | |
| | Accuracy class: | | | |
| | I core | | 0.2 | |
| 2 4 0 | • Il core | | 0.2 | |
| 2.10 | • III core | | 5P20 | |
| | IV core | | 5P20 | |
| | V core | | 5P20 | |
| | Security factor: | | | |
| 2.11 | I core | | Fs=10 | |
| | Il core | | Fs=10 | |

5.2.1.14 B3.1: Current Transformer 132 kV, 3200-1600-800/1 A/A



| | | Minin | um Requirements | | |
|--------|--|---------|------------------|------------|--|
| No. | Description | Unit | Data | Guaranteed | |
| | Rated power: | | | | |
| 2.12 | I core | VA | 10 | | |
| | Il core | VA | 15 | | |
| | III core | VA | 30 | | |
| | IV core | VA | 30 | | |
| | V core | VA | 30 | | |
| 3. | Current Transformers - Design and Constr | uction | | | |
| 3.1 | Insulator material | | Porcelain, brown | | |
| 3.2 | Insulating medium | | Oil-paper | | |
| 3.3 | Minimum creepage distance | mm/ kV | Min. ≥ 25 mm/ kV | | |
| 3.4 | Max. radio interference voltage at 0.5-2 MHz (acc. to IEC 60694) | μV | Max. 2500 | | |
| | Permissible level of partial discharges: | | | | |
| 3.5 | Test voltage 1.2*U_M/√3 | рС | Max. ≤ 5 | | |
| | Test voltage U_M | рС | ≤ 10 | | |
| 3.7 | Min. LV enclosure protection | | IP54 | | |
| 3.8 | HV terminals | | | | |
| 3.8.1 | Shape | | Flat | | |
| 3.8.2 | Position | | Horizontal | | |
| 3.8.3 | Dimensions | mm x mm | Min 100 x 100 | | |
| 3.8.4 | Number of holes | | Min 4 | | |
| 3.8.5 | Dimensions of holes | mm | Ø 14 | | |
| 3.8.6 | Distance between holes | mm | 50 | | |
| 3.8.7 | Material suitable for | | Al terminal | | |
| 3.10 | tgδ test terminal | | Yes | | |
| 3.11 | Oil drain cock and sampling device | | Yes | | |
| 3.13 | Secondary reconnection | | Yes | | |
| 3.14 | Outdoor metal part made of aluminium or stain- less steel | | Yes | | |
| 3.15 | Mass and dimensions | | | | |
| 3.15.1 | Total mass | kg | Insert | | |
| 3.15.2 | Height | mm | Insert | | |
| | Overall compliance with the requirements (yes/no) | | | | |



| | Description | Minin | num Requirements | |
|------|--|-----------------------|----------------------|------------|
| No. | | Unit | Data | Guaranteed |
| 1. | Current Transformers - General | | | |
| 1.1. | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 60044-1 | |
| 1.6 | Quality control | | ISO 9001 | |
| 1.7 | Туре | | Outdoor | |
| 1.8 | Shape / design | | Head type | |
| 1.9 | Sealing | | Hermetically closed | |
| 1.0 | | | Thermetically closed | |
| 2. | Current Transformers - Characteristics | | | I |
| 2.1 | Nominal system voltage | kV _{rms} | 132 | |
| 2.2 | Highest voltage for equipment Un | kV _{rms} | 145 | |
| 2.3 | Rated lightning impulse withstand voltage | kV _{peak} | 650 | |
| 2.4 | Rated short duration power frequency voltage | kV | 275 | |
| 2.5 | Rated frequency fr | Hz | 50 | |
| 2.6 | Rated short-time thermal current lth, 1 s | kA | 40 | |
| 2.7 | Rated dynamic current I _{dyn} | kV peak | 100 | |
| | Rated continuous thermal current (40°C): | | | |
| | I core | % In | 200 | |
| 0.0 | Il core | % In | 200 | |
| 2.8 | III core | % In | 120 | |
| | IV core | % In | 120 | |
| | V core | % In | 120 | |
| | Rated transformer ratio: | | | |
| | I core | A/A | 2000-1000/1 | |
| 2.9 | • Il core | A/A | 2000-1000/1 | |
| 2.9 | III core | A/A | 2000-1000/1 | |
| | IV core | A/A | 2000-1000/1 | |
| | V core | A/A | 2000-1000/1 | |
| | Accuracy class: | | | |
| | I core | | 0.2 | |
| 2.10 | Il core | | 0.2 | |
| 2.10 | III core | | 5P20 | |
| | IV core | | 5P20 | |
| | V core | | 5P20 | |
| | Security factor: | | | |
| 2.11 | I core | | Fs=10 | |
| | Il core | | Fs=10 | |

5.2.1.15 B3.2: Current Transformer 132 kV, 1600-800-400/1 A/A



| | | Minin | num Requirements | |
|--------|---|----------|------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| | Rated power: | | | |
| | I core | VA | 10 | |
| 2.12 | Il core | VA | 15 | |
| | III core | VA | 30 | |
| | IV core | VA | 30 | |
| | V core | VA | 30 | |
| 3. | Current Transformers - Design and Constr | uction | | |
| 3.1 | Insulator material | | Porcelain, brown | |
| 3.2 | Insulating medium | | Oil-paper | |
| 3.3 | Minimum creepage distance | mm/ kV | Min. ≥ 25 mm/ kV | |
| 3.4 | Max. radio interference voltage at 0.5-2 MHz (acc. IEC 60694) | μV | Max. 2500 | |
| | Permissible level of partial discharges: | | | |
| 3.5 | Test voltage 1.2*U_M/√3 | рС | Max. ≤ 5 | |
| | Test voltage U _M | рС | ≤ 10 | |
| 3.7 | Min. LV enclosure protection | | IP54 | |
| 3.8 | HV terminals | | | |
| 3.8.1 | Shape | | Flat | |
| 3.8.2 | Position | | Horizontal | |
| 3.8.3 | Dimensions | mm x mm | Min 100 x 100 | |
| 3.8.4 | Number of holes | | Min 4 | |
| 3.8.5 | Dimensions of holes | mm | Ø 14 | |
| 3.8.6 | Distance between holes | mm | 50 | |
| 3.8.7 | Material suitable for | | Al terminal | |
| 3.10 | tgδ test terminal | | Yes | |
| 3.11 | Oil drain cock and sampling device | | Yes | |
| 3.13 | Secondary reconnection | | Yes | |
| 3.14 | Outdoor metal part made of aluminium or stain- less steel | | Yes | |
| 3.15 | Mass and dimensions | | | |
| 3.15.1 | Total mass | kg | Insert | |
| 3.15.2 | Height | mm | Insert | |
| | Overall compliance with the requirements | (yes/no) | | |



5.2.1.16 B4: Voltage Transformer 132 kV

| | | Mini | Minimum Requirements | |
|-------|---|-------------------|-----------------------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 1. | Voltage Transformers - General | | | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Туре | | Capacitive | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| | | | IEC 60044-2 | |
| 1.5 | Standards | | IEC 60273 | |
| 110 | | | IEC 60694 | |
| | | | IEC 60815 | |
| 1.6 | Quality control | | ISO 9001 | |
| 1.7 | Туре | | Outdoor | |
| 1.8 | Shape | | Insert | |
| 1.9 | Sealing | | Hermetically closed | |
| 2. | Voltage Transformers - Characteristics | | | |
| 2.1 | Nominal system voltage | kV _{rms} | 132 | |
| 2.2 | Highest voltage for equipment Un | kV _{rms} | 145 | |
| 2.3 | Rated lightning impulse withstand voltage | kV peak | 650 | |
| 2.4 | Rated short duration power frequency voltage | kV | 275 | |
| 2.5 | Rated frequency f _r | Hz | 50 | |
| 2.8 | Rated primary voltage | kV | 132/√3 | |
| | Rated secondary voltage | | | |
| 2.9 | I winding | V | 110√3 | |
| | II winding | V | 110√3 | |
| | Accuracy class: | | | |
| 2.10 | I winding | | 0.2 | |
| | Il winding | | 1/3P | |
| | Rated power: | | | |
| 2.11 | I winding | VA | 25 | |
| | Il winding | VA | 75 | |
| 2.12 | Load | | Simultaneously | |
| 3. | Voltage Transformers - Design and Const | ruction | | |
| 3.1 | Insulator material | | Porcelain, brown | |
| 3.2 | Insulating medium | | Oil-paper - Mixed dielec- tric | |
| 3.3 | Minimum creepage distance | mm/ kV | Min. ≥ 25 mm/ kV | |
| 3.4 | Max. radio interference voltage at 0.5-2 MHz (acc. IEC 60694) | μV | Max. 2500 | |
| 3.5 | Permissible level of partial discharges: Test voltage 1.2*U_M/√3 Test voltage U_M | pC pC | Max. ≤ 5 ≤ 10 | |
| 3.7 | Min. LV enclosure protection | | IP54 | |
| 3.8 | HV terminals | | | |
| 3.8.1 | Shape | | Flat | |
| 3.8.2 | Position | | Vertical or horizontal | |



| N | Description | Mini | mum Requirements | 0 |
|--------|---|---------|------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 3.8.3 | Dimensions | mm x mm | Min 100 x 100 | |
| 3.8.4 | Number of holes | | Min 4 | |
| 3.8.5 | Dimensions of holes | mm | Ø 14 | |
| 3.8.6 | Distance between holes | mm | 50 | |
| 3.8.7 | Material suitable for | | Al terminal | |
| 3.10 | Oil drain cock and sampling device | | Yes | |
| 3.11 | Enable sealing after accuracy class checks (seal- ing possibilities) | | Yes | |
| 3.13 | Outdoor metal part made of aluminium or stain- less steel | | Yes | |
| 3.14 | Mass and dimensions | | | |
| 3.14.1 | Total mass | kg | Insert | |
| 3.14.2 | Height | mm | Insert | |
| | Overall compliance with the requirements (yes/no) | | | |

5.2.1.17 B5: Surge Arrester 132 kV

| N | Description | Minir | num Requirements | Our sector of | | |
|------|---|--------------------|----------------------------------|---------------|--|--|
| No. | Description | Unit | Data | Guaranteed | | |
| 1. | Surge Arresters - General | | | | | |
| 1.1 | Manufacturer | | Insert | | | |
| 1.2 | Туре | | Insert | | | |
| 1.3 | Model designation | | Insert | | | |
| 1.4 | Country of origin | | Insert | | | |
| 1.5 | Standards | | IEC 60099-4 | | | |
| 1.6 | Quality control | | ISO 9001 | | | |
| 1.7 | Design | | Metal oxide, gapless, outdoor | | | |
| 1.8 | Short circuit testing authority | | Insert authority | | | |
| 2. | Surge Arresters - Characteristics | | | | | |
| 2.1 | Nominal system voltage | kV _{rms} | 132 | | | |
| 2.2 | Highest voltage for equipment Un | kV _{rms} | 145 | | | |
| 2.4 | Rated voltage of surge arrester U _r | kV _{rms} | 120 | | | |
| 2.5 | Max. continuous operating voltage Uc | kV _{rms} | 96 | | | |
| 2.8 | Rated frequency | Hz | 50 | | | |
| 2.9 | Nominal discharge current In (8/20 µs) | kA _{peak} | 10 | | | |
| 2.10 | High current impulse of an arrester (4/10 µs) | kA _{peak} | 100 | | | |
| 3. | Surge Arresters - Design and Constructi | ion | | | | |
| 3.1 | Line discharge class | Class | 3 | | | |
| 3.2 | Energy dissipation capacity (per kV of rated voltage) | kJ/ kV | ≥6.5 | | | |
| 3.3 | Long duration current impulse (2000 µs) | А | ≥ 850 | | | |
| 3.4 | Maximum residual voltage Ures | | | | | |





| | | Minim | num Requirements | |
|--------|--|--------------------|-------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 3.4.1 | For switching impulse current 30/60 µs at 0,5 kA | kV _{peak} | ≤ 235 | |
| 3.4.2 | For switching impulse current 30/60 µs at 1 kA | kV _{peak} | ≤ 240 | |
| 3.4.3 | For switching impulse current 30/60 µs at 2 kA | kV _{peak} | ≤ 255 | |
| 3.4.4 | For lightning impulse current 8/20 µs at 5 kA | kV _{peak} | ≤ 280 | |
| 3.4.5 | For lightning impulse current 8/20 µs at 10 kA | kV _{peak} | ≤ 300 | |
| 3.4.6 | For lightning impulse current 8/20 µs at 20 kA | kV _{peak} | ≤ 320 | |
| 3.5. | Dielectric endurance of arrester housing) | | | |
| 3.5.1 | Lightning impulse withstand voltage of arrester housing up (1.2/50 µs) | kV | ≥ 550 | |
| 3.5.2 | Power frequency withstand voltage of arrester housing (1 min wet) | kV | ≥ 250 | |
| 3.6. | Mechanical requirements | | | |
| 3.6.1 | Specified short-term load SSL (F _{dyn}) | N | ≥ 3750 | |
| 3.6.2 | Specified long-term load SSL (F _{stat}) | Ν | ≥ 2500 | |
| 3.7 | Minimum creepage distance | mm/ kV | ≥ 25 mm/ kV | |
| 3.8. | Housing insulating material | | Composite/Silicon | |
| 3.9 | Insulating basement | | Yes | |
| 3.10 | Surge arrester height | mm | Insert | |
| 3.11 | Surge arrester weight | kg | Insert | |
| 3.12 | Voltage distribution ring present / ring diame- ter | yes / no / mm | Insert | |
| 3.14 | HV terminal | | | |
| 3.14.1 | Shape | | Flat | |
| 3.14.2 | Dimension | mm x mm | Min 100 x 100 | |
| 3.14.3 | Number of holes | | Min 4 | |
| 3.14.4 | Distance between holes | mm x mm | 50 x 50 | |
| 3.14.5 | Material suitable for | | Al terminal | |
| | Overall compliance with the requirement | s (yes/no) | | |

5.2.1.18 B6: Post Insulator 132 kV

| Na | Description | Minim | Our service of | |
|------|---|--------------------|--|------------|
| No. | | Unit | Data | Guaranteed |
| 1. | Post Insulators - General | | | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 60168 IEC 60273 IEC 60672 IEC 60694 | |
| 1.6 | Quality control | | ISO 9001 | |
| 1.7 | Design | | Solid core, porcelain, outdoor | |
| 2. | Post Insulators - Characteristics | | | |
| 2.1 | Nominal system voltage | kV _{rms} | 132 | |
| 2.2 | Highest voltage for equipment Un | kV _{rms} | 145 | |
| 2.3 | Rated lightning impulse withstand voltage | kV _{peak} | 650 | |
| 2.4 | Rated short duration power frequency voltage | kV | 275 | |
| 2.5 | Rated frequency fr | Hz | 50 | |
| 2.6 | Minimum creepage distance | mm/ kV | Min. ≥ 25 mm/ kV | |
| 2.7 | Failing load bending (p0) (C10) | Ν | ≥ 10000 | |
| 2.8 | Failing load torsion | Nm | ≥ 4000 | |
| 3. | Post Insulators - Design and Construction | n | | |
| 3.1 | Insulation material | | Porcelain, brown | |
| 3.2 | Material quality acc. IEC 60672 | | Min. C130 | |
| 3.3 | Insulator height | mm | Insert | |
| 3.4 | Max. diameter of insulating part | mm | Insert | |
| 3.5 | Diameter of upper base | mm | Insert | |
| 3.6 | Number of holes on upper base | | Insert | |
| 3.7 | Diameter distance between holes on upper base | mm | Insert | |
| 3.8 | Hole type on upper base | | Insert | |
| 3.9 | Diameter on lower base | mm | Insert | |
| 3.10 | Number of holes on lower base | | Insert | |
| 3.11 | Diameter distance between holes on lower base | mm | Insert | |
| 3.12 | Hole type on lower base | | Insert | |
| 3.13 | Insulator weight | kg | Insert | |
| | Overall compliance with the requirements | s (yes/no) | | |



5.2.2 C: Switchgear 33 kV

5.2.2.1 C1: Circuit Breaker 33 kV

| No. | Description | Minimum Requirements | | Oursenteed |
|------|---|----------------------|--|------------|
| | | Unit | Data | Guaranteed |
| 1. | Circuit Breaker - General | | | |
| 1.1. | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 62271-100 IEC 60273 IEC 60694 IEC 60815 ISO 9001 | |
| 1.6 | Quality control | | ISO 14001 ISO 18001 | |
| 1.7 | Isolating and quenching medium | | Vacuum | |
| 1.8 | Type of circuit breaker | | Outdoor | |
| 1.9 | Design | | Single breaking | |
| 1.10 | Operating mechanism | | Motor-wound spring | |
| 1.11 | Number of poles | pcs. | 3 | |
| 1.12 | Number of operating mechanisms per circuit breaker | pcs. | 1 | |
| 2. | Circuit Breaker - Characteristics | | | |
| 2.1 | Nominal system voltage | kV _{rms} | 33 | |
| 2.2 | Highest voltage for equipment Un | kV _{rms} | 36 | |
| 2.3 | Rated lightning impulse withstand voltage | kV peak | 170 | |
| 2.4 | Rated short duration power frequency voltage | kV | 70 | |
| 2.5 | Rated frequency fr | Hz | 50 | |
| 2.6 | Rated current Ir | А | ≥ 2000 | |
| 2.7 | Rated short-circuit breaking current Isc | kA _{rms} | ≥ 25 | |
| 2.8 | Rated peak withstand current I _p (equal short- circuit making current) | kA | ≥ 63 | |
| 2.9 | D.C. component of the rated short-circuit break- ing current | % | > 30 | |
| 2.10 | First-pole-to-clear factor Terminal fault Short-line fault Out-of-phase | p.u. p.u. p.u. | 1.3 N.A. N.A. | |
| 2.11 | Standard value of transient recovery voltage (T100) | kV | Insert | |
| 2.12 | Rate of rise recovery voltage | kV/µs | Insert | |
| 2.13 | Rated operating sequence | | O-0.3 s-CO-3 min-CO | |
| 2.14 | Duration of short-circuit | s | ≥ 1 | |
| 2.15 | Rated out-of-phase breaking current | kA | Insert | |
| 2.16 | Auto reclosing | | Зр | |



| No. | Description | Minimum Requirements | | Guaranteed |
|---------|---|----------------------|--------------|------------|
| INO. | Description | Unit | Data | Guaranteeu |
| | Maximum total break time (trip initiation to final | | | |
| 2.17 | arc extinction) pos.3.7.135 acc. to IEC 62271- | ms | ≤ 100 | |
| | 100) | | | |
| 2.18 | Time of final arc extinction (3.7134 acc. IEC | ms | 20 ± 5 | |
| | 62271-100) | | | |
| | Opening time (trip initiation to contact separa- | | | |
| 2.19 | tion) | ms | Insert | |
| | Without current | ms | Insert | |
| | With 100 % rated breaking current | | | |
| 2.20 | Maximum time interval between opening inter- | ms | Insert | |
| | rupters Maximum time interval between opening of first | | | |
| 2.21 | and last phase of three-phase circuit breakers | ms | 3 | |
| | Time for making (trip initiation to contact touch) | | | |
| 2.22 | Without current | ms | Insert | |
| | 100 % making current | ms | Insert | |
| 2.23 | Minimum dead time | ms | Insert | |
| | Restrike performance during capacitive current | | | |
| 2.24 | switching | Class | C2 | |
| | Number of operations without maintenance | | | |
| 2.25 | CO at no-load | | ≥ 10000 | |
| 2.25 | CO at rated current | | ≥ 2500 | |
| | CO at rated breaking current lsc | | ≥ 5 | |
| 2.26 | The frequency of mechanical operations | Class | Min M1 | |
| 2.27 | Rated electrical endurance | Class | Min E1 | |
| 2.28 | Rated pressure of a circuit breaker | Мра | Insert | |
| 2.29 | Total mass of SF ₆ gas in a circuit breaker | kg | Insert | |
| 2.30 | Rated mechanical terminal loads | | | |
| 2.30.1 | Static horizontal force, longitudinal F _{thA} | N | Insert | |
| 2.30.2 | Static horizontal force, transversal F _{thB} | N | Insert | |
| 2.30.3 | Static vertical force F _{tv} | N | Insert | |
| 2.30.4 | Dynamic horizontal force, longitudinal F _{wx} | N | Insert | |
| 2.30.5 | Dynamic horizontal force, transversal | N | Insert | |
| 3. | Circuit Breaker - Design and Construction | 1 | | |
| 3.1 | Circuit Breaker | | | |
| 3.1.1 | Insulator material | | Porcelain | |
| 3.1.2 | Minimum creepage distance | mm/ kV | Min. ≥ 25 | |
| 3.1.3 | HV terminal | pcs. | 2 | |
| 3.1.3.1 | Shape | | Flat | |
| 3.1.3.2 | Dimensions | mm x mm | Min 100 x 50 | |
| 3.1.3.3 | Number of holes | | Min 2 | |
| 3.1.3.4 | Dimensions of holes | mm | Ø 14 | |
| 3.1.3.5 | Distance between holes | mm | 50 | |
| 3.1.3.6 | Material suitable for | | Al terminal | |
| 3.1.5 | Weight and dimensions | | | |
| 3.1.5.1 | Support insulator height | mm | Insert | |
| 3.1.5.2 | Total height | mm | Insert | |



| | | Minir | num Requirements | 0 |
|---------|---|----------|-----------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 3.1.5.3 | Pole weight | kg | Insert | |
| 3.1.5.4 | Weight of operating mechanism | kg | Insert | |
| 3.1.5.5 | Total weight (with metal structure) | kg | Insert | |
| 3.1.6 | Minimum distance | | | |
| 3.1.6.1 | Between poles | mm | Insert | |
| 3.1.6.2 | To ground | mm | Insert | |
| 3.2 | Operating mechanism | | | |
| 3.2.1 | Туре | | Insert | |
| 3.2.2 | Motor - auxiliary supply voltage | V. DC | 110 | |
| 3.2.3 | Rated power of motor | W | Insert | |
| 3.2.4 | Control voltage | V. DC | 110 | |
| 3.2.5 | Number of making coils | pcs. | 1 | |
| 3.2.6 | Rated power of making coils | W | Insert | |
| 3.2.7 | Number of breaking coils | pcs. | 1 | |
| 3.2.8 | Rated power of breaking coils | W | Insert | |
| 3.2.9 | Heater | | Yes | |
| 3.2.10 | Heater supply voltage | V. Hz | 230. 50 | |
| 3.2.11 | Total heater power | W | Insert | |
| 3.2.12 | Minimum number of available contacts (NO/NC/V) | | 6NO+6NC+1V | |
| 3.2.15 | Water-tight corrosion-resistant housing | | IP54 | |
| 3.2.17 | | | Al or stainless steel | |
| 3.2.19 | | | Yes | |
| 3.4 | Local operation push buttons | | | |
| 3.4.1 | Anti-pumping relay | | Yes | |
| 3.4.2 | Operation counter | | Yes | |
| 3.4.3 | Motor MCB (miniature circuit breakers) | | Yes | |
| 3.4.4 | Heater - 230 V, 50 HZ | | Yes | |
| 3.4.5 | Cu earthing rails inside central control cabinet | | Yes | |
| 3.4.6 | Detachable plates, the bottom of central control cabinet | | Yes | |
| 3.4.7 | Galvanized horizontal and vertical metal struc- ture with minimum 70 µm zinc layer | | Yes | |
| | Overall compliance with the requirements | (yes/no) | | |



5.2.2.2 C2.1: Disconnector 33 kV

| | Description | Minim | um Requirements | Guarantaad |
|--------|--|--------------------|--|------------|
| No. | | Unit | Data | Guaranteed |
| 1. | Disconnector- General | | | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 62271-102 IEC 60273 IEC 60694 IEC 60815 | |
| 1.6 | Quality control | | ISO 9001 ISO 14001 ISO 18001 | |
| 1.7 | Type of disconnector | | Outdoor | |
| 1.8 | Design | | Vertical break, horizontal or wall mounting | |
| 1.9 | Number of poles | pcs. | 3 | |
| 1.10 | Type of operating mechanism | | Hand operated | |
| 1.11 | Number of operating mechanisms | pcs. | 1 | |
| 2. | Disconnector - Characteristics | | | |
| 2.1 | Nominal system voltage | kV _{rms} | 33 | |
| 2.2 | Highest voltage for equipment Un | kV _{rms} | 36 | |
| 2.3 | Rated lightning impulse withstand voltage | kV _{peak} | 170 | |
| 2.4 | Rated short duration power frequency voltage | kV | 70 | |
| 2.5 | Rated frequency fr | Hz | 50 | |
| 2.7 | Rated current Ir | А | ≥ 2000 | |
| 2.8 | Rated short withstand current Ik | kA _{rms} | ≥ 25 | |
| 2.9 | Rated duration of short-circuit | S | 3 | |
| 2.10 | Rated maximum withstand current lp | kA | ≥ 63 | |
| 2.13 | Nominal supply voltage | | | |
| 2.13.1 | Controls and alarm (signalling) circuits | V d.c. | 110 | |
| 2.13.2 | Heaters | V a.c. / Hz | 230 / 50 | |
| 2.14 | Opening time | S | Insert | |
| 2.15 | Closing time | S | Insert | |
| 2.16 | Mechanical endurance | Class | Min M1 | |
| 2.17 | Rated mechanical terminal loads of terminals | | | |
| 2.17.1 | Direct loading, static Fa | Ν | Insert | |
| 2.17.2 | Transversal loading, static F _b | Ν | Insert | |
| 2.17.3 | Vertical force F _c | Ν | Insert | |
| 2.17.4 | Direct loading, dynamic | Ν | Insert | |
| 2.17.5 | Transversal loading, dynamic | Ν | Insert | |
| 3. | Disconnector - Design and Construction | | | |
| 3.1 | Disconnector | | | |
| 3.1.1 | Insulator material | | Porcelain, brown | |



| Ne | Description | Minim | um Requirements | O |
|---------|---|---------|------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 3.1.2 | Minimum creepage distance | mm/ kV | Min. ≥ 25 mm/ kV | |
| 3.1.3 | HV terminals | | | |
| 3.1.3.1 | Shape | | Flat | |
| 3.1.3.2 | Dimensions | mm x mm | Min 100 x 50 | |
| 3.1.3.3 | Number of holes | | Min 2 | |
| 3.1.3.4 | Dimensions of holes | mm | Ø 14 | |
| 3.1.3.5 | Distance between holes | mm | 50 | |
| 3.1.3.6 | Material suitable for | | Al terminal | |
| 3.1.4 | Weight and dimensions | | | |
| 3.1.4.1 | Pole height | mm | Insert | |
| 3.1.4.2 | Pole length | mm | Insert | |
| 3.1.4.3 | Distance between support axis of a pole | mm | Insert | |
| 3.1.4.4 | Shipping dimensions | mm | Insert | |
| 3.1.4.5 | Pole weight | kg | Insert | |
| 3.1.4.6 | Total weight | kg | Insert | |
| 3.1.4.7 | Shipping weight | kg | Insert | |
| 3.2 | Operating mechanism | | | |
| 3.2.1 | Number of operating mechanism | pcs. | 1 | |
| 3.2.2 | Туре | | Insert | |
| 3.2.3 | Minimum number of available contacts (NO/NC) | pcs. | 6NO+6NC | |
| 3.2.4 | Anti-condensation heater inside the operating mechanism cabinet | | Yes | |
| 3.2.5 | Heater, 230 V, 50 Hz | | Yes | |
| 3.2.6 | Total heater power | W | Insert | |
| 3.2.7 | Water-tight corrosion-resistant housing | | IP54 | |
| 3.2.8 | Housing of AI or stainless steel | | Yes | |
| 3.2.9 | Equipotential bonding rails | | Yes | |
| | Overall compliance with the requirements (yes/no) | | | |



| Na | Description | Minin | num Requirements | Guarantood |
|--------|--|-------------------|--------------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 1. | Disconnector- General | | | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| | | | IEC 62271-102 | |
| | | | IEC 60273 | |
| 1.5 | Standards | | IEC 60694 | |
| | | | IEC 60815 | |
| | | | ISO 9001 | |
| 1.6 | Quality control | | ISO 14001 | |
| | | | ISO 18001 | |
| 1.7 | Type of disconnector | | Outdoor | |
| | | | Vertical break, horizon- | |
| | | | tal or wall mounting, | |
| 1.8 | Design | | with integrated fuse | |
| | | | 10 A | |
| 1.9 | Number of poles | pcs. | 3 | |
| 1.10 | Type of operating mechanism | | Hand operated | |
| 1.11 | Number of operating mechanisms | pcs. | 1 | |
| 2. | Disconnector - Characteristics | | | |
| 2.1 | Nominal system voltage | kV _{rms} | 33 | |
| 2.2 | Highest voltage for equipment Un | kV ms | 36 | |
| 2.3 | Rated lightning impulse withstand voltage | kV mis | 170 | |
| 2.4 | Rated short duration power frequency voltage | kV peak | 70 | |
| 2.5 | Rated frequency f_r | Hz | 50 | |
| 2.7 | Rated current Ir | A | ≥ 100 | |
| 2.8 | Rated short withstand current Ik | kA _{rms} | ≥ 25 | |
| 2.9 | Rated duration of short-circuit | S | 3 | |
| 2.10 | Rated maximum withstand current lp | kA | ≥ 63 | |
| 2.13 | Nominal supply voltage | 101 | _ 00 | |
| 2.13.1 | Controls and alarm (signalling) circuits | V d.c. | 110 | |
| 2.13.2 | Heaters | V a.c. / Hz | 230 / 50 | |
| 2.14 | Opening time | S S | Insert | |
| 2.14 | Closing time | s | Insert | |
| 2.16 | Mechanical endurance | Class | Min M1 | |
| 2.10 | Rated mechanical terminal loads of terminals | 0.000 | | |
| 2.17.1 | Direct loading, static Fa | N | Insert | |
| 2.17.2 | Transversal loading, static F _b | N | Insert | |
| 2.17.2 | Vertical force F _c | N | Insert | |
| 2.17.4 | Direct loading, dynamic | N | Insert | |
| | Encociouding, dynamic | I N | moore | |

5.2.2.3 C2.2: Disconnector 33 kV with Integrated Fuse



| Na | Description | Minin | num Requirements | Cuerenteed |
|---------|---|----------|------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 3. | Disconnector - Design and Construction | | | |
| 3.1 | Disconnector | | | |
| 3.1.1 | Insulator material | | Porcelain, brown | |
| 3.1.2 | Minimum creepage distance | mm/ kV | Min. ≥ 25 mm/ kV | |
| | HV terminals | | | |
| 3.1.3.1 | Shape | | Flat | |
| 3.1.3.2 | Dimensions | mm x mm | Min 100 x 50 | |
| 3.1.3.3 | Number of holes | | Min 2 | |
| 3.1.3.4 | Dimensions of holes | mm | Ø 14 | |
| 3.1.3.5 | Distance between holes | mm | 50 | |
| 3.1.3.6 | Material suitable for | | Al terminal | |
| 3.1.4 | Weight and dimensions | | | |
| 3.1.4.1 | Pole height | mm | Insert | |
| 3.1.4.2 | Pole length | mm | Insert | |
| 3.1.4.3 | Distance between support axis of a pole | mm | Insert | |
| 3.1.4.4 | Shipping dimensions | mm | Insert | |
| 3.1.4.5 | Pole weight | kg | Insert | |
| 3.1.4.6 | Total weight | kg | Insert | |
| 3.1.4.7 | Shipping weight | kg | Insert | |
| 3.2 | Operating mechanism | | | |
| 3.2.1 | Number of operating mechanism | pcs. | 1 | |
| 3.2.2 | Туре | | Insert | |
| 3.2.3 | Minimum number of available contacts (NO/NC) | | 6NO+6NC | |
| 3.2.4 | Anti-condensation heater inside the operating mechanism cabinet | | Yes | |
| 3.2.5 | Heater, 230 V, 50 Hz | | Yes | |
| 3.2.6 | Total heater power | W | Insert | |
| 3.2.7 | Water-tight corrosion-resistant housing | | IP54 | |
| 3.2.8 | Housing of AI or stainless steel | | Yes | |
| 3.2.9 | Equipotential bonding rails | | Yes | |
| 3.3 | Fuse | | | |
| 3.3.1 | Integrated fuse 10 A | | Yes | |
| | Overall compliance with the requirements | (yes/no) | | |



| N | Description | Minin | mum Requirements | |
|------|--|--------------------|-----------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 1. | Current Transformers - General | | | |
| 1.1. | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 60044-1 | |
| 1.6 | Quality control | | ISO 9001 | |
| 1.7 | Туре | | Outdoor, post type | |
| 2. | Current Transformers - Characteristics | | | |
| 2.1 | Nominal system voltage | kV _{rms} | 33 | |
| 2.2 | Highest voltage for equipment Un | kV _{rms} | 36 | |
| 2.3 | Rated lightning impulse withstand voltage | kV _{peak} | 170 | |
| 2.4 | Rated short duration power frequency voltage | kV | 70 | |
| 2.5 | Rated frequency fr | Hz | 50 | |
| 2.6 | Rated short-time thermal current lth, 1 s | kA | 25 | |
| 2.7 | Rated dynamic current I _{dyn} | kV peak | 63 | |
| | Rated continuous thermal current (40°C): | | | |
| | I core | % In | 200 | |
| 2.8 | Il core | % In | 200 | |
| | III core | % In | 120 | |
| | IV core | % In | 120 | |
| | Rated transformer ratio: | | | |
| | I core | A/A | 2000/1 | |
| 2.9 | Il core | A/A | 2000/1 | |
| | • III core | A/A | 2000/1 | |
| | IV core | A/A | 2000/1 | |
| | Accuracy class: | | | |
| | • I core | | 0.2 | |
| 2.10 | • Il core | | 0.2 | |
| | Ill core | | 5P20 | |
| | IV core | | 5P20 | |
| 2.11 | Security factor: • I core | | Fs=10 | |
| 2.11 | Il core | | Fs=10 Fs=10 | |
| | Rated power: | | 13-10 | |
| | I core | VA | 10 | |
| 2.12 | Il core | VA VA | 15 | |
| | Ill core | VA | 30 | |
| | IV core | VA | 30 | |
| 3. | Current Transformers - Design and Const | | | |
| 3.1 | Insulator material | | Porcelain or araldite | |
| 3.2 | Insulating medium | | Oil-paper or araldite | |
| 3.3 | Minimum creepage distance | mm/ kV | Min. ≥ 25 mm/ kV | |
| | Max. radio interference voltage at 0.5-2 MHz | | | |
| 3.4 | (acc. IEC 60694) | μV | Max. 2500 | |

5.2.2.4 C3.1.: Current Transformer 33 kV, 2000/1 A/A



| N - | Description | Minir | num Requirements | Ownerstand |
|-------|---|---------|------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| | Permissible level of partial discharges: | | | |
| 3.5 | Test voltage 1.2*U_M/√3 | рС | Max. ≤ 5 | |
| | Test voltage U_M | рС | ≤ 10 | |
| 3.7 | Min. LV enclosure protection | | IP54 | |
| 3.8 | HV terminals | | | |
| 3.8.1 | Shape | | Flat | |
| 3.8.2 | Position | | Horizontal | |
| 3.8.3 | Dimensions | mm x mm | Min 100 x 50 | |
| 3.8.4 | Number of holes | | Min 2 | |
| 3.8.5 | Dimensions of holes | mm | Ø 14 | |
| 3.8.6 | Distance between holes | mm | 50 | |
| 3.8.7 | Material suitable for | | Al terminal | |
| 3.10 | Mass and dimensions | | | |
| 3.11 | Total mass | kg | Insert | |
| 3.13 | Height | mm | Insert | |
| | Overall compliance with the requirements (yes/no) | | | |

5.2.2.5 C3.2: Current Transformer 33 kV, 10/1 A/A

| Na | Description | Minim | um Requirements | Currenteed |
|------|--|--------------------|--------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 1. | Current Transformers - General | | | |
| 1.1. | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 60044-1 | |
| 1.6 | Quality control | | ISO 9001 | |
| 1.7 | Туре | | Outdoor, post type | |
| 2. | Current Transformers - Characteristics | | | |
| 2.1 | Nominal system voltage | kV _{rms} | 33 | |
| 2.2 | Highest voltage for equipment U _n | kV _{rms} | 36 | |
| 2.3 | Rated lightning impulse withstand voltage | kV _{peak} | 170 | |
| 2.4 | Rated short duration power frequency voltage | kV | 70 | |
| 2.5 | Rated frequency fr | Hz | 50 | |
| 2.6 | Rated short-time thermal current lth, 1 s | kA | 25 | |
| 2.7 | Rated dynamic current I _{dyn} | kV peak | 63 | |
| | Rated continuous thermal current (40°C): | | | |
| | I core | % In | 200 | |
| 2.8 | II core | % In | 200 | |
| | III core | % In | 120 | |
| | IV core | % In | 120 | |



| Na | Description | Minin | num Requirements | Guarantaad | |
|-------|---|---------|-----------------------|------------|--|
| No. | Description | Unit | Data | Guaranteed | |
| | Rated transformer ratio: | | | | |
| 2.9 | I core | A/A | 10/1 | | |
| 2.9 | Il core | A/A | 10/1 | | |
| | III core | A/A | 10/1 | | |
| | Accuracy class: | | | | |
| 2.10 | I core | | 0.2 | | |
| 2.10 | Il core | | 5P20 | | |
| | III core | | 5P20 | | |
| 2.11 | Security factor: | | | | |
| 2.11 | I core | | Fs=10 | | |
| | Rated power: | | | | |
| 2.12 | I core | VA | 15 | | |
| 2.12 | Il core | VA | 30 | | |
| | III core | VA | 30 | | |
| 3. | Current Transformers - Design and Constr | uction | | | |
| 3.1 | Insulator material | | Porcelain or araldite | | |
| 3.2 | Insulating medium | | Oil-paper or araldite | | |
| 3.3 | Minimum creepage distance | mm/ kV | Min. ≥ 25 mm/ kV | | |
| | Max. radio interference voltage at 0.5-2 MHz | | | | |
| 3.4 | (acc. IEC 60694) | μV | Max. 2500 | | |
| | Permissible level of partial discharges: | | | | |
| 3.5 | Test voltage 1.2*U_M/√3 | рС | Max. ≤ 5 | | |
| | Test voltage U_M | рС | ≤ 10 | | |
| 3.7 | Min. LV enclosure protection | | IP54 | | |
| 3.8 | HV terminals | | | | |
| 3.8.1 | Shape | | Flat | | |
| 3.8.2 | Position | | Horizontal | | |
| 3.8.3 | Dimensions | mm x mm | Min 100 x 50 | | |
| 3.8.4 | Number of holes | | Min 2 | | |
| 3.8.5 | Dimensions of holes | mm | Ø 14 | | |
| 3.8.6 | Distance between holes | mm | 50 | | |
| 3.8.7 | Material suitable for | | Al terminal | | |
| 3.10 | Mass and dimensions | | | | |
| 3.11 | Total mass | kg | Insert | | |
| 3.13 | Height | mm | Insert | | |
| | Overall compliance with the requirements | | | | |
| | | | | | |



5.2.2.6 C4: Voltage Transformer 33 kV

| | Description | Minim | um Requirements | Our man to a d |
|------|--|--------------------|-----------------------|----------------|
| No. | | Unit | Data | Guaranteed |
| 1. | Voltage Transformers - General | | | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Туре | | Inductive | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| | | | IEC 60044-2 | |
| | | | IEC 60273 | |
| 1.5 | Standards | | IEC 60694 | |
| | | | IEC 60815 | |
| 1.6 | Quality control | | ISO 9001 | |
| 1.7 | Туре | | Outdoor, post type | |
| 2. | Voltage Transformers - Characteristics | | | |
| 2.1 | Nominal system voltage | kV _{rms} | 33 | |
| 2.2 | Highest voltage for equipment Un | kV ms | 36 | |
| 2.3 | Rated lightning impulse withstand voltage | kV _{peak} | 170 | |
| 2.4 | Rated short duration power frequency voltage | kV | 70 | |
| 2.5 | Rated frequency f _r | Hz | 50 | |
| 2.6 | Rated short-time thermal current Ith, 1 s | kA | 25 | |
| 2.7 | Rated dynamic current I _{dyn} | kV _{peak} | 63 | |
| 2.8 | Rated primary voltage | kV | 33/√3 | |
| | Rated secondary voltage | | | |
| 2.9 | I winding | V | 110√3 | |
| | Il winding | V | 110√3 | |
| | Accuracy class: | | | |
| 2.10 | I winding | | 0.2 | |
| | II winding | | 1/3P | |
| | Rated power: | | | |
| 2.11 | I winding | VA | 25 | |
| | II winding | VA | 75 | |
| 2.12 | Load | | Simultaneously | |
| 2.13 | Voltage factor | p.u./s | 1.5/30 | |
| 2.14 | Rated mechanical strength | Class | Min. Class I | |
| 2.15 | Power frequency withstand tests on secondary | kV rms | 3 | |
| | windings, 1 min | | _ | |
| 3. | Voltage Transformers - Design and Const | ruction | | |
| 3.1 | Insulator material | | Porcelain or araldite | |
| 3.2 | Insulating medium | | Oil-paper or araldite | |
| 3.3 | Minimum creepage distance | mm/ kV | Min. ≥ 25 mm/ kV | |
| 3.4 | Max. radio interference voltage at 0.5-2 MHz | μV | Max. 2500 | |
| 0.7 | (acc. IEC 60694) | м ч П | | |
| | Permissible level of partial discharges: | | | |
| 3.5 | Test voltage 1.2*UM/√3 | рС | Max. ≤ 5 | |
| | Test voltage UM | рС | ≤ 10 | |
| 3.7 | Min. LV enclosure protection | | IP54 | |



| No | Minimum Requirements | | Im Requirements | Guarantood |
|-------|---|---------|------------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 3.8 | HV terminals | | | |
| 3.8.1 | Shape | | Flat | |
| 3.8.2 | Position | | Vertical or horizontal | |
| 3.8.3 | Dimensions | mm x mm | Min 100 x 50 | |
| 3.8.4 | Number of holes | | Min 2 | |
| 3.8.5 | Dimensions of holes | mm | Ø 14 | |
| 3.8.6 | Distance between holes | mm | 50 | |
| 3.8.7 | Material suitable for | | Al terminal | |
| 3.10 | Mass and dimensions | | | |
| 3.11 | Total mass | kg | Insert | |
| 3.13 | Height | mm | Insert | |
| | Overall compliance with the requirements (yes/no) | | | |

5.2.2.7 C5: Surge Arrester 33 kV

| NI- | Description | Minin | num Requirements | Oursenteed |
|-------|---|--------------------|----------------------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 1. | Surge Arresters - General | | | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 60099-4 | |
| 1.6 | Quality control | | ISO 9001 | |
| 1.7 | Design | | Metal oxide, gapless, outdoor | |
| 1.8 | Short circuit testing authority | | Insert authority | |
| 2. | Surge Arresters - Characteristics | | | |
| 2.1 | Nominal system voltage | kV _{rms} | 33 | |
| 2.2 | Highest voltage for equipment Un | kV _{rms} | 36 | |
| 2.4 | Rated voltage of surge arrester Ur | kV _{rms} | 30 | |
| 2.5 | Max. continuous operating voltage Uc | kV _{rms} | 24 | |
| 2.8 | Rated frequency | Hz | 50 | |
| 2.9 | Nominal discharge current In (8/20 µs) | kA _{peak} | 10 | |
| 2.10 | High current impulse of an arrester (4/10 µs) | kA _{peak} | 100 | |
| 3. | Surge Arresters - Design and Constructi | on | | |
| 3.1 | Line discharge class | Class | 3 | |
| 3.2 | Energy dissipation capacity (per kV of rated voltage) | kJ/ kV | ≥6.5 | |
| 3.3 | Long duration current impulse (2000 µs) | А | ≥ 850 | |
| 3.4 | Maximum residual voltage U _{res} | | | |
| 3.4.1 | For switching impulse current 30/60 µs at 0,5 kA | kV _{peak} | ≤ 65 | |



| N | Description | Minim | um Requirements | Quantational |
|--------|--|--------------------|-------------------|--------------|
| No. | Description | Unit | Data | Guaranteed |
| 3.4.2 | For switching impulse current 30/60 µs at 1 kA | kV _{peak} | ≤ 67.5 | |
| 3.4.3 | For switching impulse current 30/60 µs at 2 kA | kV _{peak} | ≤ 70 | |
| 3.4.4 | For lightning impulse current 8/20 µs at 5 kA | kV _{peak} | ≤ 75 | |
| 3.4.5 | For lightning impulse current 8/20 µs at 10 kA | kV _{peak} | ≤ 80 | |
| 3.4.6 | For lightning impulse current 8/20 µs at 20 kA | kV _{peak} | ≤ 90 | |
| 3.5. | Dielectric endurance of arrester housing) | | | |
| 3.5.1 | Lightning impulse withstand voltage of arrester housing up (1.2/50 µs) | kV | ≥ 235 | |
| 3.5.2 | Power frequency withstand voltage of arrester housing (1 min wet) | kV | ≥ 105 | |
| 3.6. | Mechanical requirements | | | |
| 3.6.1 | Specified short-term load SSL (F _{dyn}) | Ν | ≥ 7500 | |
| 3.6.2 | Specified long-term load SSL (F _{stat}) | Ν | ≥ 5000 | |
| 3.7 | Minimum creepage distance | mm/ kV | ≥ 25 mm/ kV | |
| 3.8. | Housing insulating material | | Composite/Silicon | |
| 3.9 | Insulating basement | | Yes | |
| 3.10 | Surge arrester height | mm | Insert | |
| 3.11 | Surge arrester weight | kg | Insert | |
| 3.12 | Voltage distribution ring present / ring diame- ter | yes / no / mm | Insert | |
| 3.14 | HV terminal | | | |
| 3.14.1 | Shape | | Flat | |
| 3.14.2 | Dimension | mm x mm | Min 100 x 50 | |
| 3.14.3 | Number of holes | | Min 2 | |
| 3.14.4 | Distance between holes | Mm | 50 | |
| 3.14.5 | Material suitable for | | Al terminal | |
| | Overall compliance with the requirements (yes/no) | | | |



5.2.3 D: Transformers

5.2.3.1 D2: 132/33 kV 80/120 MVA Power Transformer

| Na | Description | Mini | mum Requirements | Cuerenteed |
|-------|--|---------|--------------------------|------------|
| No. | | Unit | Data | Guaranteed |
| 1. | General | | | |
| 1.1 | Manufacturer | | Insert | |
| | | | Power transformer | |
| | | | three-phase, oil im- | |
| 1.2 | Туре | | mersed, two windings, | |
| | | | with on-load tap chang- | |
| | | | er, outdoor | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| | | | IEC 60044 | |
| | | | IEC 60076 | |
| | | | IEC 60137 | |
| | | | IEC 60214 | |
| 1.5 | Standards | | IEC 60354 | |
| 1.5 | Standards | | IEC 60529 | |
| | | | IEC 60815 | |
| | | | IEC 60947 | |
| | | | NEMA TR-1 | |
| | | | CENELEC EN 50216 | |
| 1.6 | Quality control | | ISO 9001 | |
| 1.7 | Tertiary winding function | | N.A. | |
| 1.8 | Thermal insulation class | | A | |
| 2. | Ratings and properties | | | |
| 2.1 | Cooling system | - | ONAN / ONAF | |
| 0.0.4 | Rated power: | | | |
| 2.2.1 | Primary / Secondary winding | MVA | 120 / 120 | |
| 0.0.0 | Deted news (M)(A) by section ONANI (ONAE | NA) / A | ONAN / ONAF | |
| 2.2.2 | Rated power (MVA) by cooling ONAN / ONAF | MVA | 80 / 120 | |
| 2.3 | Rated voltage | kV/ kV | 132 ± 10 x 1,25 % / 34,5 | |
| 2.4 | Tap changer: | | | |
| | Manufacturer | | Insert | |
| | Country of origin | | Insert | |
| | Model designation | | Insert | |
| | Type of tap changing | | On-load | |
| | Tap changer location | | Insert | |
| | Type of voltage regulation | % | Insert | |
| | Tapping range | % | ±10 | |
| | Tapping step | | 1.25 | |
| | Rating | MVA | Rated power 120 MVA, | |
| | • Rating | IVIVA | all taps | |
| 2.5 | Frequency | Hz | 50 | |
| 2.6 | Connection of three-phase windings (group of | | Dyn1 | |
| 2.0 | vector IEC 60076) | | Uyiii | |



| Na | Description | Minimum Requirements | | Guerenteed | |
|-------|--|----------------------|---------------|------------|--|
| No. | Description | Unit | Data | Guaranteed | |
| 3. | Special technical requirements | | | | |
| | Short circuit impedance corrected to reference | | | | |
| 3.1 | temperature of 75°C at rated frequency and | | | | |
| | rated power | | | | |
| | HV - MV, on the basis of rated power 300 MWA | 0/ | 10 10 % | | |
| 3.1.1 | with on-load tap changer in middle position | % | 12 ±10 % | | |
| 24.2 | HV - LV, on the basis of rated power 'x' MWA | 0/ | | | |
| 3.1.2 | with on-load tap changer in middle position | % | N.A. | | |
| 3.1.3 | MV - LV, on the basis of rated power 'x' MWA | % | N.A: | | |
| 3.1.3 | with on-load tap changer in middle position | 70 | N.A. | | |
| | Zero-sequence impedance, with tap changer in | | | | |
| 3.2 | middle position: | % | Insert | | |
| | HV/MV | 70 | moen | | |
| 3.3 | Power transformer capacity to withstand exter- | | | | |
| | nal short circuits | | | | |
| 3.3.1 | Short-circuit duration | S | 2 | | |
| | Symmetrical short-circuit with-stand capacity | | | | |
| | and asymmetrical short-circuit withstand ca- | | | | |
| 3.3.2 | pacity during indicated period: | | | | |
| | HV winding | kA | 40 | | |
| | MV winding | kA | 25 | | |
| 2.4 | Pre-fault voltage | p.u. | 1.05 | | |
| 3.4 | Guaranteed losses | | | | |
| | No-load losses with tap changer in 9 th regula- tion position: | | | | |
| | at rated voltage and rated frequency (this | | | | |
| | value will be evaluated) | kW | Insert | | |
| 3.4.1 | at 110 % rated voltage, at rated frequency | kW | Insert | | |
| | No-load losses with tap changer in 17th regula- | | | | |
| | tion position: | kW | Insert | | |
| | • at 110 % rated voltage, at rated frequency | | | | |
| 3.4.2 | No-load losses capitalized value | €/kW | 7000 | | |
| | Tolerance to be applied to no-load losses in % | | 40 | | |
| 3.4.3 | of the guaranteed value | % | 10 | | |
| | On-load losses at 75°C, at rated voltage and | | | | |
| 3.4.4 | rated frequency, with tap changer in normal po- | kW | Insert | | |
| | sition (this value will be evaluated) | | | | |
| 3.4.5 | On-load losses capitalized value | €/kW | 3500 | | |
| 3.4.6 | Tolerance to be applied to on-load losses in % | % | 10 | | |
| 5.4.0 | on the guaranteed value | 70 | 10 | | |
| 3.5 | Ancillary equipment (fans, pumps, heaters, etc.) | | | | |
| 3.5.1 | Load of ancillary equipment (this value will be | kW | Insert | | |
| | evaluated) | | | | |
| 3.5.2 | Capitalized valued of ancillary equipment load | €/kW | 3500 | | |
| 3.5.3 | Tolerance to be applied to ancillary equipment | % | 20 | | |
| | load in % of the guaranteed value | | | | |
| 3.6 | Insulation level | | | | |
| 3.6.1 | High voltage (HV) | | LI 650 AC 275 | | |



| | Description | Minimu | Minimum Requirements | |
|-------|---|--------|----------------------|------------|
| No. | | Unit | Data | Guaranteed |
| 3.6.2 | Medium voltage (MV) | | LI 270 AC 70 | |
| 3.6.3 | Low voltage (LV) | | N.A. | |
| 3.7 | The highest voltage for equipment (effective value) | | | |
| 3.7.1 | High voltage (HV) | kV | 145 | |
| 3.7.2 | Medium voltage (MV) | kV | 36 | |
| 3.7.3 | Low voltage (LV) | kV | N.A. | |
| 3.8 | Temperature rise limits, at rated power, with complete cooling system in service and at low-est voltage tap | | | |
| 3.8.1 | Top oil | К | ≤ 50 | |
| 3.8.2 | Winding | К | ≤ 55 | |
| 3.8.3 | Hottest spot | К | ≤ 65 | |
| 4. | Oil | | | |
| 4.1 | New | | Insert | |
| 4.2 | Manufacturer | | Insert | |
| 4.3 | Туре | | Insert | |
| 4.4 | Standard | | IEC 60296 | |
| 4.5 | Minimum flash point | °C | Insert | |
| 4.6 | Viscosity at 20°C | mm²/s | Insert | |
| 4.7 | Minimum dielectric strength | kV/cm | Insert | |
| 4.8 | Data sheet attached | | Insert | |
| 4.9 | Corrosive Sulphur | | No | |
| 4.10 | PCB content | | Without PCB | |
| 5. | Bushing | | | |
| 5.1 | HV bushings (145 kV) | | | |
| 5.1.1 | Quantity | | 3 | |
| 5.1.2 | Class | kV | 145/650/275 | |
| 5.1.3 | Manufacturer | | Insert | |
| 5.1.4 | Туре | | Insert | |
| 5.1.5 | Rated current | A | ≥ 800 | |
| 5.1.6 | Minimum creepage distance (25 mm/ kV) | mm/ kV | ≥ 25 mm/ kV | |
| 5.2 | LV bushings (36 kV) | | | |
| 5.2.1 | Quantity | | 4 | |
| 5.2.2 | Class | kV | 36/170/70 | |
| 5.2.3 | Manufacturer | | Insert | |
| 5.2.4 | Туре | | Insert | |
| 5.2.5 | Rated current | A | ≥ 2500 | |
| 5.2.6 | Minimum creepage distance (25 mm/ kV) | mm/ kV | ≥ 25 mm/ kV | |
| 6. | Design data | | | |
| 6.1 | Audible noise level (acc. to NEMA TR1), at 105 % of rated voltage, at maximum power and with complete cooling system in service | dB | Insert | |
| 6.2 | Radio Interference Voltage at 0.5 MHz as specified in IEC 60694 | μV | 2500 max | |



| NI - | Description | Mini | Minimum Requirements | | |
|------|--|------------|------------------------------|------------|--|
| No. | Description | Unit | Data | Guaranteed | |
| 7. | Weights and dimensions | | | | |
| 7.1 | Total weight of transformer, ready for service | kg | Insert | | |
| | Outer dimensions: | | | | |
| 7.2 | Length | mm | Insert | | |
| | Width | mm | Insert | | |
| 7.3 | Informative dimensional sketch | | To be enclosed with bid | | |
| 8. | Tap changer | | · | | |
| 8.1 | Tap position indicator | | Digital code matrix (BCD) | | |
| 8.2 | Auxiliary supply | | 3x400 V / 230 V, 50 Hz | | |
| 9. | Auxiliary power supply | | | | |
| 9.1 | Motors | | 3x400 V / 50 Hz | | |
| 9.2 | Heaters | | 230 V / 50 Hz | | |
| 9.3 | Control voltage | | 110 V DC | | |
| 9.4 | Oil pump | | 3x400 V / 50 Hz | | |
| | | | | | |
| 10. | Current transformer incorporated into th | e power ti | | | |
| | | | In all phases, 3 cores | | |
| | CT in HV bushings, for protection, WTI and Tap Changer | | Characteristics shall be | | |
| 10.1 | | | defined in design stage | | |
| | | | One core shall be | | |
| | | | 800/1 for protection | | |
| | | | In all phases, 3 cores | | |
| | | | Characteristics shall be | | |
| | CT in MV bushings, for protection, WTI and | | defined in design stage | | |
| 10.2 | Tap Changer | | One core shall be | | |
| | | | 2400/1 for protection | | |
| | | | One core shall be for | | |
| | | | metering | | |
| 11. | Layout | 1 | 1 | | |
| 11.1 | Primary winding bushings | | Longitudinal axis | | |
| 11.2 | Secondary winding bushings | | Longitudinal axis | | |
| 11.2 | Secondary winding businings | | (opposite to HV) | | |
| 11.3 | Conservator tank | | To be defined | | |
| 11.5 | | | in design stage | | |
| 11.4 | Tap changer | | To be defined | | |
| 11.7 | | | in design stage | | |
| 11.5 | Control cabinet | | To be defined | | |
| 11.0 | | | in design stage | | |
| 11.6 | Coolers | | To be defined | | |
| | | | in design stage | | |
| 12. | Cooling groups | 1 | | | |
| 12.1 | Number of cooling groups (total) | Qty. | 4 | | |
| 12.2 | Number of cooling groups (for rated power) | Qty. | 3 | | |
| 12.3 | Number of stand-by cooling groups | Qty. | 1 | | |



| | Description | Minim | Minimum Requirements | |
|----------------------------|--|---------|----------------------|------------|
| No. | | Unit | Data | Guaranteed |
| 13. | Dehydrating breather | | | |
| 13.1 | Type of dehydrating breather | | Insert | |
| 13.2 | Dehumidifying agent | kg | Insert | |
| 14. | Autotransformer tank | | | |
| 14.1 | Type of design | | | |
| | Thickness of transformer tank: | | | |
| | Sides | mm | Insert | |
| 14.2 | Bottom | mm | Insert | |
| | • Тор | mm | Insert | |
| 14.3 | Material of the autotransformer tank | | Insert | |
| 14.4 | Corrosion protection of the tank | | YES | |
| 14.5 | Vacuum withstand of the complete tank with cooler | mbar | 1 | |
| 14.6 | Over-pressure withstand of the complete auto- transformer | bar | 0.3 | |
| 15. | Conservator | | | |
| 15.1 | Туре | | With diaphragm | |
| 15.2 | Number of compartments | pcs. | 2 | |
| 15.3 | Oil level indicators with alarm for minimum oil level | pcs. | 2 | |
| | Membrane provided inside the conservator for | | Yes | |
| 15.4 | "breathing" of the transformer | | | |
| 15.4 16. | | I | | |
| | "breathing" of the transformer Operating conditions At the altitude (above sea level) | m | ≤ 1000 | |
| 16. | Operating conditions | m °C | ≤ 1000 + 45 | |
| 16. 16.1 | Operating conditions At the altitude (above sea level) | | | |
| 16. 16.1 16.2 | Operating conditions At the altitude (above sea level) Maximum ambient temperature | °C | + 45 | |



5.2.4 F: Auxiliary Transformers

5.2.4.1 F1: 33/0.415 kV 200 kVA, ZNyn11, Auxiliary Transformer

| Ne | Description | Mini | mum Requirements | Our sector of the sector of th |
|-------|---|-----------|---------------------------|--|
| No. | Description | Unit | Data | Guaranteed |
| 1. | General | | | |
| 1.1 | Manufacturer | | Insert | |
| | | | Power transformer | |
| | | | three-phase, oil im- | |
| | | | mersed, two windings, | |
| 1.2 | Туре | | without tertiary winding, | |
| | | | with off-load tap chang- | |
| | | | er, outdoor | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Standards | | IEC 60076 | |
| 1.6 | Quality control | | ISO 9001 | |
| 2. | Ratings and properties | | | |
| 2.1 | Rated power: | kVA | 200 | |
| 2.1 | Type of cooling ONAN / ONAF | KVA | ONAN | |
| 2.2 | Rated voltage | - kV/V | 33 ± 2 x 2,5 % / 415 | |
| 2.3 | Tap changer: | K V / V | 55 ± 2 X 2,5 /6 / 415 | |
| | Type of tap changing | | Off-load | |
| | Tapping range | | ±5 | |
| 2.4 | Tapping step | % | 2.5 | |
| | Rating | % | Rated power 200 kVA, | |
| | - rearry | | all taps | |
| 2.5 | Frequency | Hz | 50 | |
| 0.0 | Connection of three-phase windings (group of | | 711 | |
| 2.6 | vector IEC 60076) | | ZNyn11 | |
| 3. | Special technical requirements | | | |
| | Power transformer capacity to withstand exter- | | | |
| 3.1 | nal short circuits | | | |
| 3.1.1 | Short-circuit duration | S | 3 | |
| | Symmetrical short-circuit with-stand capacity | | | |
| | and asymmetrical short-circuit withstand ca- | | | |
| 3.1.2 | pacity during indicated period: | | | |
| | MV winding | kA | 25 | |
| | LV winding | kA | - | |
| 3.2 | Guaranteed losses | | | |
| 3.2.1 | No-load losses with tap changer in normal posi- | kW | Insert | |
| 0.2.1 | tion, at rated voltage and rated frequency | r v v | 1113011 | |
| 3.2.2 | Tolerance to be applied to no-load losses in % | % | 10 | |
| 0.2.2 | of the guaranteed value | 70 | 10 | |
| | On-load losses at 75°C, at rated voltage and | | | |
| 3.2.3 | rated frequency, with tap changer in normal po- | kW | Insert | |
| | sition | | | |



| NI - | Description | Minimum Requirements | | Quanta da |
|---------------------|--|----------------------|-------------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 3.2.4 | Tolerance to be applied to on-load losses in % | % | 10 | |
| | on the guaranteed value | 70 | 10 | |
| 3.3 | Insulation level | | | |
| 3.3.1 | Medium voltage (MV) | | LI 170 AC 70 | |
| 3.3.2 | Low voltage (LV) | | LI - AC 3 | |
| 3.4 | The highest voltage for equipment (effective | | | |
| | value) | | | |
| 3.4.1 | Medium voltage (MV) | kV | 36 | |
| 3.4.2 | Low voltage (LV) | kV | 1.1 | |
| | Temperature rise limits, at rated power, with | | | |
| 3.5 | complete cooling system in service and at low- | | | |
| 0.5.4 | est voltage tap | 14 | 4.50 | |
| 3.5.1 | Top oil | K | ≤ 50 | |
| 3.5.2 | Winding | K | ≤ 55 | |
| 3.5.3 | Hottest spot | K | ≤ 65 | |
| 4. | Oil | | | |
| 4.1 | New | | Insert | |
| 4.2 | Manufacturer | | Insert | |
| 4.3 | Туре | | Insert | |
| 4.4 | Standard | | IEC 60296 | |
| 4.5 | Minimum flash point | °C | Insert | |
| 4.6 | Viscosity at 20°C | mm²/s | Insert | |
| 4.7 | Minimum dielectric strength | kV/cm | Insert | |
| 5. | Bushing | | | |
| | | | | |
| <u>5.1</u> 5.1.1 | MV bushing (36 kV) Quantity | | 3 + 1 | |
| 5.1.2 | Class | kV | 36/170/70 | |
| 5.1.2 | Manufacturer | ĸv | Insert | |
| | | | | |
| 5.1.4 | Type Rated current | ۸ | Insert | |
| 5.1.5 | | A mm(14)(| ≥ 100 | |
| 5.1.6 | Minimum creepage distance (25 mm/ kV) | mm/ kV | ≥ 25 mm/ kV | |
| 5.2 | LV bushings (3 kV) Quantity | | 2 + 1 | |
| 5.2.1 | Class | kV | <u>3 + 1</u> 3 | |
| 5.2.2 | Manufacturer | KV | | |
| 5.2.3 | | | Insert | |
| 5.2.4 | Type Rated current | ۸ | Insert ≥ 400 | |
| 5.2.5 | Minimum creepage distance (25 mm/ kV) | A mm/ kV | ≥ 400 ≥ 25 mm/ kV | |
| 5.2.6 6. | Weights and dimensions | IIIII/KV | 2 23 Min/ KV | |
| 6.1 | Total weight of transformer, ready for service | kg | Insert | |
| | Outer dimensions: | | | |
| 6.2 | Length | mm | Insert | |
| | Width | mm | Insert | |
| 6.3 | Informative dimensional sketch | | To be enclosed with bid | |
| 7. | Dehydrating breather | | | |
| 7.1 | Type of dehydrating breather | | Insert | |



| NI- | Description | Minim | Minimum Requirements | |
|-----|---|-------|---------------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 7.2 | Dehumidifying agent | kg | Insert | |
| 8. | Conservator | | | |
| 8.1 | Туре | | With dehydrating breather | |
| 8.2 | Number of compartments | pcs. | 1 | |
| 8.3 | Oil level indicators with alarm for minimum oil level | pcs. | 1 | |
| 9. | Operating conditions | | | |
| 9.1 | At the altitude (above sea level) | m | ≤ 1000 | |
| 9.2 | Maximum ambient temperature | °C | + 45 | |
| 9.3 | Average daily temperature | °C | + 35 | |
| 9.4 | Average annual temperature | °C | + 30 | |
| 9.5 | Minimum ambient temperature | °C | - 5 | |
| | Overall compliance with the requirements (yes/no) | | | |

5.2.4.2 F2: 33/0.415 kV 200 kVA, Dyn11, Auxiliary Transformer

| No | Description | Mini | mum Requirements | Cueronteed | | |
|-----|---|--------|--|------------|--|--|
| No. | Description | Unit | Data | Guaranteed | | |
| 1. | 1. General | | | | | |
| 1.1 | Manufacturer | | Insert | | | |
| 1.2 | Туре | | Power transformer three-phase, oil im- mersed, two windings, without tertiary winding, with off-load tap chang- er, outdoor | | | |
| 1.3 | Model designation | | Insert | | | |
| 1.4 | Country of origin | | Insert | | | |
| 1.5 | Standards | | IEC 60076 | | | |
| 1.6 | Quality control | | ISO 9001 | | | |
| 2. | Ratings and properties | | | | | |
| 2.1 | Rated power: | kVA | 200 | | | |
| 2.2 | Type of cooling ONAN / ONAF | - | ONAN | | | |
| 2.3 | Rated voltage | kV/V | 33 ± 2 x 2,5 % / 415 | | | |
| 2.4 | Tap changer:Type of tap changingTapping rangeTapping stepRating | % % | Off-load ±5 2.5 Rated power 200 kVA, all taps | | | |
| 2.5 | Frequency | Hz | 50 | | | |



| | Description | Minimu | Minimum Requirements | |
|-------|--|----------|----------------------|------------|
| No. | | Unit | Data | Guaranteed |
| 2.6 | Connection of three-phase windings (group of vector IEC 60076) | | Dyn11 | |
| 3. | Special technical requirements | | | |
| 3.1 | Power transformer capacity to withstand exter- nal short circuits | | | |
| 3.1.1 | Short-circuit duration | s | 3 | |
| 3.1.2 | Symmetrical short-circuit with-stand capacity and asymmetrical short-circuit withstand ca- pacity during indicated period: • MV winding • LV winding | kA kA | 25 | |
| 3.2 | Guaranteed losses | | | |
| 3.2.1 | No-load losses with tap changer in normal posi- tion, at rated voltage and rated frequency | kW | Insert | |
| 3.2.2 | Tolerance to be applied to no-load losses in % of the guaranteed value | % | 10 | |
| 3.2.3 | On-load losses at 75°C, at rated voltage and rated frequency, with tap changer in normal position | kW | Insert | |
| 3.2.4 | Tolerance to be applied to on-load losses in % on the guaranteed value | % | 10 | |
| 3.3 | Insulation level | | | |
| 3.3.1 | Medium voltage (MV) | | LI 170 AC 70 | |
| 3.3.2 | Low voltage (LV) | | LI - AC 3 | |
| 3.4 | The highest voltage for equipment (effective value) | | | |
| 3.4.1 | Medium voltage (MV) | kV | 36 | |
| 3.4.2 | Low voltage (LV) | kV | 1.1 | |
| 3.5 | Temperature rise limits, at rated power, with complete cooling system in service and at low- est voltage tap | | | |
| 3.5.1 | Top oil | К | ≤ 50 | |
| 3.5.2 | Winding | К | ≤ 55 | |
| 3.5.3 | Hottest spot | К | ≤ 65 | |
| 4. | Oil | | | |
| 4.1 | New | | Insert | |
| 4.2 | Manufacturer | | Insert | |
| 4.3 | Туре | | Insert | |
| 4.4 | Standard | | IEC 60296 | |
| 4.5 | Minimum flash point | °C | Insert | |
| 4.6 | Viscosity at 20°C | mm²/s | Insert | |
| 4.7 | Minimum dielectric strength | kV/cm | Insert | |
| 5. | Bushing | | | |
| 5.1 | MV bushing (36 kV) | | | |
| 5.1.1 | Quantity | | 3 + 1 | |
| 5.1.2 | Class | kV | 36/170/70 | |



| Na | Description | Minir | num Requirements | Guarantaad |
|-------|---|-------------|-------------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 5.1.3 | Manufacturer | | Insert | |
| 5.1.4 | Туре | | Insert | |
| 5.1.5 | Rated current | А | ≥ 100 | |
| 5.1.6 | Minimum creepage distance (25 mm/ kV) | mm/ kV | ≥ 25 mm/ kV | |
| 5.2 | LV bushings (3 kV) | | | |
| 5.2.1 | Quantity | | 3 + 1 | |
| 5.2.2 | Class | kV | 3 | |
| 5.2.3 | Manufacturer | | Insert | |
| 5.2.4 | Туре | | Insert | |
| 5.2.5 | Rated current | А | ≥ 400 | |
| 5.2.6 | Minimum creepage distance (25 mm/ kV) | mm/ kV | ≥ 25 mm/ kV | |
| 6. | Weights and dimensions | | | |
| 6.1 | Total weight of transformer, ready for service | kg | Insert | |
| | Outer dimensions: | | | |
| 6.2 | Length | mm | Insert | |
| | Width | mm | Insert | |
| 6.3 | Informative dimensional sketch | | To be enclosed with bid | |
| 7. | Dehydrating breather | | | |
| 7.1 | Type of dehydrating breather | | Insert | |
| 7.2 | Dehumidifying agent | kg | Insert | |
| 8. | Conservator | | | |
| | | | With dehydrating | |
| 8.1 | Туре | | breather | |
| 8.2 | Number of compartments | pcs. | 1 | |
| 8.3 | Oil level indicators with alarm for minimum oil level | pcs. | 1 | |
| 9. | Operating conditions | | | |
| 9.1 | At the altitude (above sea level) | m | ≤ 1000 | |
| 9.2 | Maximum ambient temperature | °C | + 45 | |
| 9.3 | Average daily temperature | °C | + 35 | |
| 9.4 | Average annual temperature | °C | + 30 | |
| 9.5 | Minimum ambient temperature | °C | - 5 | |
| | Overall compliance with the requirement | ts (yes/no) | | |



5.2.5 G-P: Control, Relay Protection, Substation Automation System & Metering

All auxiliary equipment such as MCBs, heaters, lighting, AC sockets, terminals, auxiliary relays, wiring and necessary electrical/optical converters for communication, etc. shall be foreseen

Enough auxiliary relays/contactors for OHL/transformer/busbar protection shall be foreseen and delivered as built-in elements in the cubicles.

The central unit for busbar protection must be supported for min. 16 bays.

The design proposal of the cubicles is subject of approval.

The cubicles shall be delivered completely wired and tested.

5.2.5.1 14291 - Control Cubicle for OHL & Bus Coupler

| N | Description | Minim | um Requirements | Cuerenteed |
|-------|--|----------|-----------------|------------|
| No. | Description | Unit | Unit Data Guara | Guaranteed |
| 14291 | Control Cubicle for OHL & Bus Couplers with Swite | ch / Cod | e number: 14291 | |
| 1.1 | Control cubicle for OHL & bus couplers with LAN switch | | | |
| 1.1.1 | Bay control unit for OHL & bus couplers (Code: 14251) | pcs. | 1 | |
| 1.1.2 | Back-up control panel (Code: 14254) | pcs. | 1 | |
| 1.1.3 | Front panel annunciation for OHL & TR (Code: 14255) | pcs. | 1 | |
| 1.1.4 | Ethernet switch-process LAN (Code: 14273) | pcs. | 1 | |
| 1.2 | Other equipment (specify if any) | | Insert | |
| | Overall compliance with the requirements (yes/no) | | | |

5.2.5.2 14292 - Control Cubicle for Power Transformers HV Side

| No. | Description | Minim | um Requirements | Guaranteed |
|-------|---|----------|-----------------|------------|
| NO. | Description | Unit | Data | Guaranteed |
| 14292 | Control Cubicle for Power Transformers HV Side 14292 | e with L | AN Switch / Co | de number: |
| 1.1 | Control cubicle for power transformers HV side with LAN swi | tch | | |
| 1.1.1 | Bay control unit for power transformers HV & LV (Code: 14252) | pcs. | 1 | |
| 1.1.2 | Back-up control panel (Code: 14254) | pcs. | 1 | |
| 1.1.3 | Front panel annunciation for OHL & TR (Code: 14255) | pcs. | 1 | |
| 1.1.4 | Ethernet switch process LAN (Code: 14273) | pcs. | 1 | |
| 1.2 | Other equipment (specify if any) | | Insert | |
| | Overall compliance with the requirements (yes/no) | | | |



| No | Description | Minimu | m Requirements | 0 |
|-------|--|-----------|-----------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 14293 | General (Control Cubicle for Power Transformers I | _V Side / | Code number: 14 | 4293) |
| 1.1 | Control cubicle for power transformers LV side | | | |
| 1.1.1 | Bay control unit for power transformers HV&LV (Code: 14252) | pcs. | 1 | |
| 1.1.2 | Back-up control panel (Code: 14254) | pcs. | 1 | |
| 1.1.3 | Front panel annunciation for OHL & TR (Code: 14255) | pcs. | 1 | |
| 1.1.4 | Ethernet switch-process LAN (Code: 14273) | pcs. | 1 | |
| 1.1.5 | AVR (Code: 14008) | pcs. | 1 | |
| 1.2 | Other equipment (specify if any) | | Insert | |
| | Overall compliance with the requirements (yes/no) | | | |

5.2.5.3 14293 - Control Cubicle for Power Transformers LV Side

5.2.5.4 14294 - Control Cubicle for LV AC & DC Switchgear

| No | Description | Minimum Requirements | Guarantood | |
|-------|---|----------------------|------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 14294 | Control Cubicle for LV AC & DC SWG / Code num | ber: 142 | 94 | |
| 1.1 | Control cubicle for LV AC&DC SWG | | | |
| 1.1.1 | Bay control unit for LV AC&DC SWG (Code: 14253) | pcs. | 4 | |
| 1.1.2 | Front panel annunciation for control room (Code: 14256) | pcs. | 1 | |
| 1.1.4 | Horn on/off switch | | Yes | |
| | Overall compliance with the requirements (yes/no) | | | |

5.2.5.5 14295 - Control Cubicle for SCADA Server

| Ne | Description | Minim | um Requirements | Cuerente e d |
|-------|---|-------|-----------------|--------------|
| No. | Description | Unit | Data | Guaranteed |
| 14295 | Control Cubicle for SCADA Server / Code number: | 14295 | | |
| 1.1 | Cubicle for SCADA servers | | | |
| 1.1.1 | SCADA server (Code: 14261) | pcs. | 2 | |
| 1.1.2 | Ethernet switch-process LAN (Code: 14273) | pcs. | 2 | |
| 1.1.3 | Ethernet switch-control room LAN (Code: 14274) | pcs. | 2 | |
| | Overall compliance with the requirements (yes/no) | | | |



| Ne | Description | Minim | um Requirements | Guaranteed |
|-------|--|-------|---|------------|
| No. | Description | Unit | | Guaranteed |
| 14103 | 14103 Protection Cubicle No. 3 for 132 kV OHL / Code number: 14103 | | | |
| 1.1 | Protection cubicle No. 3 for 132 kV OHL-Long | - | | |
| 1.1.1 | Protection terminal for 132 kV OHL Main 1 (Code: 14003) | pcs. | 1 | |
| 1.1.2 | Protection terminal for 132 kV OHL Main 2 (Code: 14004) | pcs. | 1 | |
| 1.1.3 | Busbar & breaker failure protection bay unit (Code: 14010) | pcs. | 1 | |
| 1.1.4 | Trip circuit supervision relay (Code: 14011) | pcs. | 6 | |
| 1.1.5 | Tripping unit (Code: 14012) | pcs. | 8 (To be confirmed with detailed de- sign) | |
| 1.1.6 | Test socket (Code: 14013) | pcs. | 3 | |
| | Overall compliance with the requirements (yes/no) | | | |

5.2.5.6 14103 - Protection Cubicle No. 3 for 132 kV OHL

5.2.5.7 14104 - Protection Cubicle No. 4 for Power Transformer HV Side

| No | Description | Minim | um Requirements | Guaranteed |
|-------|--|----------|---|------------|
| No. | Description | Unit | Data | |
| 14104 | Protection Cubicle No. 4 for Power Transformer HV | Side / C | ode number: 1410 | 94) |
| 1.1 | Protection cubicle No. 5 for Power Transformer HV Side | | | |
| 1.1.1 | Protection terminal for power transformer Main 1 (Code: 14005) | pcs. | 1 | |
| 1.1.2 | Busbar & breaker failure protection bay unit (Code: 14010) | pcs. | 1 | |
| 1.1.3 | Trip circuit supervision relay (Code: 14011) | pcs. | 6 | |
| 1.1.4 | Tripping unit (Code: 14012) | pcs. | 4 (To be confirmed with detailed de- sign) | |
| 1.1.5 | Test socket (Code: 14013) | pcs. | 2 | |
| | Overall compliance with the requirements (yes/no) | | | |



| Ne | Description | Minim | um Requirements | Guaranteed |
|-------|---|----------|---|------------|
| No. | Description | Unit | Data | |
| 14105 | Protection Cubicle No. 5 for Power Transformer LV | Side / C | ode number: 1410 | 5 |
| 1.1 | Protection cubicle No. 5 for Power Transformer LV Side | | | |
| 1.1.1 | Protection terminal for power transformer Main 2 (Code: 14006) | pcs. | 1 | |
| 1.1.2 | Protection terminal for power transformer LV Side (Code: 14007) | pcs. | 1 | |
| 1.1.3 | Busbar & breaker failure protection bay unit (Code: 14010) | pcs. | 1 | |
| 1.1.4 | Trip circuit supervision relay (Code: 14011) | pcs. | 2 | |
| 1.1.5 | Tripping unit (Code: 14012) | pcs. | 3 (To be confirmed with detailed de- sign) | |
| 1.1.6 | Test socket (Code: 14013) | pcs. | 3 | |
| | Overall compliance with the requirements (yes/no) | | | |

5.2.5.8 14105 - Protection Cubicle No. 5 for Power Transformer LV Side

5.2.5.9 14106 - Protection Cubicle No. 6 for Bus Couplers 132 kV

| No | Description | Minim | um Requirements | S Cuerenteed |
|-------|--|-------|---|--------------|
| No. | Description | Unit | Data | Guaranteed |
| 14106 | 4106 Protection Cubicle No. 6 for Bus couplers 132 kV / Code number: 14106 | | | |
| 1.1 | Protection cubicle No. 6 for bus couplers 132 kV | | | |
| 1.1.1 | Protection terminal for bus couplers 132 kV (Code: 14009) | pcs. | 1 | |
| 1.1.2 | Busbar & breaker failure protection central unit (Code: 14010) | pcs. | 2 | |
| 1.1.3 | Trip circuit supervision relay (Code: 14011) | pcs. | 2 | |
| 1.1.4 | Tripping unit (Code: 14012) | pcs. | 2 (To be confirmed with detailed de- sign) | |
| 1.1.5 | Test socket (Code: 14013) | pcs. | 2 | |
| | Overall compliance with the requirements (yes/no) | | | |



| | | Minin | num Requirements | |
|-------|--|--------------|------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 14251 | Bay Control Unit for OHL and Bus Coupl | ers / Code n | umber: 14251 | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Country of origin | | Insert | |
| 1.3 | Terminal type | | Insert | |
| 1.4 | Terminal version (software version) | | Insert | |
| 1.5 | Standards | | IEC | |
| 2. | Characteristics | | | |
| 2.1 | Auxiliary supply voltage | | | |
| 2.1.1 | Rated auxiliary supply voltage | V d.c. | 110 ±15 % | |
| | Interruption in auxiliary d.c. voltage: | | | |
| 2.1.2 | Without resetting | ms | > 50 | |
| | Restart time | s | Insert | |
| 2.2 | a.c. current inputs | | | |
| 2.2.1 | Number of inputs | | Min. 4 | |
| 2.2.2 | Rated current Ir | Α | 1 | |
| 2.2.3 | Permissive overload, continuous | | 4xlr | |
| 2.2.4 | Permissive overload, 1 s | | 100xlr | |
| 2.2.5 | Burden at Ir | VA | < 0.5 | |
| 2.3 | a.c. voltage inputs | | x 0.0 | |
| 2.3.1 | Number of inputs | | Min. 4 | |
| 2.3.2 | Rated voltage Ph-Ph Ur | V | 100 | |
| 2.3.3 | Permissive overload, continuous | % Ur | 150 | |
| 2.3.4 | Permissive overload, 1 s | % Ur | 250 | |
| 2.3.5 | Burden at Ur | VA | < 0.3 | |
| 2.3.3 | Binary inputs | • • • | Vi.0 | |
| 2.4.1 | Number of BI groups with common root | | Max. 4 | |
| 2.4.2 | Number of inputs per BI group with common root | | Max. 4 Max. 8 | |
| 2.4.3 | Rated voltage | V d.c. | 110 | |
| 2.5 | Binary outputs | V 0.0. | Min. 24 | |
| 2.5.1 | Number of BO with common contact | | Max. 4 | |
| 2.5.2 | Rated voltage | V d.c. | 110 | |
| 2.5.3 | Breaking capacity at inductive load with L/R<40 ms, at rated voltage | A | 0.1 | |
| 2.5.4 | Current carrying capacity at rated voltage for signalling contacts, continuous | A | Insert | |
| 2.5.5 | Number of tripping contacts (high-speed out- put) | pcs. | Insert | |
| 2.5.6 | Current carrying capacity at rated voltage for tripping contacts, continuous | A | 5 | |
| 2.6 | LED indications | | | |
| 2.6.1 | Number of LED's | | Min. 16 | |
| 2.6.2 | Multi-colour LED's | Yes/No | Insert | |

5.2.5.10 14251 - Bay Control Unit for OHL and Bus Couplers



| Na | Description | Minim | num Requirements | Quenerto e d |
|---------|--|------------|------------------|--------------|
| No. | Description | Unit | Data | Guaranteed |
| 2.7 | Communication ports | | Yes | |
| 2.7.1 | Port for front-connected PC | | | |
| 2.7.1.1 | Protocols supported | | Insert | |
| 2.7.1.2 | Communication speed | Kbit/s | Insert | |
| 2.7.1.3 | PC side connector type | | Insert | |
| 2.7.2 | System interface | | | |
| 2.7.2.1 | Number of rear ports | | 2 | |
| 2.7.2.2 | Protocols supported | | IEC 61850 | |
| 2.7.2.3 | Communication speed | Mbit/s | Min. 100 | |
| 2.7.2.4 | Connector type | | RJ45 or FO | |
| 2.7.3 | Time synchronisation | | SNTP | |
| 2.8 | Human-machine interface | | | |
| 2.8.1 | HMI with single line diagram, measurement, signalling and control | | Yes | |
| 2.9 | Synchronism & energising check | | | |
| 2.9.1 | Frequency difference range | mHz. | Insert | |
| 2.9.2 | Voltage difference range | % Ur | Insert | |
| 2.9.3 | Phase difference range | o | Insert | |
| 2.9.4 | Operating time for synchro check function | ms | Insert | |
| 2.9.5 | Operating time for energising check function | ms | Insert | |
| 2.10 | Event recorder | | | |
| 2.10.1 | Max. number of events | | Insert | |
| 2.10.2 | Time tagging resolution | ms | 1 | |
| 2.11 | Self-supervision | | Yes | |
| 2.12 | Measurement | | | |
| 2.12.1 | Active power measurement | | Yes | |
| 2.12.2 | Reactive power measurement | | Yes | |
| 2.12.3 | Energy measurement | | Yes | |
| 2.12.4 | Voltage measurement | | Yes | |
| 2.12.5 | Frequency measurement | | Yes | |
| 2.12.6 | Current measurement | | Yes | |
| | Overall compliance with the requirement | s (yes/no) | | |

Bay Control Units must be from the same manufacturer as substation protection system. Bay Control Units must be parameterized, configured and delivered as per Engineer's requirements.



| | Description | Minin | num Requirements | |
|-------|--|---------|--------------------|------------|
| No. | | Unit | Data | Guaranteed |
| 14252 | Bay Control Unit for Power Transformers | HV&LV/C | Code number: 14252 | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Country of origin | | Insert | |
| 1.3 | Terminal type | | Insert | |
| 1.4 | Terminal version (software version) | | Insert | |
| 1.5 | Standards | | IEC | |
| 2. | Characteristics | | | I |
| 2.1 | Auxiliary supply voltage | | | |
| 2.1.1 | Rated auxiliary supply voltage | V d.c. | 110 ±15 % | |
| | Interruption in auxiliary d.c. voltage: | | | |
| 2.1.2 | Without resetting | ms | > 50 | |
| | Restart time | S | Insert | |
| 2.2 | a.c. current inputs | | | |
| 2.2.1 | Number of inputs | | Min. 4 | |
| 2.2.2 | Rated current Ir | А | 1 | |
| 2.2.3 | Permissive overload, continuous | | 4xlr | |
| 2.2.4 | Permissive overload, 1 s | | 100xlr | |
| 2.2.5 | Burden at Ir | VA | < 0.5 | |
| 2.3 | a.c. voltage inputs | | | |
| 2.3.1 | Number of inputs | | Min. 4 | |
| 2.3.2 | Rated voltage Ph-Ph Ur | V | 100 | |
| 2.3.3 | Permissive overload, continuous | % Ur | 150 | |
| 2.3.4 | Permissive overload, 1 s | % Ur | 250 | |
| 2.3.5 | Burden at Ur | VA | < 0.3 | |
| 2.4 | mA inputs | | | |
| 2.4.1 | Number of mA inputs | pcs. | Min. 2 | |
| 2.4.2 | Input range | | 4-20 mA | |
| 2.5 | Binary inputs | | Min. 45 | |
| 2.5.1 | Number of BI groups with common root | | Max. 4 | |
| 2.5.2 | Number of inputs per BI group with common root | | Max. 8 | |
| 2.5.3 | Rated voltage | V d.c. | 110 | |
| 2.6 | Binary outputs | | Min. 24 | |
| 2.6.1 | Number of BO with common contact | | Max. 4 | |
| 2.6.2 | Rated voltage | V d.c. | 110 | |
| 2.6.3 | Breaking capacity at inductive load with | А | 0.1 | |
| | L/R<40 ms, at rated voltage | | | |
| 2.6.4 | Current carrying capacity at rated voltage for | А | Insert | |
| 2.6.5 | signalling contacts, continuous Number of tripping contacts (high-speed output) | pcs. | Insert | |
| | Current carrying capacity at rated voltage for | P00. | | |
| 2.6.6 | tripping contacts, continuous | А | 5 | |
| 2.7 | LED indications | | | |
| 2.7.1 | Number of LED's | | Min. 16 | |
| 2.7.2 | Multi-colour LED's | Yes/No | Insert | |

5.2.5.11 14252 - Bay Control Unit for Power Transformers HV & LV



| Na | Description | Minimum Requirements | | Cuerrenteed |
|---------|--|----------------------|------------|-------------|
| No. | | Unit | Data | Guaranteed |
| 2.8 | Communication ports | | Yes | |
| 2.8.1 | Port for front-connected PC | | | |
| 2.8.1.1 | Protocols supported | | Insert | |
| 2.8.1.2 | Communication speed | Kbit/s | Insert | |
| 2.8.1.3 | PC side connector type | | Insert | |
| 2.8.2 | System interface | | | |
| 2.8.2.1 | Number of rear ports | | 2 | |
| 2.8.2.2 | Protocols supported | | IEC 61850 | |
| 2.8.2.3 | Communication speed | Mbit/s | Min. 100 | |
| 2.8.2.4 | Connector type | | RJ45 or FO | |
| 2.8.3 | Time synchronisation | | SNTP | |
| 2.9 | Human-machine interface | | | |
| 2.9.1 | HMI with single line diagram, measurement, sig- nalling and control | | Yes | |
| 2.10 | Synchronism & energising check | | | |
| 2.10.1 | Frequency difference range | mHz. | Insert | |
| 2.10.2 | Voltage difference range | % Ur | Insert | |
| 2.10.3 | Phase difference range | o | Insert | |
| 2.10.4 | Operating time for synchro check function | ms | Insert | |
| 2.10.5 | Operating time for energising check function | ms | Insert | |
| 2.11 | Event recorder | | | |
| 2.11.1 | Max. number of events | | Insert | |
| 2.11.2 | Time tagging resolution | ms | 1 | |
| 2.12 | Self-supervision | | Yes | |
| 2.13 | Measurement | | | |
| 2.13.1 | Active power measurement | | Yes | |
| 2.13.2 | Reactive power measurement | | Yes | |
| 2.13.3 | Energy measurement | | Yes | |
| 2.13.4 | Voltage measurement | | Yes | |
| 2.13.5 | Frequency measurement | | Yes | |
| 2.13.6 | Current measurement | | Yes | |
| | Overall compliance with the requirements | s (yes/no) | | |

Bay Control Units for Transformer HV & LV side must be from the same manufacturer as substation protection system. Bay Control Units for Transformer HV & LV side must be parameterized, configured and delivered as per Engineer's requirements.



5.2.5.12 14253 - Bay Control Unit for LV AC & DC

| No. | Description | Minim | num Requirements | Guerenteed |
|-------|--|-----------|------------------|------------|
| | Description | Unit | Data | Guaranteed |
| 14253 | Bay Control Unit for LV AC&DC -SWG / (| Code numb | er: 14253 | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Country of origin | | Insert | |
| 1.3 | Terminal type | | Insert | |
| 1.4 | Terminal version (software version) | | Insert | |
| 1.5 | Standards | | IEC | |
| 2. | Characteristics | | | |
| 2.1 | Auxiliary supply voltage | | | |
| 2.1.1 | Rated auxiliary supply voltage | V d.c. | 110 ±15 % | |
| | Interruption in auxiliary d.c. voltage: | | | |
| 2.1.2 | Without resetting | ms | > 50 | |
| | Restart time | s | Insert | |
| 2.2 | a.c. current inputs | | | |
| 2.2.1 | Number of inputs | | Min. 3 | |
| 2.2.2 | Rated current Ir | А | 5 | |
| 2.2.3 | Permissive overload, continuous | | 4xlr | |
| 2.2.4 | Permissive overload, 1 s | | 100xlr | |
| 2.2.5 | Burden at Ir | VA | | |
| 2.3 | a.c. voltage inputs | | | |
| 2.3.1 | Number of inputs | | Min. 3 | |
| 2.3.2 | Rated voltage Ph-Ph Ur | V | 250 | |
| 2.3.3 | Permissive overload, continuous | % Ur | 150 | |
| 2.3.4 | Permissive overload, 1 s | % Ur | 250 | |
| 2.3.5 | Burden at Ur | VA | | |
| 2.4 | mA inputs | | | |
| 2.4.1 | Number of mA inputs | pcs. | Min. 4 | |
| 2.4.2 | Input range | | 4-20 mA | |
| 2.5 | Binary inputs | | Min. 45 | |
| 2.5.1 | Number of BI groups with common root | | Max. 4 | |
| 2.5.2 | Number of inputs per BI group with common root | | Max. 8 | |
| 2.5.3 | Rated voltage | V d.c. | 110 | |
| 2.6 | Binary outputs | 7 0.0. | Min. 4 | |
| 2.6.1 | Number of BO with common contact | | Insert | |
| 2.6.2 | Rated voltage | V d.c. | 110 | |
| 2.6.3 | Breaking capacity at inductive load with | A | 0.1 | |
| | L/R<40 ms, at rated voltage | | | |
| 2.6.4 | Current carrying capacity at rated voltage for signalling contacts, continuous | A | Insert | |
| 2.6.5 | Number of tripping contacts (high-speed out- put) | pcs. | Insert | |
| 2.6.6 | Current carrying capacity at rated voltage for tripping contacts, continuous | А | 5 | |
| 2.7 | LED indications | | | |
| 2.7.1 | Number of LED's | | Insert | |



| N - | Description | Minim | Minimum Requirements | |
|---------|--|--------|----------------------|------------|
| No. | | Unit | Data | Guaranteed |
| 2.7.2 | Multi-colour LED's | Yes/No | Insert | |
| 2.8 | Communication ports | | Yes | |
| 2.8.1 | Port for front-connected PC | | | |
| 2.8.1.1 | Protocols supported | | Insert | |
| 2.8.1.2 | Communication speed | Kbit/s | Insert | |
| 2.8.1.3 | PC side connector type | | Insert | |
| 2.8.2 | System interface | | | |
| 2.8.2.1 | Number of rear ports | | 2 | |
| 2.8.2.2 | Protocols supported | | IEC 61850 | |
| 2.8.2.3 | Communication speed | Mbit/s | Min. 100 | |
| 2.8.2.4 | Connector type | | RJ45 or FO | |
| 2.8.3 | Time synchronisation | | SNTP | |
| 2.9 | Human-machine interface | | | |
| 2.9.1 | HMI with single line diagram, measurement, | | Yes | |
| 2.9.1 | signalling and control | | Tes | |
| 2.10 | Event recorder | | | |
| 2.10.1 | Max. number of events | | Insert | |
| 2.10.2 | Time tagging resolution | ms | 1 | |
| 2.11 | Self-supervision | | Yes | |
| 2.12 | Measurement | | | |
| 2.12.1 | Voltage measurement | | Yes | |
| 2.12.2 | Frequency measurement | | Yes | |
| 2.12.3 | Current measurement | | Yes | |
| | Overall compliance with the requirement | | | |

Bay Control Units must be from the same manufacturer as substation protection system. Bay Control Units must be parameterized, configured and delivered as per Engineer's requirements.



5.2.5.13 14254 - Back-Up Control Panel

| N | Description | Minim | Minimum Requirements | |
|-------|--|------------|----------------------|------------|
| No. | | Unit | Data | Guaranteed |
| 14254 | Back-up Control Panel / Code number: 14 | 4254 | | |
| 1.1 | Scheme elements | | | |
| 1.1.1 | Switch selector for HV apparatus | pcs. | 1 | |
| 1.1.2 | Close/open push buttons for HV apparatus | | Yes | |
| 1.1.3 | Ammeter | pcs. | Min. 1 | |
| 1.1.4 | Voltmeter | pcs. | 1 | |
| 1.1.5 | Voltmeter selector switch | pcs. | 1 | |
| 1.1.6 | Local/Remote switch | | Yes | |
| 1.1.7 | Push button for lamp tests | | Yes | |
| 1.1.8 | Switchgear status indicator | | Yes | |
| 1.1.9 | Horn on/off switch | | Yes | |
| | Overall compliance with the requirement | s (yes/no) | | |

• Back-up control panel must have single-line bay diagram with indicators for switchgear status and push buttons for switchgear control for every HV apparatus in the bay.

- Design proposal of the back-up control panel is subject to Engineer's approval
- Back-up control panels should be delivered completely wired and tested.

5.2.5.14 14255 - Front Panel Annunciation for OHL & Power Transformers

| Na | Description | Minimum Requirements | | |
|-------|--|----------------------|------------|------------|
| No. | | Unit | Data | Guaranteed |
| 14255 | Front Panel annunciation for OHL & TR / C | ode numbe | er: 14255 | |
| 1.1 | Panel mounting | | Yes | |
| 1.2 | Number of inputs | | Min. 16 | |
| 1.3 | Contact type | | NO/NC | |
| 1.4 | Galvanic isolation | | Yes | |
| 1.5 | Self-monitoringvia front indicationvia relay contact | | Yes | |
| 1.6 | Response delay time | | Adjustable | |
| 1.7 | Bright LED technology | | Yes | |
| 1.8 | Audible device output | | Yes | |
| 1.9 | Lamp test button | | Yes | |
| 1.10 | Acknowledgement button | | Yes | |
| 1.11 | Horn acknowledgement button Overall compliance with the requirements | (yes/no) | Yes | |

Front panel annunciation must be parameterised, configured and delivered as per Engineer's requirements.



| | Description | Minimum Requirements | | | | |
|-------|---|----------------------|------------|------------|--|--|
| No. | | Unit | Data | Guaranteed | | |
| 14256 | Front Panel annunciation for Control Room / Code number: 14256 | | | | | |
| 1.1 | Panel mounting | | Yes | | | |
| 1.2 | Number of inputs | | Min. 48 | | | |
| 1.3 | Contact type | | NO/NC | | | |
| 1.4 | Galvanic isolation | | Yes | | | |
| 1.5 | Self-monitoring via front indication via relay contact | | Yes | | | |
| 1.6 | Response delay time | | Adjustable | | | |
| 1.7 | Bright LED technology | | Yes | | | |
| 1.8 | Audible device output | | Yes | | | |
| 1.9 | Lamp test button | | Yes | | | |
| 1.10 | Acknowledgement button | | Yes | | | |
| 1.11 | Horn acknowledgement button | | Yes | | | |
| | Overall compliance with the requirements | s (yes/no) | | | | |

5.2.5.15 14256 - Front Panel Annunciation for Control Room

Front panel annunciation must be parameterised, configured and delivered as per Engineer's requirements.

5.2.5.16 14261 - SCADA Server

| Na | Description | Minimum Requirements | | |
|-------|-----------------------------------|----------------------|---------------------|------------|
| No. | | Unit | Data | Guaranteed |
| 14261 | SCADA Server / Code number: 14261 | | | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Country of origin | | Insert | |
| 1.3 | Туре | | Insert | |
| 1.4 | Standards | | IEC | |
| 1.5 | Type of housing | | Industrial 19" rack | |
| 2. | Characteristics | | | |
| 2.1 | Auxiliary supply voltage | | | |
| 2.1.1 | Rated auxiliary supply voltage | V d.c. | 110 ±15 % | |
| 2.1.2 | Dual power supply | | Yes | |
| 2.2 | Processor type | | Insert | |
| 2.3 | Processor clock | GHz | Insert | |
| 2.4 | Memory type | | Insert | |
| 2.5 | Memory capacity | MB | Insert | |
| 2.6 | Video display adapter type | | Insert | |
| 2.7 | Video display adapter memory | | Insert | |
| 2.8 | Hard disc type | | Insert | |
| 2.9 | Rotating hard disc | Yes/No | Insert | |
| 2.10 | Hard disc capacity | GB | Insert | |
| 2.11 | Number of hard discs | pcs. | Insert | |



| No | Description | Minimum Requirements | | Cuerenteed |
|----------|---|----------------------|-----------|------------|
| No. | | Unit | Data | Guaranteed |
| 2.12 | RAID controller type | | Insert | |
| 2.13 | DVD RW type | | Insert | |
| 2.14 | Serial interface RS232 | | Yes | |
| 2.15 | Number of serial interfaces | | Min. 2 | |
| 2.16 | Fast Ethernet network interface card type | | Insert | |
| 2.17 | Number of fast Ethernet network interface cards | pcs. | 4 | |
| 2.18 | Fans | Yes/No | Insert | |
| 2.19 | Monitor 19" | pcs. | 1 | |
| 2.19.1 | Manufacturer | | Insert | |
| 2.19.2 | Country of origin | | Insert | |
| 2.19.3 | Туре | | TFT | |
| 2.19.4 | Standards | | IEC | |
| 2.19.5 | Supply voltage | | | |
| 2.19.5.1 | Rated auxiliary supply voltage | V a.c. | 110 ±15 % | |
| 2.19.5.2 | Power consumption | W | Insert | |
| 2.20 | Vertical frequency | Hz | Insert | |
| 2.21 | Max. resolution | | Insert | |
| | Overall compliance with the requirement | s (yes/no) | | |

SCADA servers must be in hot-standby redundant configuration.



5.2.5.17 14262- Operator Workstation

| No. | Description | Minimum Requirements | | 0 |
|----------|---|----------------------|----------------------|------------|
| NO. | | Unit | Data | Guaranteed |
| 14262 | Operator Workstation / Code number: 14 | 262 | | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Country of origin | | Insert | |
| 1.3 | Туре | | Insert | |
| 1.4 | Standards | | IEC | |
| 1.5 | Type of housing | | Insert | |
| 2. | Characteristics | | | |
| 2.1 | Auxiliary supply voltage | | | |
| 2.1.1 | Rated auxiliary supply voltage | V d.c. | 110 ±15 % | |
| 2.2 | Processor type | | Insert | |
| 2.3 | Processor clock | GHz | Insert | |
| 2.4 | Memory type | | Insert | |
| 2.5 | Memory capacity | MB | Insert | |
| 2.6 | Video display adapter type | | Dual head capability | |
| 2.7 | Video display adapter memory | MB | Insert | |
| 2.8 | Hard disc type | | Insert | |
| 2.9 | Rotating hard disc | Yes/No | Insert | |
| 2.10 | Hard disc capacity | GB | Insert | |
| 2.11 | Number of hard discs | pcs. | Insert | |
| 2.12 | RAID controller type | | Insert | |
| 2.13 | DVD RW type | | Insert | |
| 2.14 | Sound card type | | Insert | |
| 2.15 | Fast Ethernet network interface card type | | Insert | |
| 2.16 | Number of fast Ethernet network interface cards | pcs. | 4 | |
| 2.17 | Fans | Yes/No | Insert | |
| 2.18 | Monitor 24" | pcs. | 2 | |
| 2.18.1 | Manufacturer | | Insert | |
| 2.18.2 | Country of origin | | Insert | |
| 2.18.3 | Туре | | TFT | |
| 2.18.4 | Standards | | IEC | |
| 2.18.5 | Supply voltage | | | |
| 2.18.5.1 | Rated auxiliary supply voltage | V a.c. | 110 ±15 % | |
| 2.18.5.2 | | W | Insert | |
| 2.19 | Visible diagonal | " | Insert | |
| 2.20 | Vertical frequency | Hz | Insert | |
| 2.21 | Max. resolution | | Insert | |
| | Overall compliance with the requirement | s (yes/no) | | |



5.2.5.18 14263 - Printer

| | | Minin | num Requirements | |
|-------|---|----------|------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 14263 | Printer / Code number: 14263 | | | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Model | | Insert | |
| 1.3 | Country of origin | | Insert | |
| 1.4 | Standards | | IEC / ISO | |
| 2. | Characteristics | | | |
| 2.1 | Auxiliary supply voltage | | | |
| 2.1.1 | Rated auxiliary supply voltage | V d.c. | 110 ±15 % | |
| 2.2 | Туре | | Colour laser | |
| 2.3 | Format | | A4 | |
| 2.4 | Resolution | dpi | Insert | |
| 2.5 | Memory | MB | Insert | |
| 2.6 | Parallel port | Yes/No | Insert | |
| 2.7 | Fast Ethernet port | | Yes | |
| 2.8 | USB port | Yes/No | Insert | |
| 2.9 | Minimum speed | Page/min | Insert | |
| | Overall compliance with the requirements (yes/no) | | | |



5.2.5.19 14264- Monitoring Workstation

| Ne | Description | Minimum Requirements | | |
|----------|---|----------------------|-----------|------------|
| No. | | Unit | Data | Guaranteed |
| 14264 | Monitoring Workstation / Code number: 1 | 4264 | | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Country of origin | | Insert | |
| 1.3 | Туре | | Insert | |
| 1.4 | Standards | | IEC | |
| 1.5 | Type of housing | | Insert | |
| 2. | Characteristics | | | |
| 2.1 | Auxiliary supply voltage | | | |
| 2.1.1 | Rated auxiliary supply voltage | V d.c. | 110 ±15 % | |
| 2.2 | Processor type | | Insert | |
| 2.3 | Processor clock | GHz | Insert | |
| 2.4 | Memory type | | Insert | |
| 2.5 | Memory capacity | MB | Insert | |
| 2.6 | Video display adapter type | | Insert | |
| 2.7 | Video display adapter memory | MB | Insert | |
| 2.8 | Hard disc type | | Insert | |
| 2.9 | Rotating hard disc | Yes/No | Insert | |
| 2.10 | Hard disc capacity | GB | Insert | |
| 2.11 | Number of hard discs | pcs. | Insert | |
| 2.12 | RAID controller type | | Insert | |
| 2.13 | DVD RW type | | Insert | |
| 2.14 | Sound card type | | Insert | |
| 2.15 | Serial interface RS232 | | Yes | |
| 2.16 | Fast Ethernet network interface card type | | Insert | |
| 2.17 | Number of fast Ethernet network interface cards | pcs. | 1 | |
| 2.18 | Fans | Yes/No | Insert | |
| 2.19 | Monitor 24" | pcs. | 1 | |
| 2.19.1 | Manufacturer | | Insert | |
| 2.19.2 | Country of origin | | Insert | |
| 2.19.3 | Туре | | TFT | |
| 2.19.4 | Standards | | IEC | |
| 2.19.5 | Supply voltage | | | |
| 2.19.5.1 | | V a.c. | 110 ±15 % | |
| 2.19.5.2 | | W | Insert | |
| 2.20 | Vertical frequency | Hz | Insert | |
| 2.21 | Max. resolution | | Insert | |
| | Overall compliance with the requirements | s (yes/no) | | |



5.2.5.20 14273- Ethernet Switch Process LAN

| Ne | Description | Mini | Cuerenteed | |
|--------|---|------------|---|------------|
| No. | | Unit | Data | Guaranteed |
| 14273 | Ethernet Switch-Process LAN / Code num | nber: 1427 | ' 3 | |
| 1.1 | Terminal Type | | Insert | |
| 1.2 | Terminal version (software version) | | Insert | |
| 1.3 | Standards | | IEC | |
| 2. | Characteristics | | | |
| 2.1 | Auxiliary supply voltage | | | |
| 2.1.1 | Rated auxiliary supply voltage | V d.c. | 110 ±15 % | |
| 2.1.2 | Dual power supply | V 0.0. | Yes | |
| 2.2 | Ethernet ports | | 100 | |
| 2.2.1 | Number of ports | | Min. 6xRJ45 or Min. 6xFO for IED con- nections AND 2xFO (1 GB) for process LAN | |
| 2.2.1 | Type of ports | | RJ45 or FO and Fibre Optical (1 GB) | |
| 2.3 | Immunity to EMI and heavy electrical surges | | Insert | |
| 2.4 | Temperature range | | | |
| 2.4.1 | Operation | | 050°C | |
| 2.4.2 | Storage | | –20+70°C | |
| 2.5 | Switching method an layer | | Store & Forward Layer 3 (IEC 61850), RSTP (802.1w); eRSTP [™] or RSTP (802.1D-2004) network fault recovery | |
| 2.6 | Switching latency | | ≤ 5µs | |
| 2.7 | Switching bandwidth | | ≤ 1.6 Gbps | |
| 2.8 | Failsafe output relay | | Potential-free | |
| 2.9 | Cyber security features | | | |
| 2.9.1 | Multi-level passwords | | Yes | |
| 2.9.2 | SSH/SSL encryption | | Yes | |
| 2.9.3 | Enable/disable ports, MAC based port security | | Yes | |
| 2.9.4 | Port based network access control | | Yes | |
| 2.10 | System features | | | |
| 2.10.1 | Automatic learning negotiation and crossover detection | | | |
| 2.10.2 | Port configuration, status, statistics, mirroring, security | | | |
| 2.10.3 | Network fault recovery | | ≤ 5 ms | |
| 2.11 | Type Test Reports | | To be included with bid | |
| 2.12 | Installation | | Indoor | |
| | Overall compliance with the requirements | s (yes/no) | | |

Technical characteristics of optical ports of process LAN Ethernet switches must comply with appropriate characteristics of fibre optic cables for protection and control (see Code No. 14296).



5.2.5.21 14274 - Ethernet Switch Control Room

| | Description | Mini | mum Requirements | |
|--------|---|------------|-------------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 14274 | Ethernet Switch-Control Room / Code nu | mber: 142 | 74 | |
| 1.1 | Terminal Type | | Insert | |
| 1.2 | Terminal version (software version) | | Insert | |
| 1.3 | Standards | | IEC | |
| 2. | Characteristics | | | |
| 2.1 | Auxiliary supply voltage | | | |
| 2.1.1 | Rated auxiliary supply voltage | V d.c. | 110 ±15 % | |
| 2.1.2 | Dual power supply | | Yes | |
| 2.2 | Ethernet ports | | | |
| 2.2.1 | Number of ports | | Min. 16 | |
| 2.2.1 | Type of ports | | RJ45 | |
| 2.3 | Immunity to EMI and heavy electrical surges | | Insert | |
| 2.4 | Temperature range | | | |
| 2.4.1 | Operation | | 050°C | |
| 2.4.2 | Storage | | –20+70°C | |
| | | | Store & Forward Layer 3 | |
| | | | (IEC 61850), RSTP | |
| 2.5 | Switching method an layer | | (802.1w); eRSTPTM or | |
| | | | RSTP (802.1D-2004) | |
| | | | network fault recovery | |
| 2.6 | Switching latency | | ≤ 5µs | |
| 2.7 | Switching bandwidth | | ≤ 1.6 Gbps | |
| 2.8 | Failsafe output relay | | Potential-free | |
| 2.9 | Cyber security features | | | |
| 2.9.1 | Multi-level passwords | | Yes | |
| 2.9.2 | SSH/SSL encryption | | Yes | |
| 2.9.3 | Enable/disable ports, MAC based port security | | Yes | |
| 2.9.4 | Port based network access control | | Yes | |
| 2.10 | System features | | | |
| 2.10.1 | Automatic learning negotiation and crossover detection | | | |
| 2.10.2 | Port configuration, status, statistics, mirroring, security | | | |
| 2.10.3 | Network fault recovery | | ≤ 5 ms | |
| 2.11 | Type Test Reports | | To be included with bid | |
| 2.12 | Installation | | Indoor | |
| | Overall compliance with the requirements | s (yes/no) | | |



5.2.5.22 14281 - Protection Monitoring Software

| Na | Description | Minin | num Requirements | C | |
|-------|---|-------|------------------|------------|--|
| No. | Description | Unit | Data | Guaranteed | |
| 14281 | Protection Monitoring Software / Code number: 14281 | | | | |
| 1.1 | Protection Monitoring Software | | | | |
| 1.1.1 | Communication with protection terminals | | Yes | | |
| 1.1.2 | Protection terminal configuration | | Yes | | |
| 1.1.3 | Protection terminal parameter setting | | Yes | | |
| 1.1.4 | Disturbance data collecting | | Yes | | |
| 1.1.5 | Disturbance data analysing | | Yes | | |
| 1.1.6 | Other software: | | Insert | | |
| | Overall compliance with the requirements (yes/no) | | | | |



5.2.5.23 14282 - SCADA Software

| NI- | Description | Minim | mum Requirements | |
|-------|---|------------|------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 14282 | SCADA Software / Code number: 14282 | | | |
| 1.1 | Basic SCADA server software | | | |
| 1.1 | Basic SCADA server software | pcs. | 2 | |
| 1.1.1 | Communication with 2 higher level control centres | | Yes | |
| 1.1.2 | Real-time database management | | Yes | |
| 1.1.3 | Data processing | | Yes | |
| 1.1.4 | Data acquisition | | Yes | |
| 1.1.5 | Alarm and event processing | | Yes | |
| 1.1.6 | Data archiving | | Yes | |
| 1.1.7 | Report generation and printing | | Yes | |
| 1.1.8 | Redundancy management | | Yes | |
| 1.2 | Operator workstation software | pcs. | 2 | |
| 1.3 | Communication software | pcs. | 2 | |
| 1.3.1 | Communication with 2 higher level control centres | | Yes | |
| 1.4 | Application libraries | pcs. | 1, optional | |
| 1.5 | Software tools | pcs. | 1 | |
| 1.5.1 | Database creating, maintaining and viewing | | Yes | |
| 1.5.2 | User interface definition | | Yes | |
| 1.5.3 | Report definition | | Yes | |
| 1.5.4 | System configuration | | Yes | |
| 1.5.5 | Historical data maintaining | | Yes | |
| 1.5.6 | Database and historical data export/import | | Yes | |
| 1.5.7 | Analysis and diagnostic tools | | Yes | |
| 1.5.8 | Training simulator | | Yes | |
| 1.5.9 | Other software tools according to Contractor's concept: | | Insert | |
| | Overall compliance with the requirements | s (yes/no) | | |



| | | Minir | imum Requirements | |
|-------|---|------------|--|------------|
| No. | Description | Unit | Data | Guaranteed |
| 14298 | Fibre Optic Cables & Terminal Equipmen | t / Code n | umber: 14298 | |
| | Sufficient quantity of adequate glass fibre op- | | | |
| 1.1 | tic cables for overall Protection & Control & | | Yes | |
| 1.1 | Monitoring & Metering system should be fore- | | 165 | |
| | seen and included in the bid. | | | |
| 1.2 | Below proposed quantities shall be verified | | Yes | |
| 1.2 | according to specific Bidder's design. | | 100 | |
| | Final quantities must be estimated and deliv- | | | |
| 1.3 | ered as per Single Line Diagram and Substa- | | Yes | |
| | tion layouts. | | | |
| | At least 20% spare in cable length, as well as | | | |
| 1.4 | in number of fibres in cable, should be fore- | | Yes | |
| | | | | |
| 1.5 | Fibre optic ducted cables shall be foreseen. | | Yes | |
| 1.6 | Type of fibre optic | | Multimode | |
| 1.7 | Number of fibres in cable | | Min. 4 | |
| 1.8 | Operational Wave length | | Insert | |
| 1.9 | Attenuation factor maximum | | Insert | |
| 1.10 | Band-width minimum | | Insert | |
| 1.11 | Manufacturer | | Insert | |
| 2. | Characteristics | | | |
| | Fibre optic terminations | | | |
| | Overall quantities of specific fibre optic termi- | | | |
| | nations should be closely related to number of | | | |
| 2.1 | fibres in each cable (each fibre, used or spare, | | Yes | |
| | should be properly terminated). | | | |
| | At least 20% spare terminations for each pro- | | | |
| | posed type should be foreseen. | | | |
| 2.1.1 | Plug connectors type | | Insert | |
| 2.1.2 | Connection technology | | Insert | |
| 2.1.3 | Plug pin type | | Insert | |
| 2.1.4 | Manufacturer | | Insert | |
| | Optical distributor with connectors | | | |
| | Overall quantity of optical distributor with con- | | | |
| | nectors should be closely related to number of | | | |
| 2.2 | relay houses. Optical distributors with con- | | Yes | |
| | nectors should be foreseen for both cable | | | |
| | ends. At least 10% spare optical distributors | | | |
| | with connectors should be foreseen. | | | |
| 2.2.1 | Fibre optic cable gland | | To accept metal- free optical cable | |
| 2.2.3 | Patch-cord connection | | Yes | |
| 2.2.4 | Type of optical connectors | | Insert | |
| 2.2.5 | Manufacturer | | Insert | |

5.2.5.24 14298 - Fibre Optic Cables & Terminal Equipment



| Ne | Description | Minimum Requirements | Guaranteed | |
|-----|---|----------------------|------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 2.3 | Patch-cord with optical connectors Overall quantity of fibre optic patch-cord cables should be closely related to number of protec- tion and control devices (terminals) in each par- ticular relay house. At least 20% spare patch-cord cables should be foreseen. | | Yes | |
| | Overall compliance with the requirements (yes/no) | | | |

- Quantities and specifications of optical distributor with connectors and patch cord with optical connectors predicted according to the optical ring configuration for control and according to the configuration of busbar protection.
- Technical characteristics of fibre optic cables for protection and control have influence on optical ports characteristics of process LAN Ethernet switches.

5.2.5.25 14299 - Special Control Equipment and Tools

| Na | Description | Minir | num Requirements | Cuerente e d |
|-------|---|----------|------------------|--------------|
| No. | Description | Unit | Data | Guaranteed |
| 14299 | Special Control Equipment and Tools / Co | ode numb | er: 14299 | |
| 1.1 | Special Control Equipment and Tools | | | |
| 1.1.1 | Special equipment and tools for setting, repair- ing, handling and maintaining of control system | set | 1 | |
| 1.1.2 | Software needed for configuration, setting, commissioning, testing, communication, interfac- ing with substation system | set | 1 | |
| 1.1.3 | Laptop brand-name computer | pcs. | 2 | |
| 1.1.4 | Test plugs, including all necessary accessories (transport case, cables, plugs, etc.) | set | 2 | |
| | Overall compliance with the requirements (yes/no) | | | |





| No. | Description | Minin | num Requirements | Guerenteed |
|-------|--|----------|---|------------|
| NO. | | Unit | Data | Guaranteed |
| 14003 | Protection Terminal 132 kV OHL Main 1 / 0 | ode numb | per: 14003 | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Country of origin | | Insert | |
| 1.3 | Terminal type | | Insert | |
| 1.4 | Terminal version (software version) | | Insert | |
| 1.5 | Standards | | IEC | |
| 2. | Characteristics | | - | |
| 2.1 | Auxiliary supply voltage | | | |
| 2.1.1 | Rated auxiliary supply voltage | V d.c. | 110 ±15 % | |
| | Interruption in auxiliary d.c. voltage: | | | |
| 2.1.2 | Without resetting | ms | > 50 | |
| | Restart time | S | Insert | |
| 2.2 | a.c. current inputs | | | |
| 2.2.1 | Number of inputs | | Min. 4 | |
| 2.2.2 | Rated current Ir | А | 1 | |
| 2.2.3 | Permissive overload, continuous | | 4xlr | |
| 2.2.4 | Permissive overload, 1 s | | 100xlr | |
| 2.2.5 | Burden at Ir | VA | < 0.5 | |
| 2.3 | a.c. voltage inputs | | | |
| 2.3.1 | Number of inputs | | Min. 4 | |
| 2.3.2 | Rated voltage Ph-Ph Ur | V | 100 | |
| 2.3.3 | Permissive overload, continuous | % Ur | 150 | |
| 2.3.4 | Permissive overload, 1 s | % Ur | 250 | |
| 2.3.5 | Burden at Ur | VA | < 0.3 | |
| 2.4 | Binary inputs | | Min. 16 | |
| 2.4.1 | Number of BI groups with common root | | Insert | |
| 2.4.2 | Number of inputs per BI group with common root | | < 8 | |
| 2.4.3 | Rated voltage | V d.c. | 110 ±15 % | |
| 2.5 | Binary outputs | | Min. 16 (code 14004) Min. 24 (code 14004A) | |
| 2.5.1 | Number of modules | | Insert | |
| 2.5.2 | Number of outputs per group with common root | | Max. 3 | |
| 2.5.3 | Rated voltage | V d.c. | 110 ±15 % | |
| 2.5.5 | Breaking capacity at inductive load with L/R<40 ms, at rated voltage | А | 0.1 | |
| 2.5.6 | Current carrying capacity at rated voltage for signalling contacts, continuous | А | Insert | |
| 2.5.7 | Number of tripping contacts (high-speed output) | pcs. | 6 | |
| | Current carrying capacity at rated voltage for | • | | |
| 2.5.8 | tripping contacts, continuous | A | 5 | |
| 2.6 | LED indications | | | |
| 2.6.1 | Number of LED's | | Insert | |
| 2.6.2 | Multi-colour LED's | Yes/No | Insert | |

5.2.5.26 14003 - Protection Terminal 132 kV OHL Main 1



| | - | Mini | Minimum Requirements | | |
|---------|---|--------|------------------------|------------|--|
| No. | Description | Unit | Data | Guaranteed | |
| 2.7 | Communication ports | | Yes | | |
| 2.7.1 | Port for front-connected PC | | | | |
| 2.7.1.1 | Protocols supported | | Insert | | |
| 2.7.1.2 | Communication speed | Kbit/s | Insert | | |
| 2.7.1.3 | PC side connector type | | Insert | | |
| 2.7.2 | System interface | | | | |
| 2.7.2.1 | Number of rear ports | | 2 | | |
| 2.7.2.2 | Protocols supported | | IEC 61850 | | |
| 2.7.2.3 | Communication speed | Mbit/s | Min. 100 | | |
| 2.7.2.4 | Connector type | | RJ45 or FO | | |
| 2.7.3 | Time synchronisation | | SNTP | | |
| 2.8 | Human-machine interface | | Yes | | |
| 2.8.1 | LCD alphanumeric display, No. of rows | | Insert | | |
| 2.9 | Number of setting parameter groups | | Min. 4 | | |
| 2.10 | Line differential protection | | | | |
| 2.10.1 | Sensitive differential current trip stage | | Yes | | |
| 2.10.2 | High current differential trip stage | | Yes | | |
| 2.10.3 | Inrush restraint 2 nd harmonic | | Yes | | |
| 2.10.4 | Cross-block function | | Yes | | |
| 2.10.5 | Operating time, typical | ms | < 30 | | |
| 2.10.6 | Resetting time at I _{diff} =0 | ms | Insert | | |
| 2.10.7 | Transfer trip operating time | ms | < 40 | | |
| 2.11 | Remote end data communication | | | | |
| 2.11.1 | Transmission type | | Insert | | |
| 2.11.2 | Data transfer rate | Kbit/s | Insert | | |
| 2.11.3 | FO protection interface | | | | |
| | Type of fibre optic | μm | Insert | | |
| | Connector type | - F | Insert | | |
| | Wavelength | nm | 1300 | | |
| | Optical transmitter injected power | dBm | Insert | | |
| | Optical receiver sensitivity | dBm | Insert | | |
| | Transmission distance (estimated) | km | Min. 15 | | |
| 2.12 | Back-up Distance protection | | | | |
| 2.12.1 | Number of protection zones | | Min. 4 | | |
| 2.12.2 | Operating time | ms | < 35 | | |
| 2.12.3 | Operating characteristic | | quadrilateral | | |
| 2.12.4 | Zone 1 direction software selectable | | Insert | | |
| 2.12.5 | Zone 2 direction software selectable | | Insert | | |
| 2.12.6 | Zone 3 direction software selectable | | Insert | | |
| 2.12.7 | Zone 4 direction software selectable | | Insert | | |
| 2.12.8 | Minimum impedance setting | Ω | Insert | | |
| 2.12.9 | Full scheme protection phase segregated | | Yes | | |
| 2.13 | Communication scheme logic | | | | |
| | | | Intertrip | | |
| | | | Permissive under-reach | | |
| 2.13.1 | Operational modes | | Permissive overreach | | |
| | | | Blocking | | |



| | | Minim | um Requirements | 0 | |
|----------|--|--------|-----------------|------------|--|
| No. | Description | Unit | Data | Guaranteed | |
| 2.14 | Power swing detection | | Yes | | |
| | Secondary circuits supervision: | | | | |
| 2.15 | VT circuits supervision | | Yes | | |
| | CT circuits supervision | | Yes | | |
| | Automatic switch onto fault logic | | | | |
| 2.16 | Impedance criteria | | Yes | | |
| | Instantaneous overcurrent criteria | | Yes | | |
| 2.17 | Multistage three-phase overcurrent protection | | | | |
| 2.17.1 | Directional | | Insert | | |
| 2.17.2 | Number of stages | | Min. 2 | | |
| 2.17.3 | Setting range | % Ir | Insert | | |
| 2.17.4 | Characteristics | | | | |
| 2.17.4.1 | Definite time delayed | Yes/no | Yes | | |
| 2.17.4.2 | Normal inverse | Yes/No | Yes | | |
| 2.17.4.3 | Very inverse | Yes/No | Insert | | |
| | Extremely inverse | Yes/No | Insert | | |
| 2.18 | Multistage earth fault overcurrent protection | | | | |
| 2.18.1 | Directional | | Insert | | |
| 2.18.2 | Number of stages | | Min. 2 | | |
| 2.18.3 | Setting range | % Ir | Insert | | |
| 2.18.4 | Type of protection | | Non-directional | | |
| 2.18.5 | Characteristics | | | | |
| | Definite time delayed | Yes/no | Yes | | |
| | Normal inverse | Yes/No | Yes | | |
| | Very inverse | Yes/No | Insert | | |
| | Extremely inverse | Yes/No | Insert | | |
| 2.19 | Current negative sequence protection | | | | |
| 2.19.1 | Number of stages | | Insert | | |
| 2.19.2 | Setting range | % Ir | Insert | | |
| 2.19.3 | Characteristic | | Insert | | |
| 2.20 | Directional earth fault protection | | | | |
| 2.20.1 | Number of stages | | Insert | | |
| 2.20.2 | Setting range | % Ir | Insert | | |
| 2.20.3 | Type of protection | ,,,,,, | Directional | | |
| 2.20.4 | Characteristics | 1 | 2 / ookondi | | |
| 2.20.4.1 | | Yes/no | Yes | | |
| | Normal inverse | Yes/No | Yes | | |
| | Very inverse | Yes/No | Insert | | |
| | Extremely inverse | Yes/No | Insert | | |
| 2.20.4.4 | Minimum polarizing voltage | % Ur | 3 % | | |
| 2.20.5 | Communication scheme logic | 70 01 | Yes | | |
| 2.20.6.1 | Permissive and blocking | + + | Yes | | |
| 2.20.0.1 | Single and three-pole tripping schemes | | Yes | | |
| 2.20.7 | Power system supervision | + + | 160 | | |
| | Broken conductor check | + + | Yes | | |
| 2.21.1 | | + + | 162 | | |
| 2.21.2 | Overload protection | 0/ lr | Incort | | |
| 2.21.2.1 | Setting range of 1 stage | % Ir | Insert | | |



| | | Minim | um Requirements | ts |
|----------|---|-------|-----------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 2.21.2.2 | Time delay range of 1 stage | min | > 20 | |
| 2.21.2.3 | Setting range of 2 stage | % Ir | Insert | |
| 2.21.2.4 | Time delay range of 2 stage | S | > 20 | |
| 2.21.2.5 | Blocking external (system or HMI) | | Yes | |
| 2.22 | Autoreclosing | | | |
| 2.22.1 | Number of shots | | Min. 2 | |
| 2.22.2 | AR program | | 1/3 pole | |
| 2.22.3 | Reclosing pulse duration | S | Insert | |
| 2.22.4 | Dead time range | S | Insert | |
| 2.22.5 | Counters for AR operation | | Yes | |
| 2.22.6 | Inhibit time range | S | Insert | |
| 2.22.7 | Reclaim time range | S | Insert | |
| 2.22.8 | Synchronism & energising check during 3 ph | | Yes | |
| 2.22.0 | AR | | 165 | |
| 2.22.9 | Evolving faults treatment | | Yes | |
| | AR blocking for CB not ready | | Yes | |
| 2.22.11 | AR operation 1/3ph in 1 st and 2 nd zone | | Yes | |
| 2.23 | Synchronism & energising check | | | |
| 2.23.1 | Frequency difference range | mHz. | Insert | |
| 2.23.2 | Voltage difference range | % Ur | Insert | |
| 2.23.3 | Phase difference range | 0 | Insert | |
| 2.23.4 | Operating time for synchro check function | ms | Insert | |
| 2.23.5 | Operating time for energising check function | ms | Insert | |
| 2.24 | Disturbance recorder | | | |
| 2.24.1 | Number of digital signals | | Min. 40 | |
| 2.24.2 | Number of analogue signals | | Min. 8 | |
| 2.24.3 | External/manual initiation of recording | | Insert | |
| 2.24.4 | Sampling rate | kHz | Insert | |
| 2.24.5 | Pre-fault time | ms | ≥ 300 | |
| 2.24.6 | Recording time | ms | ≥ 2000 | |
| 2.24.7 | Number of recorded disturbances | | Min. 5 | |
| 2.24.8 | Total recording time with max. analogue and bi- nary signals | s | > 10 | |
| 2.24.9 | Output file Comtrade format | | Yes | |
| 2.25 | Event recorder | | | |
| 2.25.1 | Max. number of events | | Insert | |
| 2.25.2 | Time tagging resolution | ms | 1 | |
| 2.26 | Fault locator, measurement in (km) | | Yes | |
| 2.27 | Self-supervision | | Yes | |
| 2.28 | Measurement | | | |
| 2.28.1 | Active power measurement | | Yes | |
| 2.28.2 | Reactive power measurement | | Yes | |
| 2.28.3 | Voltage measurement | | Yes | |
| 2.28.4 | Current measurement | | Yes | |



| Nia | Description | Minimum Requirements | | Quantum ta a d |
|-----|--|----------------------|------|----------------|
| No. | Description | Unit | Data | Guaranteed |
| 3. | Additional requirements | | | |
| 3.1 | Test socket | | Yes | |
| 3.2 | Setting and configuration of Protection Terminal approved by Engineer | | Yes | |
| | Overall compliance with the requirements (yes/no) | | | |



| | Description | Minin | Minimum Requirements | | |
|-------|--|-----------|-----------------------|------------|--|
| No. | | Unit | Data | Guaranteed | |
| 14004 | Protection Terminal 132 kV OHL Main 2 / 0 | Code numb | per: 14004 | | |
| 1.1 | Manufacturer | | Different than Main 1 | | |
| 1.2 | Country of origin | | Insert | | |
| 1.3 | Terminal type | | Insert | | |
| 1.4 | Terminal version (software version) | | Insert | | |
| 1.5 | Standards | | IEC | | |
| 2. | Characteristics | | | | |
| 2.1 | Auxiliary supply voltage | | | | |
| 2.1.1 | Rated auxiliary supply voltage | V d.c. | 110 ±15 % | | |
| 2.1.1 | Interruption in auxiliary d.c. voltage: | V 0.0. | 110 110 /0 | | |
| 2.1.2 | Without resetting | ms | > 50 | | |
| 2.1.2 | Restart time | s | Insert | | |
| 2.2 | a.c. current inputs | 5 | insert | | |
| 2.2.1 | Number of inputs | | Min. 4 | | |
| 2.2.2 | Rated current Ir | Α | 1 | | |
| 2.2.2 | Permissive overload, continuous | | 4xlr | | |
| 2.2.3 | Permissive overload, 1 s | | 100xlr | | |
| 2.2.4 | Burden at Ir | VA | < 0.5 | | |
| 2.2.5 | | VA | < 0.5 | | |
| 2.3 | a.c. voltage inputs Number of inputs | | Min 4 | | |
| | • | V | Min. 4 | | |
| 2.3.2 | Rated voltage Ph-Ph Ur | | 100 | | |
| 2.3.3 | Permissive overload, continuous | % Ur | 150 | | |
| 2.3.4 | Permissive overload, 1 s | % Ur | 250 | | |
| 2.3.5 | Burden at Ur | VA | < 0.3 | | |
| 2.4 | Binary inputs | | Min. 16 | | |
| 2.4.1 | Number of BI groups with common root | | Insert | | |
| 2.4.2 | Number of inputs per BI group with common root | | < 8 | | |
| 2.4.3 | Rated voltage | V d.c. | 110 ±15 % | | |
| 2.5 | Binary outputs | | Min. 16 | | |
| 2.5.1 | Number of modules | | Insert | | |
| 2.5.2 | Number of outputs per group with common root | | Max. 3 | | |
| 2.5.3 | Rated voltage | V d.c. | 110 ±15 % | | |
| 2.5.4 | Breaking capacity at inductive load with L/R<40 ms, at rated voltage | A | 0.1 | | |
| 2.5.5 | Current carrying capacity at rated voltage for | Α | Insert | | |
| 255 | signalling contacts, continuous | | 6 | | |
| 2.5.6 | Number of tripping contacts (high-speed output) | pcs. | 6 | | |
| 2.5.7 | Current carrying capacity at rated voltage for tripping contacts, continuous | Α | 5 | | |
| 26 | LED indications | | | | |
| 2.6 | | | Incort | | |
| 2.6.1 | Number of LED's | Voc/No | Insert | | |
| 2.6.2 | Multi-colour LED's | Yes/No | Insert | L | |

5.2.5.27 14004 - Protection Terminal 132 kV OHL Main 2



| | | Minir | Minimum Requirements | | |
|----------|--|--------|---|------------|--|
| No. | Description | Unit | Data | Guaranteed | |
| 2.7 | Communication ports | | Yes | | |
| 2.7.1 | Port for front-connected PC | | | | |
| 2.7.1.1 | Protocols supported | | Insert | | |
| 2.7.1.2 | Communication speed | Kbit/s | Insert | | |
| 2.7.1.3 | PC side connector type | | Insert | | |
| 2.7.2 | System interface | | | | |
| 2.7.2.1 | Number of rear ports | | 2 | | |
| 2.7.2.2 | Protocols supported | | IEC 61850 | | |
| 2.7.2.3 | Communication speed | Mbit/s | Min. 100 | | |
| 2.7.2.4 | Connector type | | RJ45 or FO | | |
| 2.7.3 | Time synchronisation | | SNTP | | |
| 2.8 | Human-machine interface | | Yes | | |
| 2.8.1 | LCD alphanumeric display, No. of rows | | Insert | | |
| 2.9 | Number of setting parameter groups | | Min. 4 | | |
| 2.10 | Distance protection | | | | |
| 2.10.1 | Number of protection zones | | Min. 5 | | |
| 2.10.2 | Basic operating time | ms | < 30 | | |
| 2.10.3 | Operational characteristic | | Quadrilateral | | |
| 2.10.4 | Zone 1 direction software selectable | | Insert | | |
| 2.10.5 | Zone 2 direction software selectable | | Insert | | |
| 2.10.6 | Zone 3 direction software selectable | | Insert | | |
| 2.10.7 | Zone 4 direction software selectable | | Insert | | |
| 2.10.8 | Zone 5 direction software selectable | | Insert | | |
| 2.10.9 | Minimum impedance setting | Ω | Insert | | |
| 2.11 | Communication scheme logic | | | | |
| 2.11.1 | Operational modes | | Intertrip Permissive under-reach Permissive overreach Blocking | | |
| 2.12 | Power swing detection | | Yes | | |
| | Secondary circuits supervision: | | | | |
| 2.13 | VT circuits supervision | | Yes | | |
| | CT circuits supervision | | Yes | | |
| | Automatic switch onto fault logic | | | | |
| 2.14 | Impedance criteria | | Yes | | |
| | Instantaneous overcurrent criteria | | Yes | | |
| 2.15 | Multistage three-phase overcurrent protection | | | | |
| 2.15.1 | Directional | | Insert | | |
| 2.15.2 | Number of stages | | Min. 2 | | |
| 2.15.3 | Setting range | % Ir | Insert | | |
| 2.15.4 | Characteristics | | | | |
| 2.15.4.1 | Definite time delayed | Yes/no | Yes | | |
| 2.15.4.2 | Normal inverse | Yes/No | Yes | | |
| 2.15.4.3 | Very inverse | Yes/No | Insert | | |
| 2.15.4.4 | Extremely inverse | Yes/No | Insert | | |
| 2.16 | Multistage earth fault overcurrent protection | | | | |
| 2.16.1 | Directional | | Insert | | |



| N | Description | Minimum Requirements | | Quantational |
|----------|--|----------------------|-----------------|--------------|
| No. | Description | Unit | Data | Guaranteed |
| 2.16.2 | Number of stages | | Min. 2 | |
| 2.16.3 | Setting range | % Ir | Insert | |
| 2.16.4 | Type of protection | | Non-directional | |
| 2.16.5 | Characteristics | | | |
| 2.16.5.1 | | Yes/no | Yes | |
| | Normal inverse | Yes/No | Yes | |
| | Very inverse | Yes/No | Insert | |
| | Extremely inverse | Yes/No | Insert | |
| 2.17 | Directional earth fault protection | | | |
| 2.17.1 | Number of stages | | Insert | |
| 2.17.2 | Setting range | % Ir | Insert | |
| 2.17.3 | Type of protection | | Directional | |
| 2.17.4 | Characteristics | | | |
| 2.17.4.1 | | Yes/no | Yes | |
| | Normal inverse | Yes/No | Yes | |
| | Very inverse | Yes/No | Insert | |
| | Extremely inverse | Yes/No | Insert | |
| 2.17.5 | Minimum polarizing voltage | % Ur | 3 % | |
| 2.17.6 | Communication scheme logic | 70 01 | Yes | |
| 2.17.6.1 | Permissive and blocking | | Yes | |
| 2.17.0.1 | Single and three-pole tripping schemes | | Yes | |
| 2.17.7 | Current negative sequence protection | | 163 | |
| 2.18.1 | Number of stages | | Insert | |
| 2.18.2 | - | % Ir | Insert | |
| 2.18.3 | Setting range Characteristic | 70 11 | Definite time | |
| | | | Dennite time | |
| 2.19 | Power system supervision | | Vee | |
| 2.19.1 | Broken conductor check | | Yes | |
| 2.19.2 | Overload protection | 0/ 1- | la e est | |
| | Setting range of 1 stage | % Ir | Insert | |
| | Time delay range of 1 stage | min | > 20 | |
| | Setting range of 2 stage | % Ir | Insert | |
| | Time delay range of 2 stage | S | > 20 | |
| 2.19.2.5 | Blocking external (system or HMI) | | Yes | |
| 2.19.3 | Additional supervision functions (thermal state, | | Insert | |
| | etc.) | | | |
| 2.20 | Autoreclosing | | | |
| 2.20.1 | Number of shots | | Min. 2 | |
| 2.20.2 | AR program | | 1/3 pole | |
| 2.20.3 | Reclosing pulse duration | S | Insert | |
| 2.20.4 | Dead time range | S | Insert | |
| 2.20.5 | Counters for AR operation | + | Yes | |
| 2.20.6 | Inhibit time range | s | Insert | |
| 2.20.7 | Reclaim time range | S | Insert | |
| 2.20.8 | Synchronism & energising check during 3 ph AR | | Yes | |
| 2.20.9 | Evolving faults treatment | | Yes | |
| 2.20.10 | AR blocking for CB not ready | | Yes | |



| N | Description | Minimum Requirements | | Guaranteed |
|---------|---|----------------------|---------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 2.20.11 | AR operation 1/3ph in 1 st and 2 nd zone | | Yes | |
| 2.21 | Synchronism & energising check | | | |
| 2.21.1 | Frequency difference range | mHz. | Insert | |
| 2.21.2 | Voltage difference range | % Ur | Insert | |
| 2.21.3 | Phase difference range | 0 | Insert | |
| 2.21.4 | Operating time for synchro check function | ms | Insert | |
| 2.21.5 | Operating time for energising check function | ms | Insert | |
| 2.22 | Disturbance recorder | | | |
| 2.22.1 | Number of digital signals | | Min. 40 | |
| 2.22.2 | Number of analogue signals | | Min. 8 | |
| 2.22.3 | External/manual initiation of recording | | Yes | |
| 2.22.4 | Sampling rate | kHz | Insert | |
| 2.22.5 | Pre-fault time | ms | ≥ 300 | |
| 2.22.6 | Recording time | ms | ≥ 2000 | |
| 2.22.7 | Number of recorded disturbances | | Min. 5 | |
| 2.22.8 | Total recording time with max. analogue and bi- | | > 10 | |
| 2.22.0 | nary signals | S | > 10 | |
| 2.22.9 | Output file Comtrade format | | Yes | |
| 2.23 | Event recorder | | | |
| 2.23.1 | Max. number of events | | Insert | |
| 2.23.2 | Time tagging resolution | ms | 1 | |
| 2.24 | Fault locator, measurement in (km) | | Yes | |
| 2.25 | Self-supervision | | Yes | |
| 2.26 | Measurement | | | |
| 2.26.1 | Active power measurement | | Yes | |
| 2.26.2 | Reactive power measurement | | Yes | |
| 2.26.3 | Voltage measurement | | Yes | |
| 2.26.4 | Current measurement | | Yes | |
| 3. | Additional requirements | | | |
| 3.1 | Test socket | | Yes | |
| 3.2 | Setting and configuration of Main Protection Ter- minal approved by Engineer | | Yes | |
| | Overall compliance with the requirements | (yes/no) | | |



| NI- | Description | Minimum Requirements | | |
|-------|---|----------------------|---------------------|------------|
| No. | | Unit | Data | Guaranteed |
| 14005 | Protection Terminal for Power Transform | ers Main 1 | / Code number: 1400 | 5 |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Country of origin | | Insert | |
| 1.3 | Terminal type | | Insert | |
| 1.4 | Terminal version (software version) | | Insert | |
| 1.5 | Standards | | IEC | |
| 2. | Characteristics | | | |
| 2.1 | Auxiliary supply voltage | | | |
| 2.1.1 | Rated auxiliary supply voltage | V d.c. | 110 ±15 % | |
| | Interruption in auxiliary d.c. voltage: | | | |
| 2.1.2 | Without resetting | ms | > 50 | |
| | Restart time | S | Insert | |
| 2.2 | a.c. current inputs | | | |
| 2.2.1 | Number of inputs | | Min. 9 | |
| 2.2.2 | Rated current Ir | А | 1 | |
| 2.2.3 | Permissive overload, continuous | | 4xlr | |
| 2.2.4 | Permissive overload, 1 s | | 100xlr | |
| 2.2.5 | Burden at Ir | VA | < 0.5 | |
| 2.3 | a.c. voltage inputs | | < 0.5 | |
| 2.3.1 | Number of inputs | | Min 4 | |
| 2.3.1 | Rated voltage Ph-Ph Ur | V | 100 | |
| 2.3.2 | Permissive overload, continuous | v % Ur | 150 | |
| 2.3.4 | Permissive overload, 1 s | % Ur | 250 | |
| 2.3.4 | Burden at Ur | VA | < 0,3 | |
| 2.3.5 | | VA | < 0,3 Min. 16 | |
| | Binary inputs | | - | |
| 2.4.1 | Number of BI groups with common root Number of inputs per BI group with common | | Insert | |
| 2.4.2 | root | | < 8 | |
| 2.4.3 | Rated voltage | V d.c. | 110 ±15 % | |
| 2.5 | Binary outputs | | Min. 16 | |
| 2.5.1 | Number of modules | | Insert | |
| 2.5.2 | Number of outputs per group with common root | | Max. 3 | |
| 2.5.3 | Rated voltage | V d.c. | 110 ±15 % | |
| 2.5.4 | Breaking capacity at inductive load with | А | 0.1 | |
| 055 | L/R<40 ms, at rated voltage Current carrying capacity at rated voltage for | • | lass = st | |
| 2.5.5 | signalling contacts, continuous | A | Insert | |
| 2.5.6 | Number of tripping contacts (high-speed output) | pcs. | 6 | |
| 057 | Current carrying capacity at rated voltage for | Δ | r | |
| 2.5.7 | tripping contacts, continuous | A | 5 | |
| 2.6 | LED indications | | | |
| 2.6.1 | Number of LED's | | Insert | |
| 2.6.2 | Multi-colour LED's | Yes/No | Insert | |

5.2.5.28 14005 - Protection Terminal for Power Transformers Main 1



| | | Minim | um Requirements | 0 | |
|------------|---|--------|-----------------|------------|--|
| No. | Description | Unit | Data | Guaranteed | |
| 2.7 | Communication ports | | Yes | | |
| 2.7.1 | Port for front-connected PC | | | | |
| 2.7.1.1 | Protocols supported | | Insert | | |
| 2.7.1.2 | Communication speed | Kbit/s | Insert | | |
| 2.7.1.3 | PC side connector type | | Insert | | |
| 2.7.2 | System interface | | | | |
| 2.7.2.1 | Number of rear ports | | 2 | | |
| 2.7.2.2 | Protocols supported | | IEC 61850 | | |
| 2.7.2.3 | Communication speed | Mbit/s | Min. 100 | | |
| 2.7.2.4 | Connector type | | RJ45 or FO | | |
| 2.7.3 | Time synchronisation | | SNTP | | |
| 2.8 | Human-machine interface | | Yes | | |
| 2.8.1 | LCD alphanumeric display, No. of rows | | Insert | | |
| 2.9 | Number of setting parameter groups | | Min. 4 | | |
| | Autotransformer / Transformer Differential pro- | | | | |
| 2.10 | tection | | | | |
| 2.10.1 | Inrush restraint | | Yes | | |
| 2.10.2 | Over excitation restraint | | Yes | | |
| 2.10.3 | Basic differential current range | % Ir | Insert | | |
| 2.10.4 | Operating characteristic with 2 slope | , e | Yes | | |
| 2.10.5 | High non-restraint differential current range | % Ir | Insert | | |
| 2.10.6 | Operating time | ms | < 30 | | |
| 2.10.7 | Internal CT ratio and vector group compensa- | | Yes | | |
| 2.10.7 | tion | | 163 | | |
| 2.10.8 | Cross block function | | Yes | | |
| 2.10.9 | Zero sequence subtraction | | Yes | | |
| 2.11 | Restricted earth fault protection for autotrans- | | | | |
| 2.11 | former / transformer | | | | |
| 2.11.1 | Low Impedance | | Yes | | |
| 2.11.2 | Internal CT ratio vector group compensation | | Yes | | |
| 2.11.3 | Basic differential current range | % Ir | Insert | | |
| 2.11.4 | Operating time | ms | < 30 | | |
| 2.12 | Current negative sequence protection | | | | |
| 2.12.1 | Number of stages | | Insert | | |
| 2.12.2 | Setting range | % Ir | Insert | | |
| 2.12.3 | Characteristic | | Insert | | |
| 2.13 | Multistage three-phase overcurrent protection | pcs. | Min. 2 | | |
| 2.13.1 | Instantaneous overcurrent protection with in- rush restraint | | | | |
| 2.13.1.1 | Setting range | % Ir | Insert | | |
| 2.13.1.2 | Min. operating time at I > 10 [*] l _{set} | ms | < 30 | | |
| 2.13.2 | Time delayed overcurrent protection | | | | |
| 2.13.2.1 | Setting range | % Ir | Insert | | |
| 2.13.2.2 | Type of protection | | Non-directional | | |
| 2.13.2.3 | Characteristics | | | | |
| 2.13.2.3.1 | | Yes/no | Yes | | |
| | Normal inverse | Yes/No | Yes | | |



| N - | Description | Minim | Im Requirements | Guaranteed |
|------------|--|------------|-----------------|------------|
| No. | Description | Unit | Data | |
| 2.13.2.3.3 | Very inverse | Yes/No | Insert | |
| 2.13.2.3.4 | Extremely inverse | Yes/No | Insert | |
| 2.14 | Multistage earth fault overcurrent protection | pcs. | Min. 2 | |
| 2.14.1 | Instantaneous earth fault overcurrent protection with inrush restraint | | | |
| 2.14.1.1 | Setting range | % Ir | Insert | |
| 2.14.1.2 | Min. operating time at $l > 10^{*}l_{set}$ | ms | < 30 | |
| 2.14.2 | Time delayed earth fault overcurrent protection | | | |
| 2.14.2.1 | Setting range | % Ir | Insert | |
| 2.14.2.2 | Type of protection | | Non-directional | |
| 2.14.2.3 | Characteristics | | | |
| 2.14.2.3.1 | Definite time delayed | Yes/no | Yes | |
| | Normal inverse | Yes/No | Yes | |
| 2.14.2.3.3 | Very inverse | Yes/No | Insert | |
| | Extremely inverse | Yes/No | Insert | |
| 2.15 | Thermal overload protection | | Yes | |
| 2.16 | Disturbance recorder | | | |
| 2.16.1 | Number of digital signals | | Min. 40 | |
| 2.16.2 | Number of analogue signals | | Min. 9 | |
| 2.16.3 | External/manual initiation of recording | | | |
| 2.16.4 | Sampling rate | kHz | Insert | |
| 2.16.5 | Pre-fault time | ms | ≥ 300 | |
| 2.16.6 | Recording time | ms | ≥ 2000 | |
| 2.16.7 | Number of recorded disturbances | | Min. 5 | |
| 2.16.8 | Total recording time with max. analogue and binary signals | S | > 10 | |
| 2.16.9 | Output file Comtrade format | | Yes | |
| 2.17 | Event recorder | | | |
| 2.17.1 | Max. number of events | | Insert | |
| 2.17.2 | Time tagging resolution | ms | 1 | |
| 2.18 | Self-supervision | | Yes | |
| 3. | Additional requirements | | | |
| 3.1 | Test socket | | Yes | |
| 3.2 | Setting and configuration of Protection Terminal approved by Engineer | | Yes | |
| | Overall compliance with the requirements | s (yes/no) | | |



| Ne | Description | Minimum Requirements | | Ouerenteed |
|-------|--|----------------------|-----------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 14006 | Protection Terminal for Power Transfor | mers Mair | 2 / Code number: 140 | 006 |
| 1.1 | Manufacturer | | Different than Main 1 | |
| 1.2 | Country of origin | | Insert | |
| 1.3 | Terminal type | | Insert | |
| 1.4 | Terminal version (software version) | | Insert | |
| 1.5 | Standards | | IEC | |
| 2. | Characteristics | • | | |
| 2.1 | Auxiliary supply voltage | | | |
| 2.1.1 | Rated auxiliary supply voltage | V d.c. | 110 ±15 % | |
| 2.1.1 | Interruption in auxiliary d.c. voltage: | v u.o. | 110 ±10 /0 | |
| 2.1.2 | Without resetting | ms | > 50 | |
| 2.1.2 | Restart time | S | Insert | |
| 2.2 | a.c. current inputs | 3 | moent | |
| 2.2.1 | Number of inputs | | Min. 9 | |
| 2.2.1 | Rated current Ir | A | 1 | |
| 2.2.3 | Permissive overload, continuous | | 4xlr | |
| 2.2.4 | Permissive overload, 1 s | | 100xlr | |
| 2.2.5 | Burden at Ir | VA | < 0.5 | |
| 2.3 | a.c. voltage inputs | V/(| < 0.0 | |
| 2.3.1 | Number of inputs | | Min 4 | |
| 2.3.2 | Rated voltage Ph-Ph Ur | V | 100 | |
| 2.3.3 | Permissive overload, continuous | % Ur | 150 | |
| 2.3.3 | Permissive overload, 1 s | % Ur | 250 | |
| 2.3.4 | Burden at Ur | VA | < 0,3 | |
| 2.3.5 | | VA | × 0,3 Min. 16 | |
| | Binary inputs | | | |
| 2.4.1 | Number of BI groups with common root | | Insert | |
| 2.4.2 | Number of inputs per BI group with common root | | < 8 | |
| 2.4.3 | Rated voltage | V d.c. | 110 ±15 % | |
| 2.5 | Binary outputs | | Min. 16 | |
| 2.5.1 | Number of modules | | Insert | |
| 2.5.2 | Number of outputs per group with common root | | Max. 3 | |
| 2.5.3 | Rated voltage | V d.c. | 110 ±15 % | |
| 2.5.4 | Breaking capacity at inductive load with | A 4 | 0.1 | |
| 2.5.5 | L/R<40 ms, at rated voltage Current carrying capacity at rated voltage for signalling contacts, continuous | A | Insert | |
| 2.5.6 | Number of tripping contacts (high-speed output) | pcs. | 6 | |
| 2.5.7 | Current carrying capacity at rated voltage for tripping contacts, continuous | А | 5 | |
| 2.6 | LED indications | | | |
| 2.6.1 | Number of LED's | | Insert | |
| 2.6.2 | Multi-colour LED's | Yes/No | Insert | |

5.2.5.29 14006 - Protection Terminal for Power Transformers Main 2



| | Description | Minim | Minimum Requirements | |
|------------|---|--------|----------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 2.7 | Communication ports | | Yes | |
| 2.7.1 | Port for front-connected PC | | | |
| 2.7.1.1 | Protocols supported | | Insert | |
| 2.7.1.2 | Communication speed | Kbit/s | Insert | |
| 2.7.1.3 | PC side connector type | | Insert | |
| 2.7.2 | System interface | | | |
| 2.7.2.1 | Number of rear ports | | 2 | |
| 2.7.2.2 | Protocols supported | | IEC 61850 | |
| 2.7.2.3 | Communication speed | Mbit/s | Min. 100 | |
| 2.7.2.4 | Connector type | | RJ45 or FO | |
| 2.7.3 | Time synchronisation | | SNTP | |
| 2.8 | Human-machine interface | | Yes | |
| 2.8.1 | LCD alphanumeric display, No. of rows | | Insert | |
| 2.9 | Number of setting parameter groups | | Min. 4 | |
| | Autotransformer / Transformer Differential | | | |
| 2.10 | protection | | | |
| 2.10.1 | Inrush restraint | | Yes | |
| 2.10.2 | Overexcitation restraint | | Yes | |
| 2.10.3 | Basic differential current range | % Ir | Insert | |
| 2.10.4 | Operating characteristic with 2 slope | | Yes | |
| 2.10.5 | High non-restraint differential current range | % Ir | Insert | |
| 2.10.6 | Operating time | ms | < 30 | |
| 2.10.7 | Internal CT ratio and vector group compen- sation | | Yes | |
| 2.10.8 | Cross-block function | | Yes | |
| 2.10.9 | Zero sequence subtraction | | Yes | |
| 2.11 | Restricted earth fault protection for auto- | | | |
| | transformer / transformer | | | |
| 2.11.1 | Low Impedance | | Yes | |
| 2.11.2 | Internal CT ratio vector group compensation | | Yes | |
| 2.11.3 | Basic differential current range | % Ir | Insert | |
| 2.11.4 | Operating time | ms | < 30 | |
| 2.12 | Current negative sequence protection | | | |
| 2.12.1 | Number of stages | | Insert | |
| 2.12.2 | Setting range | % Ir | Insert | |
| 2.12.3 | Characteristic | | Insert | |
| 2.13 | Multistage three-phase overcurrent protec- tion | pcs. | Min. 2 | |
| 2.13.1 | Instantaneous overcurrent protection with in- rush restraint | | | |
| 2.13.1.1 | Setting range | % Ir | Insert | |
| 2.13.1.2 | Min. operating time at I > 10*I _{set} | Ms | < 30 | |
| 2.13.2 | Time delayed overcurrent protection | | | |
| 2.13.2.1 | Setting range | % Ir | Insert | |
| 2.13.2.2 | Type of protection | | Non-directional | |
| 2.13.2.3 | Characteristics | | | |
| 2.13.2.3.1 | Definite time delayed | Yes/no | Yes | |



| | | Minim | um Requirements | |
|------------|---|--------------|-----------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 2.13.2.3.2 | Normal inverse | Yes/No | Yes | |
| 2.13.2.3.3 | Very inverse | Yes/No | Insert | |
| 2.13.2.3.4 | Extremely inverse | Yes/No | Insert | |
| 2.14 | Multistage earth fault overcurrent protection | pcs. | Min. 2 | |
| 2.14.1 | Instantaneous earth fault overcurrent protec- tion with inrush restraint | | | |
| 2.14.1.1 | Setting range | % Ir | Insert | |
| 2.14.1.2 | Min. operating time at I > 10*I _{set} | Ms | < 30 | |
| 2.14.2 | Time delayed earth fault overcurrent protec- | | | |
| 2.14.2.1 | Setting range | % Ir | Insert | |
| 2.14.2.2 | Type of protection | | Non-directional | |
| 2.14.2.3 | Characteristics | | | |
| 2.14.2.3.1 | Definite time delayed | Yes/no | Yes | |
| 2.14.2.3.2 | Normal inverse | Yes/No | Yes | |
| 2.14.2.3.3 | Very inverse | Yes/No | Insert | |
| 2.14.2.3.4 | Extremely inverse | Yes/No | Insert | |
| 2.15 | Thermal overload protection | | Yes | |
| 2.16 | Disturbance recorder | | | |
| 2.16.1 | Number of digital signals | | Min. 40 | |
| 2.16.2 | Number of analogue signals | | Min. 9 | |
| 2.16.3 | External/manual initiation of recording | | | |
| 2.16.4 | Sampling rate | kHz | Insert | |
| 2.16.5 | Pre-fault time | ms | ≥ 300 | |
| 2.16.6 | Recording time | ms | ≥ 2000 | |
| 2.16.7 | Number of recorded disturbances | | Min. 5 | |
| 2.16.8 | Total recording time with max. analogue and binary signals | s | > 10 | |
| 2.16.9 | Output file Comtrade format | | Yes | |
| 2.17 | Event recorder | | | |
| 2.17.1 | Max. number of events | | Insert | |
| 2.17.2 | Time tagging resolution | ms | 1 | |
| 2.18 | Self-supervision | | Yes | |
| 3. | Additional requirements | | | |
| 3.1 | Test socket | | Yes | |
| 3.2 | Setting and configuration of Protection Ter- minal approved by Engineer | | Yes | |
| | Overall compliance with the requirement | nts (yes/no) | | |





| N | Description | Minim | Minimum Requirements | |
|-------|--|-------------|-----------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 14007 | Protection Terminal for LV side of Powe | r Transform | er / Code number: 140 | 07 |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Country of origin | | Insert | |
| 1.3 | Terminal type | | Insert | |
| 1.4 | Terminal version (software version) | | Insert | |
| 1.5 | Standards | | IEC | |
| 2. | Characteristics | | | |
| 2.1 | Auxiliary supply voltage | | | |
| 2.1.1 | Rated auxiliary supply voltage | V d.c. | 110 ±15 % | |
| | Interruption in auxiliary d.c. voltage: | | | |
| 2.1.2 | Without resetting | ms | > 50 | |
| | Restart time | s | Insert | |
| 2.2 | a.c. current inputs | | | |
| 2.2.1 | Number of inputs | | Min. 4 | |
| 2.2.2 | Rated current Ir | А | 1 | |
| 2.2.3 | Permissive overload, continuous | | 4xlr | |
| 2.2.4 | Permissive overload, 1 s | | 100xlr | |
| 2.2.5 | Burden at Ir | VA | < 0.5 | |
| 2.3 | a.c. voltage inputs | | | |
| 2.3.1 | Number of inputs | | Min. 4 | |
| 2.3.2 | Rated voltage Ph-Ph Ur | V | 100 | |
| 2.3.3 | Permissive overload, continuous | % Ur | 150 | |
| 2.3.4 | Permissive overload, 1 s | % Ur | 250 | |
| 2.3.5 | Burden at Ur | VA | < 0.3 | |
| 2.4 | Binary inputs | | Min. 16 | |
| 2.4.1 | Number of BI groups with common root | | Insert | |
| 2.4.2 | Number of inputs per BI group with common root | | < 8 | |
| 2.4.3 | Rated voltage | V d.c. | 110 ±15 % | |
| 2.4.5 | Binary outputs | v u.c. | Min. 16 | |
| 2.5.1 | Number of modules | | Insert | |
| 2.5.2 | Number of modules Number of outputs per group with common root | | Max. 3 | |
| 2.5.3 | Rated voltage | V d.c. | 110 ±15 % | |
| 2.0.0 | Breaking capacity at inductive load with | V 0.0. | 110 ±10 /0 | |
| 2.5.4 | L/R<40 ms, at rated voltage | A | 0.1 | |
| 2.5.5 | Current carrying capacity at rated voltage for signalling contacts, continuous | А | Insert | |
| 2.5.6 | Number of tripping contacts (high-speed out- put) | pcs. | 6 | |
| 2.5.7 | Current carrying capacity at rated voltage for tripping contacts, continuous | А | 5 | |
| 2.6 | LED indications | | | 1 |
| 2.6.1 | Number of LED's | | Insert | 1 |
| 2.6.2 | Multi-colour LED's | Yes/No | Insert | |

5.2.5.30 14007 - Protection Terminal for LV side of Power Transformer



| | Description | Minimum Requirements | | |
|----------|--|----------------------|-----------------|------------|
| No. | | Unit | Data | Guaranteed |
| 2.7 | Communication ports | | Yes | |
| 2.7.1 | Port for front-connected PC | | | |
| 2.7.1.1 | Protocols supported | | Insert | |
| 2.7.1.2 | Communication speed | Kbit/s | Insert | |
| 2.7.1.3 | PC side connector type | | Insert | |
| 2.7.2 | System interface | | | |
| 2.7.2.1 | Number of rear ports | | 2 | |
| 2.7.2.2 | Protocols supported | | IEC 61850 | |
| 2.7.2.3 | Communication speed | Mbit/s | Min. 100 | |
| 2.7.2.4 | Connector type | | RJ45 or FO | |
| 2.7.3 | Time synchronisation | | SNTP | |
| 2.8 | Human-machine interface | | Yes | |
| 2.8.1 | LCD alphanumeric display, No. of rows | | Insert | |
| 2.9 | Number of setting parameter groups | | Min. 4 | |
| 2.10 | Distance protection | | | |
| 2.10.1 | Number of protection zones | 1 | Min. 5 | |
| 2.10.2 | Basic operating time | ms | < 30 | |
| 2.10.3 | Operational characteristic | | Quadrilateral | |
| 2.10.4 | Zone 1 direction software selectable | | Yes (F/R/ND) | |
| 2.10.5 | Zone 2 direction software selectable | | Yes (F/R/ND) | |
| 2.10.6 | Zone 3 direction software selectable | | Yes (F/R/ND) | |
| 2.10.0 | Zone 4 direction software selectable | | Yes (F/R/ND) | |
| 2.10.7 | Zone 5 direction software selectable | | Yes (F/R/ND) | |
| 2.10.9 | Minimum impedance setting | Ω | Insert | |
| 2.10.3 | Full scheme protection phase segregated | 52 | Yes | |
| 2.10.10 | Power swing detection | | Yes | |
| 2.11 | Secondary circuits supervision: | | 165 | |
| 2.12 | VT circuits supervision | | Yes | |
| 2.12 | CT circuits supervision | | Yes | |
| | Automatic switch onto fault logic | | 165 | |
| 2.13 | Impedance criteria | | Yes | |
| 2.15 | Instantaneous overcurrent criteria | | Yes | |
| 2.14 | Multistage three-phase overcurrent protection | | 165 | |
| 2.14 | Number of stages | | Min. 2 | |
| | | % lr | | |
| 2.14.2 | Setting range | 70 11 | Insert | |
| 2.14.3 | Characteristics | Vas/na | Vaa | |
| | Definite time delayed | Yes/no | Yes | |
| | Normal inverse | Yes/No | Yes | |
| | Very inverse | Yes/No | Insert | |
| | Extremely inverse | Yes/No | Insert | |
| 2.15 | Multistage earth fault overcurrent protection | ┼───┼ | N4: 0 | |
| 2.15.1 | Number of stages | | Min. 2 | |
| 2.15.2 | Setting range | % Ir | Insert | |
| 2.15.3 | Type of protection | ╂────╂ | Non-directional | |
| 2.15.4 | Characteristics | | | |
| | Definite time delayed | Yes/no | Yes | |
| 2.15.4.2 | Normal inverse | Yes/No | Yes | |



| N | Description | Minimum Requirements | | |
|----------|--|----------------------|---------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 2.15.4.3 | Very inverse | Yes/No | Insert | |
| 2.15.4.4 | Extremely inverse | Yes/No | Insert | |
| 2.16 | Directional earth fault protection | | | |
| 2.16.1 | Number of stages | | Insert | |
| 2.16.2 | Setting range | % Ir | Insert | |
| 2.16.3 | Type of protection | | Insert | |
| 2.16.4 | Characteristics | | | |
| 2.16.4.1 | Definite time delayed | Yes/no | Insert | |
| 2.16.4.2 | Normal inverse | Yes/No | Insert | |
| 2.16.4.3 | Very inverse | Yes/No | Insert | |
| 2.16.4.4 | Extremely inverse | Yes/No | Insert | |
| 2.16.5 | Minimum polarizing voltage | % Ur | Insert | |
| 2.16.6 | Communication scheme logic | | Insert | |
| 2.17 | Power system supervision | | | |
| 2.17.1 | Broken conductor check | | Yes | |
| 2.18 | Disturbance recorder | | | |
| 2.18.1 | Number of digital signals | | Min. 40 | |
| 2.18.2 | Number of analogue signals | | Min. 8 | |
| 2.18.3 | External/manual initiation of recording | | Insert | |
| 2.18.4 | Sampling rate | kHz | Insert | |
| 2.18.5 | Pre-fault time | ms | ≥ 300 | |
| 2.18.6 | Recording time | ms | ≥ 2000 | |
| 2.18.7 | Number of recorded disturbances | | Min. 5 | |
| 2.18.8 | Total recording time with max. analogue and bi- nary signals | S | > 10 | |
| 2.18.9 | Output file Comtrade format | | Yes | |
| 2.19 | Event recorder | | | |
| 2.19.1 | Max. number of events | | Insert | |
| 2.19.2 | Time tagging resolution | ms | 1 | |
| 2.20 | Self-supervision | | Yes | |
| 2.21 | Measurement | | | |
| 2.21.1 | Active power measurement | | Yes | |
| 2.21.2 | Reactive power measurement | | Yes | |
| 2.21.3 | Voltage measurement | | Yes | |
| 2.21.4 | Current measurement | | Yes | |
| 3. | Additional requirements | | | |
| 3.1 | Test socket | | Yes | |
| 3.2 | Setting and configuration of Protection Terminal approved by Engineer | | Yes | |
| | Overall compliance with the requirements | s (yes/no) | | |



5.2.5.31 14008 - Automatic Voltage Regulation

| N | Description | Minimum Requirements | | |
|---------|---|----------------------|------------|------------|
| No. | | Unit | Data | Guaranteed |
| 14008 | Automatic Voltage Regulation / Code num | ber: 14008 | | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Country of origin | | Insert | |
| 1.3 | Terminal type | | Insert | |
| 1.4 | Terminal version (software version) | | Insert | |
| 1.5 | Standards | | IEC | |
| 2. | Characteristics | 1 1 | | 1 |
| 2.1 | Auxiliary supply voltage | | | |
| 2.1.1 | Rated auxiliary supply voltage | V d.c. | 110 ±15 % | |
| | Interruption in auxiliary d.c. voltage: | | | |
| 2.1.2 | Without resetting | ms | > 50 | |
| | Restart time | s | Insert | |
| 2.2 | a.c. current inputs | | | |
| 2.2.1 | Number of inputs | | 1 | |
| 2.2.2 | Rated current for 110 kV | А | 1 | |
| 2.2.3 | Permissive overload, continuous | | 3xlr | |
| 2.2.4 | Permissive overload, 1 s | | 100xlr | |
| 2.2.5 | Burden at Ir | VA | < 0.5 | |
| 2.3 | a.c. voltage inputs | | | |
| 2.3.1 | Number of inputs | | Min 4 | |
| 2.3.2 | Rated voltage Ph-Ph Ur | V | 100 | |
| 2.3.3 | Permissive overload, continuous | % Ur | 150 | |
| 2.3.4 | Permissive overload, 1 s | % Ur | 250 | |
| 2.3.5 | Burden at Ur | VA | < 0.3 | |
| 2.4 | Voltage control function | | | |
| 2.4.1 | Set voltage range | % U _{r2} | Insert | |
| 2.4.2 | Set voltage dead-band range | % U _{r2} | Insert | |
| 2.4.3 | Upper limit busbar voltage range | % U _{r2} | Insert | |
| 2.4.4 | Lower limit busbar voltage range | % U _{r2} | Insert | |
| 2.4.5 | Line voltage drop compensation | Yes/No | Insert | |
| 2.4.6 | Regulation for capacitive load | Yes/No | Insert | |
| 2.4.7 | Undervoltage blocking range | % U _{r2} | Insert | |
| 2.4.8 | Overcurrent blocking range | % Ir | Insert | |
| 2.4.9 | Parallel operation | | Yes | |
| 2.4.10 | Parallel operation principal | | Insert | |
| 2.5 | Communication ports | | Yes | |
| 2.5.1 | Port for front-connected PC | | | |
| 2.5.1.1 | Protocols supported | | Insert | |
| 2.5.1.2 | Communication speed | Kbit/s | Insert | |
| 2.5.1.3 | PC side connector type | | Insert | |
| 2.5.2 | System interface | | | |
| 2.5.2.1 | Number of rear ports | | Min. 1 | |
| 2.5.2.2 | Protocols supported | | IEC 61850 | |
| 2.5.2.3 | Communication speed | Mbit/s | Min. 100 | |
| 2.5.2.4 | Connector type | | RJ45 or FO | |



| Ne | Description | Minin | Minimum Requirements | |
|-------|--|-------|----------------------|------------|
| No. | | Unit | Data | Guaranteed |
| 2.5.3 | External time synchronisation | | Insert | |
| 2.6 | Tap changer, tap position | | BCD code | |
| 2.7 | Self-supervision | | Yes | |
| 3. | Additional requirements | | | |
| 3.1 | Test socket | | Yes | |
| 3.2 | Setting and configuration of Automatic Voltage Yes | | | |
| | Overall compliance with the requirements (yes/no) | | | |



| No. | Description | Minimum Requirements | | Cuerenteed |
|-------|---|----------------------|------------------|------------|
| NO. | Description | Unit | Data | Guaranteed |
| 14009 | Protection Terminal for Bus couplers | 132 kV / Coo | le number: 14009 | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Country of origin | | Insert | |
| 1.3 | Terminal type | | Insert | |
| 1.4 | Terminal version (software version) | | Insert | |
| 1.5 | Standards | | IEC | |
| 2. | Characteristics | <u> </u> | | |
| 2.1 | Auxiliary supply voltage | | | |
| 2.1.1 | Rated auxiliary supply voltage | V d.c. | 110 ±15 % | |
| | Interruption in auxiliary d.c. voltage: | 1 0.0 | | |
| 2.1.2 | Without resetting | ms | > 50 | |
| | Restart time | s | Insert | |
| 2.2 | a.c. current inputs | | | |
| 2.2.1 | Number of inputs | | Min. 4 | |
| 2.2.2 | Rated current Ir | A | 1 | |
| 2.2.3 | Permissive overload, continuous | | 4xlr | |
| 2.2.4 | Permissive overload, 1 s | 1 1 | 100xlr | |
| 2.2.5 | Burden at Ir | VA | < 0.5 | |
| 2.3 | a.c. voltage inputs | | | |
| 2.3.1 | Number of inputs | | Min. 4 | |
| 2.3.2 | Rated voltage Ph-Ph Ur | V | 100 | |
| 2.3.3 | Permissive overload, continuous | % Ur | 150 | |
| 2.3.4 | Permissive overload, 1 s | % Ur | 250 | |
| 2.3.5 | Burden at Ur | VA | < 0.3 | |
| 2.4 | Binary inputs | | Min. 8 | |
| 2.4.1 | Number of BI groups with common root | | Insert | |
| 2.4.2 | Number of inputs per BI group with com- | | Insert | |
| 2.1.2 | mon root | | moort | |
| 2.4.3 | Rated voltage | V d.c. | 110 ±15 % | |
| 2.5 | Binary outputs | | Min. 8 | |
| 2.5.1 | Number of modules | | Insert | |
| 2.5.2 | Number of outputs per group with common root | | Max. 3 | |
| 2.5.3 | Rated voltage | V d.c. | 110 ±15 % | |
| 2.5.4 | Breaking capacity at inductive load with L/R<40 ms, at rated voltage | A | 0.1 | |
| 2.5.5 | Current carrying capacity at rated voltage | A | Insert | |
| 2.5.6 | for signalling contacts, continuous Number of tripping contacts (high-speed output) | pcs. | 6 | |
| 2.5.7 | Current carrying capacity at rated voltage for tripping contacts, continuous | A | 5 | |
| 2.6 | LED indications | | | |
| 2.6.1 | Number of LED's | | Insert | |
| 2.6.2 | Multi-colour LED's | Yes/No | Insert | |

5.2.5.32 14009 - Protection Terminal for Bus couplers 132 kV



| No. | Description | Minimum Requirements | | Guarantood |
|------------|--|----------------------|-----------------|------------|
| NO. | | Unit | Data | Guaranteed |
| 2.7 | Communication ports | | Yes | |
| 2.7.1 | Port for front-connected PC | | | |
| 2.7.1.1 | Protocols supported | | Insert | |
| 2.7.1.2 | Communication speed | Kbit/s | Insert | |
| 2.7.1.3 | PC side connector type | | Insert | |
| 2.7.2 | System interface | | | |
| 2.7.2.1 | Number of rear ports | | 2 | |
| 2.7.2.2 | Protocols supported | | IEC 61850 | |
| 2.7.2.3 | Communication speed | Mbit/s | Min. 100 | |
| 2.7.2.4 | Connector type | | RJ45 or FO | |
| 2.7.3 | Time synchronisation | | SNTP | |
| 2.8 | Human-machine interface | | Yes | |
| 2.8.1 | LCD alphanumeric display, No. of rows | | Insert | |
| 2.9 | Number of setting parameter groups | | Min. 4 | |
| | Multistage three-phase overcurrent protec- | | | |
| 2.10 | tion | | | |
| 2.10.1 | Instantaneous overcurrent protection | | | |
| 2.10.1.1 | Setting range | % Ir | Insert | |
| 2.10.1.2 | Min. operating time at I > 10*I _{set} | ms | 30 | |
| 2.10.2 | Time delayed overcurrent protection | | | |
| 2.10.2.1 | Setting range | % Ir | Insert | |
| 2.10.2.2 | Type of protection | ,0 II | Non-directional | |
| 2.10.2.3 | Characteristics | | | |
| 2.10.2.3.1 | Definite time delayed | Yes/no | Yes | |
| 2.10.2.3.2 | Normal inverse | Yes/No | Yes | |
| 2.10.2.3.3 | Very inverse | Yes/No | Insert | |
| 2.10.2.3.4 | Extremely inverse | Yes/No | Insert | |
| 2.10.2.3.4 | Multistage earth fault overcurrent protection | 163/110 | Insen | |
| 2.11 | | | | |
| 2.11.1 | Instantaneous earth fault overcurrent pro- tection | | | |
| 2.11.1.1 | | % Ir | Insert | |
| | Setting range | | | |
| 2.11.1.2 | Min. operating time at I > 10 [*] I _{set} Time delayed earth fault overcurrent pro- | ms | 30 | |
| 2.11.2 | , , , | | | |
| 0 1 1 0 1 | tection | 0/ Jr | lagart | |
| 2.11.2.1 | Setting range | % Ir | Insert | |
| 2.11.2.2 | Type of protection | | Non-directional | |
| 2.11.2.3 | Characteristics | Vaalaa | ¥ | + |
| 2.11.2.3.1 | Definite time delayed | Yes/no | Yes | |
| 2.11.2.3.2 | Normal inverse | Yes/No | Yes | |
| 2.11.2.3.3 | Very inverse | Yes/No | Insert | |
| 2.11.2.3.4 | Extremely inverse | Yes/No | Insert | |
| 2.12 | Directional earth fault protection | | | |
| 2.12.1 | Number of stages | | Insert | |
| 2.12.2 | Setting range | % Ir | Insert | |
| 2.12.3 | Type of protection | | Directional | |
| 2.13.4 | Characteristics | | | |
| 2.13.4.1 | Definite time delayed | Yes/no | Yes | |



| N | Description | Minim | Minimum Requirements | |
|----------|--|--------|----------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 2.13.4.2 | Normal inverse | Yes/No | Yes | |
| 2.13.4.3 | Very inverse | Yes/No | Insert | |
| 2.13.4.4 | Extremely inverse | Yes/No | Insert | |
| 2.13.5 | Minimum polarising voltage | % Ur | 3 % | |
| 2.14 | Current negative sequence protection | | | |
| 2.14.1 | Number of stages | | Insert | |
| 2.14.2 | Setting range | % Ir | Insert | |
| 2.14.3 | Characteristic | | Insert | |
| 2.15 | Disturbance recorder | | | |
| 2.15.1 | Number of digital signals | | Min. 40 | |
| 2.15.2 | Number of analogue signals | | Min. 8 | |
| 2.15.3 | External/manual initiation of recording | | Insert | |
| 2.15.4 | Sampling rate | kHz | Insert | |
| 2.15.5 | Pre-fault time | ms | ≥ 300 | |
| 2.15.6 | Recording time | ms | ≥ 2000 | |
| 2.15.7 | Number of recorded disturbances | | Min. 5 | |
| 2.15.8 | Total recording time with max. analogue | s | > 10 | |
| 2.13.0 | and binary signals | 3 | > 10 | |
| 2.15.9 | Output file Comtrade format | | Yes | |
| 2.16 | Event recorder | | | |
| 2.16.1 | Max. number of events | | Insert | |
| 2.16.2 | Time tagging resolution | ms | 1 | |
| 2.17 | Self-supervision | | Yes | |
| 3. | Additional requirements | | | |
| 3.1 | Test socket | | Yes | |
| 3.2 | Setting and configuration of Protection Terminal approved by Engineer | | Yes | |
| | Overall compliance with the requirements (yes/no) | | | |



| | | Minimum Requirements | | |
|-------|---|----------------------|----------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 14010 | Busbar and Breaker failure protection for | or 132 kV Bu | sbars/Code number: 1 | 4010 |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Country of origin | | Insert | |
| 1.3 | Type of installation | | Distributed | |
| 1.4 | Standards | | IEC | |
| 1.5 | Central Unit (CU) | | | |
| 1.5.1 | Terminal type | | Insert | |
| 1.5.2 | Terminal version (software version) | | Insert | |
| 1.5.3 | Central unit for busbar protection must be supported for min. 16 bays | | Yes | |
| 1.6 | Bay Unit (BU) | | | |
| 1.6.1 | Terminal type | | Insert | |
| 1.6.2 | Terminal version (software version) | | Insert | |
| | | | | |
| 2. | Characteristics | | | |
| 2.1 | Auxiliary supply voltage | | 440 .45 % | |
| 2.1.1 | CU, BU Rated auxiliary supply voltage | V d.c. | 110 ±15 % | |
| 2.1.2 | CU auxiliary supply redundant | | Yes | |
| 24.2 | Interruption in auxiliary d.c. voltage:Without resetting | ~~~ | . 50 | |
| 2.1.3 | Restart time | ms | > 50 Insert | |
| 2.2 | a.c. current inputs BU | S | Insen | |
| 2.2.1 | Number of inputs | | Min. 3 | |
| 2.2.1 | Rated current Ir | A | 1 | |
| 2.2.2 | Permissive overload, continuous | <u>_</u> | 4xlr | |
| 2.2.3 | Permissive overload, 1 s | | 100xlr | |
| 2.2.4 | Burden at Ir | VA | < 0.5 | |
| 2.3 | Binary inputs CU, BU | | Min. 20 / 8 | |
| 2.3.1 | Number of modules | | Insert | |
| 2.3.2 | Number of inputs per module | | Insert | |
| 2.3.3 | Rated voltage | V d.c. | 110 ±15 % | |
| 2.4 | Binary outputs CU, BU | v u.c. | Min. 6 / 4 | |
| 2.4.1 | Number of modules | | Insert | |
| 2.4.2 | Number of outputs per module | | Insert | |
| 2.4.3 | Rated voltage | V d.c. | 110 ±15 % | |
| 2.4.4 | Breaking capacity at inductive load with L/R<40 ms, at rated voltage | A | 0.1 | |
| 2.4.5 | Current carrying capacity at rated voltage for signalling contacts, continuous | A | Insert | |
| 2.4.6 | Number of tripping contacts (high-speed out- put) | pcs. | Min. 3 | |
| 2.4.7 | Current carrying capacity at rated voltage for tripping contacts, continuous | A | 5 | |
| 2.5 | LED indications CU, BU | | | |
| 2.5.1 | Number of LED's | | Insert | |
| 2.5.2 | Multi-colour LED's | Yes/No | Insert | |

5.2.5.33 14010 - Busbar and Breaker Failure Protection for 132 kV Busbars



| | Description | Minimum Requirements | | |
|---------|---|----------------------|-----------|------------|
| No. | | Unit | Data | Guaranteed |
| 2.6 | Communication ports CU, BU | | | |
| 2.6.1 | Port for front-connected PC | | | |
| 2.6.1.1 | Protocols supported | | Insert | |
| 2.6.1.2 | Communication speed | Kbit/s | Insert | |
| 2.6.1.3 | PC connector type | | Insert | |
| 2.6.2 | CU, BU communication media | | FO | |
| 2.6.3 | CU rear station (system) communication ports | | | |
| 2.6.3.1 | Number of rear ports | | Insert | |
| 2.6.3.2 | Protocols supported | | IEC 61850 | |
| 2.6.3.3 | Communication speed | Mbit/s | Insert | |
| 2.6.3.4 | Connector type | | RJ45 | |
| 2.6.4 | Time synchronisation | | SNTP | |
| 2.7 | Busbar differential protection | | | |
| 2.7.1 | Operating time | ms | < 20 | |
| 2.7.2 | Internal CT radio adaptability | | Yes | |
| 2.7.3 | Multiple tripping criteria, check and bus zone | | Yes | |
| 2.7.4 | Current transformer supervision | | Yes | |
| 2.7.5 | External signal of load transfer starting | | Insert | |
| | Busbar protection system should be suita- | | | |
| 2.7.6 | ble/adaptable for future switchgear extension | | Yes | |
| | or modification | | | |
| 2.7.7 | Bay-selective intertripping | | Yes | |
| 2.7.8 | Phase-segregated measurement system | | Yes | |
| 2.8 | Breaker failure protection | | | |
| 2.8.1 | Setting range | % Ir | Insert | |
| 2.8.2 | Re-trip time delay range | S | 0-1 | |
| 2.8.3 | Re-trip operation mode 1/3ph | | Yes | |
| 2.8.4 | Back-up time delay range | S | 0-1 | |
| 2.8.5 | Trip operating time setting resolution | ms | 1 | |
| 2.8.6 | Trip delay range | s | 0-1 | |
| 2.8.7 | Single-phase with/without current | 0 | Yes | |
| 2.8.8 | 2-stage operation bay trip repeat/trip busbar | | Insert | |
| 2.0.0 | Selectable operation mode (current, unbal- | | liisen | |
| 2.8.9 | ance, low current) | | Insert | |
| | Independent settable delay times for all opera- | | | |
| 2.8.10 | tion modes | | Yes | |
| | Low current mode using the circuit breaker | | | |
| 2.8.11 | auxiliary contact | | Yes | |
| 2.8.12 | End fault protection | | Yes | |
| 2.0.12 | Independent breaker failure protection per bay | | 105 | |
| 2.8.13 | unit | | Yes | |
| 2.9 | Disturbance recorder CU, BU | | | |
| 2.9 | Number of digital signals | | Insert | |
| 2.9.1 | Number of analogue signals | | Insert | |
| 2.9.2 | External/manual initiation of recording | | Insert | |
| | | k⊓- | | |
| 2.9.4 | Sampling rate | kHz ma | Insert | |
| 2.9.5 | Pre-fault time | ms | ≥ 300 | |



| N | Description | Minimum Requirements | | |
|--------|---|----------------------|--------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 2.9.6 | Recording time | ms | ≥ 2000 | |
| 2.9.7 | Number of recorded disturbances | | Min. 5 | |
| 2.9.8 | 2.9.8 Total recording time with max. analogue and binary signals | | > 10 | |
| 2.9.9 | Output file Comtrade format | | Yes | |
| 2.10 | Event recorder CU, BU | | | |
| 2.10.1 | Max. number of events | | Insert | |
| 2.10.2 | Time tagging resolution | ms | 1 | |
| 2.11 | Self-supervision CU, BU | | Yes | |
| 3. | Additional requirements | | | |
| 3.1 | Test socket BU | | Yes | |
| 3.2 | Setting and configuration approved by Engi- neer | | Yes | |
| 3.4 | Centralised, user-friendly configuration and all necessary software tools for full param- eterization, and (re)configuration in case of extensions should be delivered | | Yes | |
| | Overall compliance with the requirements (yes/no) | | | |



| 5.2.5.34 | 14011 - Tri | p Circuit Su | pervision Relay |
|----------|-------------|--------------|-----------------|
| 5.2.5.54 | 14011 - 111 | p on cuit ou | |

| No. | Description | Minimum Requirements | | | |
|-------|--|----------------------|-----------|------------|--|
| | | Unit | Data | Guaranteed | |
| 14011 | Trip Circuit Supervision Relay / Code number: 14011 | | | | |
| 1.1 | Manufacturer | | Insert | | |
| 1.2 | Country of origin | | Insert | | |
| 1.3 | Туре | | Insert | | |
| 1.4 | Standards | | IEC | | |
| 2. | Characteristics | | | | |
| 2.1 | Auxiliary supply voltage | | | | |
| 2.1.1 | Rated auxiliary supply voltage | V d.c. | 110 ±15 % | | |
| 2.2 | Binary outputs | | | | |
| 2.2.1 | Number of outputs | NO/NC | Min. 2/2 | | |
| 2.2.2 | Rated voltage | V d.c. | 110 | | |
| 2.2.3 | Breaking capacity at inductive load with L/R<40 ms, at rated voltage | A | 0.1 | | |
| 2.2.4 | Current carrying capacity at rated voltage for signalling contacts, continuous | A | Insert | | |
| 2.3 | Supervised circuits | | | | |
| 2.3.1 | Voltage range of supervised circuits | V d.c. | 110 ±15 % | | |
| 2.3.2 | Injected current of supervised circuits | mA | Insert | | |
| 2.3.3 | Operating time range | s | Insert | | |
| 2.3.4 | Resetting time range | S | Insert | | |
| | Overall compliance with the requirements (yes/no) | | | | |



| No. | Description | Minimum Requirements | | | |
|-------|--|----------------------|-----------|------------|--|
| | | Unit | Data | Guaranteed | |
| 14011 | Trip Circuit Supervision Relay / Code number: 14011 | | | | |
| 1.1 | Manufacturer | | Insert | | |
| 1.2 | Country of origin | | Insert | | |
| 1.3 | Туре | | Insert | | |
| 1.4 | Standards | | IEC | | |
| 2. | Characteristics | | | | |
| 2.1 | Auxiliary supply voltage | | | | |
| 2.1.1 | Rated auxiliary supply voltage | V d.c. | 110 ±15 % | | |
| 2.2 | Binary outputs | | | | |
| 2.2.1 | Number of outputs | NO/NC | Min. 2/2 | | |
| 2.2.2 | Rated voltage | V d.c. | 110 | | |
| 2.2.3 | Breaking capacity at inductive load with L/R < 40 ms, at rated voltage | А | 0.1 | | |
| 2.2.4 | Current carrying capacity at rated voltage for signalling contacts, continuous | А | Insert | | |
| 2.3 | Supervised circuits | | | | |
| 2.3.1 | Voltage range of supervised circuits | V d.c. | 110 ±15 % | | |
| 2.3.2 | Injected current of supervised circuits | mA | Insert | | |
| 2.3.3 | Operating time range | s | Insert | | |
| 2.3.4 | Resetting time range | S | Insert | | |
| | Overall compliance with the requirement | | | | |

5.2.5.35 14012 - Tripping Unit - High-Speed Tripping Relay



5.2.5.36 14013 - Test Socket

| N | Departmetics | Minimum Requirements | | |
|-------|--|----------------------|--------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 14013 | 3 Test socket / Code number: 14013 | | | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Country of origin | | Insert | |
| 1.3 | Type • Line main 1 and 2 • Line back-up and bus coupler • Transformer main 1 and 2 • Bay unit BBF • Distance protection (code 14007) | | Insert | |
| 1.4 | Standards | | IEC | |
| 1.5 | Each protection device must have its own test socket | | Yes | |
| 1.6 | Test socket must obtain safe online protection testing and maintaining, and performing whole tripping test with following AR | | Yes | |
| 1.7 | Test socket should have enough contacts to: Short-circuit current inputs from CT's Isolate voltage inputs from VT's Isolate trip circuit for each phase separately Isolate CB close command Isolate signalling voltage Inhibit breaker failure initialising Inhibit sending of communication signal Allow functional testing of protection | | Yes | |
| 1.8 | Socket should be designed for 4 mm banana plugs access | | Yes | |
| | Overall compliance with the requirements (yes/no) | | | |



5.2.5.37 19001 - Battery

| | | Minii | mum Requirements | |
|-------|---|---------|---|------------|
| No. | Description | Unit | Data | Guaranteed |
| 19001 | 110 V & 48 V Battery units / Code number | : 19001 | | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Type designation | | Insert | |
| 1.3 | Country of origin | | Insert | |
| 1.4 | Standards | | IEC | |
| 1.5 | Quality control | | ISO 9001 | |
| 1.6 | Rated voltage | V | 110 (for 110 V DC) 48 (for 48 V DC) | |
| 1.7 | Number of cells per battery unit | pcs | 92 (for 110 V DC) 40 (for 48 V DC) | |
| 1.8 | Type of cell | | Ni-Cd | |
| 1.9 | Operating voltage per cell | V | 1,2 | |
| 1.10 | Floating voltage per cell | V | 1,40 - 1,42 | |
| 1.11 | Equalizing voltage per cell | V | 1,55 - 1,65 | |
| 1.13 | Rated capacity at 20°C | | | |
| | For 3h discharge time | Ah | Insert | |
| | For 5h discharge time | Ah | Insert | |
| | For 10h discharge time | Ah | 300 (for 110 V DC) 150 (for 48 V DC) | |
| 1.14 | Discharge voltage per cell | V | 1,0 | |
| 1.15 | Spec. gravity of electrolyte | 1 | 1,2±0,02 | |
| 1.16 | Positive plate | - | Tubular | |
| 1.17 | Negative plate | - | Pasted | |
| 1.18 | Type of container | - | Plastic polymer | |
| 1.19 | Cell condition | - | Pre-charged | |
| 1.20 | The battery stands steel frame | | Yes | |
| 1.21 | The battery stands earth-quake endurance type | | Yes | |
| 1.22 | Overall dimensions of one cell | mm | Insert | |
| 1.23 | Quantity of electrolyte per one cell | litre | Insert | |
| 1.24 | Length/width/height of assembled battery | mm | Insert | |
| 1.25 | Weight of battery and stands in service | kg | Insert | |



5.2.5.38 19002 - Battery Charger

| No. | Description | Minin | num Requirements | Guarantaad |
|-------|--|-------------------|--|------------|
| NO. | | Unit | Data | Guaranteed |
| 19002 | Battery Charger / Code number: 1900 | 3) | | |
| 1.1 | Manufacturer | | | |
| 1.2 | Type designation | | | |
| 1.3 | Туре | | Thyristor controlled | |
| 1.4 | Country of origin | | - | |
| 1.5 | Standards | | IEC | |
| 1.6 | Rated input voltage | V | 3 x 400 / 230 | |
| 1.7 | Rated input current (at rated output) | A | Insert | |
| 1.8 | Input voltage variation | % | ±5 | |
| 1.9 | Power factor | 1 | > 0,80 | |
| 1.10 | Efficiency | % | > 85 | |
| 1.11 | Degree of protection | | IP42 | |
| 1.12 | Noise level | dB | < 65 dB max | |
| 1.13 | Type of rectifiers | | Modular with MCU | |
| 1.14 | Number of modules (n+2) | pcs | Insert | |
| 1.15 | Module rated output current | A | Insert | |
| 1.16 | MCU protocol | | IEC 61850 | |
| 1.21 | Charging characteristic | | Both constant current & constant voltage | |
| 1.22 | Rated frequency | Hz | 50 | |
| 1.23 | Insulation - HV, between input and output/ground | V AC, min | 1000 V AC, 1 min | |
| 1.24 | Insulation resistance | MW ; V DC, min | 10 MW , 500 V DC, 1 min | |
| 1.25 | Rated capacity | kVA | Insert | |
| 1.26 | Rated output voltage | V d.c. | 110 | |
| 1.27 | Rated output current | A | 100 | |
| 1.28 | Rated frequency | Hz | 50 | |
| 1.29 | Voltage & Frequency variation | % | ±5 | |
| 1.30 | Voltage ripple | % | ±5 | |
| 1.31 | Ripple frequency | Hz | ±2 | |
| 1.32 | Charge modes | - | 3 levels: charge, float & boost | |
| 1.33 | Float voltage per cell | V | 1.42 | |
| 1.34 | Boost voltage per cell | V | 1.53 | |
| 1.35 | Float & Boost voltage adjustable | - | Yes | |
| 1.36 | Measurement | | Input voltage Output voltage Output current Battery current Load current | |
| | Overall compliance with the requirem | ents (yes/no) | Earth-fault voltage | |



5.2.5.39 Fibre Optic Multiplexer Equipment

| Na | Description | Minim | Minimum Requirements | |
|---------|---|-------------------|----------------------|------------|
| No. | | Unit | Data | Guaranteed |
| 1. | General: | | | |
| | Manufacturer | | | |
| | Model No. | | | |
| | Туре | | | |
| 1.1 | Type of multiplexer | | SDH: ADM | |
| 1.2 | Complying to ITU-T rec. | | Yes | |
| 1.3 | Transmission Capacity | Mbit/s | STM-4: 620 | |
| 1.4 | Access capacity on 64 Kbit/s | channels | Minimum 200 | |
| 1.5 | Access capacity on 2 Mbit/s | channels | Minimum 40 | |
| 1.6 | Redundant central processor | | Shall be available | |
| 1.7 | Digital cross connect function | | Fully non-blocking | |
| 2. | Available aggregates: | | | |
| 2.1 | Optical aggregates (ITU-T G.957) | | L-1.1, L-1.2 | |
| 3. | Available trunk interfaces: | | | |
| 3.1 | HDB3, 2 Mbit/s interfaces per module | No. | Minimum 8 | |
| | | | G.703, transparent | |
| 3.2 | Complying to ITU-T rec. | | G.704, selectable | |
| | | No. of | 4 or 2 | |
| | HDSL, 2Mbit/s interface: | channels | 30 or 15 | |
| 3.3 | no of copper wires Capacity on 2Mbit/s or on 1Mbit/s | channels / | 30 / 2 pairs | |
| | Capacity on 2Mbit/s or on 1Mbit/sCapacity selectable | pair of | 30 / 1 pair | |
| | | wire | 15 / 1 pair | |
| 4. | Available user interfaces | | | |
| 4.1 | Voice interfaces for trunk lines: | | | |
| 4.1.1 | 1 + 1 com path protection, available for all | | yes | |
| | Analogue, 4wire with E&M: | | | |
| 4.1.2 | Input level | dBr | +7.516.0 | |
| | Output level | dBr | +7.016.5 | |
| | Analogue, 2wire with E&M: | | | |
| 4.1.3 | Input level | dBr | +6.512.5 | |
| | Output level | dBr | -1.020.0 | |
| 4.1.4 | Digital, 2Mbit/s CAS or PRI | | yes | |
| 4.2 | Voice interfaces for remote subscriber: | | | |
| 4.2.1 | 2wire, subscriber side | dBr | -5 +4 / -7.51 | |
| 4.2.2 | 2wire, PABX side | dBr | -5 +4 / -7.53 | |
| 4.3 | Integrated teleprotection | | | |
| 4.3.1 | Interface for Commands: | | | |
| 4.3.1.1 | Number of independent commands | No. | 4 | |
| 4.3.1.2 | Transmission time max. | ms | 6 | |
| 4.3.1.3 | Signal voltage | V _{peak} | 250 | |
| 4.3.1.4 | 1 + 1 com path protection | | yes | |
| 4.3.2 | Interface(s) for Differential Protection: | Khit/a | C A | |
| 4.3.2.1 | Electrical interface: G.703 | Kbit/s | 64 Minimum 64 | |
| 4.3.2.2 | Optical Interface | Kbit/s | Minimum 64 | |



| N | Description | Minim | um Requirements | 0 |
|-------|---|------------|---------------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 4.4 | Data: channels per module | | | |
| 4.4.1 | 1 + 1 com path protection, available for all | | yes | |
| 4.4.2 | V.24/V.28 (RS-232): up to 38.4kbit/s | No. | 4 | |
| 4.4.3 | V.11/X.24 (RS-422): 64kbit/s | No. | 4 | |
| 4.4.4 | V.35: 64kbit/s | No. | 4 | |
| 4.4.5 | V.36 (RS-449): 64kbit/s | No. | 2 | |
| 4.4.6 | G.703: 64kbit/s | No. | 8 | |
| | Ethernet: | | | |
| 4.4.7 | • 10/100 BaseT | No. | 4 | |
| 4.4.7 | WAN capacity | Mbit/s | Min: 2x 2Mbit/s | |
| | Protocols | - | Min.: IP | |
| 4.5 | Integrated alarm gathering module: | | | |
| 4.5.1 | Number of external alarms per module | No. | Min. 20 | |
| 4.5.2 | Auxiliary power supply for ext. contacts | | Yes | |
| 4.6 | Network Management System | | | |
| 4.6.1 | Type/Name of configuration tool | | | |
| 4.6.2 | For fault / configuration management | | Yes / yes | |
| 4.6.3 | For local / remote operation | | Yes / yes | |
| 4.6.4 | Data communication network (DCN) | | Ethernet / IP or | |
| 4.0.4 | | | Ethernet / OSI | |
| 4.7 | Ambient Conditions: | | | |
| 4.7.1 | Storage: ETS 300 019-1-1, class 1.2 | °C / % hum | -5 + 55 / class 1.2 | |
| 4.7.2 | Transport: ETS 300 019-1-2, class 2.2 | °C / % hum | -5 + 70 / class 2.2 | |
| 4.7.3 | Operation: ETS 300 019-1-3, class 3.1E | °C / % hum | -5 +45 / class 3.1E | |
| 4.8 | Power Supply | | | |
| 4.8.1 | Operation | V DC | 48 / 60 (-15/+20%) | |
| 4.8.2 | Fully redundant power supply | | yes | |
| | Overall compliance with the requirements (yes/no) | | | |

Bidder shall provide all necessary information which deemed to be necessary to complete the project in all respects.



| | | Minimum Requirements | | Querenteed |
|---------|--|----------------------|--|------------|
| No. | Description | Unit | Data | Guaranteed |
| 1. | General | | | |
| 1.1 | Manufacturer | | Insert | |
| 1.2 | Туре | | Insert | |
| 1.3 | Model designation | | Insert | |
| 1.4 | Country of origin | | Insert | |
| 1.5 | Power supply | V, DC | DC 110 V | |
| 1.6 | Power supply - printer | V, Hz | AC 230 V, 50 Hz | |
| 2. | Analogue inputs | , | , | L |
| 2.1 | Number of channels | | Minimum 160 | |
| 2.1.1 | Expandability | | Minimum 32 | |
| 2.1.1 | Nominal current | Amp | 1A / 5A | |
| 2.3.1 | Nominal voltage | Vac/Vdc | Insert | |
| 2.3.1 | Nominal current | mA/Amp | Insert | |
| 2.4 | Frequency response | шдулпр | Insert | |
| 2.4 | Cut-off frequency | | insen | |
| 2.5.1 | Bandwidth | dB | insert | |
| 2.5.2 | Attenuation at | dB | Insert | |
| 2.0.2 | Auto adjusted anti-aliasing filters for chosen | GD | insert | |
| 2.5.3 | sampling rate | Yes/No | Yes | |
| | Simultaneously programmable sampling rate for | | Min 2 for FAST and | |
| 2.5.4 | all feeders/inputs | | SLOW Recording | |
| 2.5.4.1 | Locally changeable | | Yes | |
| 2.5.4.2 | Remotely changeable | | Yes | |
| 2.5.5 | Possible sampling rates | | | |
| 2.5.5.1 | Slow. 1Hz-500Hz | Samples / sec | Insert | |
| 2.5.5.2 | Fast: 0.5 kHz - 6kHz | Samples / | Insert | |
| | | Samples / | | |
| 2.5.5.3 | Continuous (variable rate) | sec | Insert | |
| 2.6 | DC coupled inputs | Yes/No | Yes | |
| 2.7 | Resolution | bits | 12 or better | |
| 2.8 | Accuracy | % | Min 0.5 | |
| 2.9 | Burden | | | |
| 2.9.1 | Current circuit | VA | Insert | |
| 2.9.2 | Voltage circuit | VA | Insert | |
| 2.10 | Over load | | | |
| 2.10.1 | Current | % In | 100% In continuously, min 600 % In for 1 sec. | |
| 2.10.2 | Voltage circuit | % Vn | 2 Vn and max. 350 Vn | |
| 3. | Digital inputs | | | 1 |
| 3.1 | Number of channels | | Minimum 480 | |
| 3.1.1 | Expandability | | Minimum 96 | |
| 3.2 | Selectable input level | Vdc | N/O or N/C, 110 VDC | |

5.2.6 Digital Fault and Disturbance Recorder (DFDR)



| | Description | Minim | um Requirements | |
|-------|--|------------|------------------------|------------|
| No. | Description | Unit Data | | Guaranteed |
| | - | | Potential or potential | |
| 3.3 | Туре | | free contact | |
| 3.4 | Resolution | ms | Insert | |
| 4. | Memory | | | |
| 4.1 | Size | MB | 64 MB or higher | |
| 4.2 | Туре | | Solid state | |
| 7.2 | | | 0.1-2 user programma- | |
| 4.3 | Pre-fault time (fast scanning rate) | sec | ble | |
| | | | 0.1-2 user programma- | |
| 4.4 | Post-fault (fast scanning rate | sec | ble | |
| | | | min. 180 user pro- | |
| 4.5 | Pre and post-fault time (slow scanning rate) | sec | grammable | |
| 4.6 | In-built hard disk (auto-maintained | GB | min. 4 GB | |
| 5. | Sensors / Triggering criteria | | | |
| J. | All sensors/triggers are preferable programma- | | | |
| | ble and virtually recordable | Yes/No | Yes | |
| 5.1. | Logical combination sensor | Yes/No | Yes | |
| 5.2. | Three phase over or under voltage / current | Yes/No | Yes | |
| 5.3. | Mono phase over or under voltage / current | Yes/No | Yes | |
| 5.4. | *du/dt, dp/dt, dq/dt, [Single/3 Phases], df/dt. etc. | Yes/No | Yes | |
| 5.5. | RMS [voltage / current] | Yes/No | Yes | |
| 5.6. | Zero sequence | Yes/No | Yes | |
| 5.7. | Negative, positive sequence | Yes/No | Yes | |
| 5.8. | Frequency | Yes/No | Yes | |
| 5.9. | DC Step | Yes/No | Yes | |
| 5.10. | Pendling / swing | Yes/No | Yes | |
| 5.11. | Digital level and edge | Yes/No | Yes | |
| 5.12. | Sensor trigger | Yes/No | Yes | |
| 5.13. | Event trigger | Yes/No | Yes | |
| 5.14. | Manual trigger | Yes/No | Yes | |
| 5.15. | Remote trigger | Yes/No | Yes | |
| | | | | 1 |
| 6. | Clock System | | | |
| 6.1. | Internal clock | Yes/No | Yes | |
| 6.2. | | | Insert | |
| 6.3. | External synchronization | Yes/No | Yes | |
| 6.4. | Time resolution between 2 synchronized pulses | | Insert | |
| 7. | Output Alarm Relay Contact | | | |
| 74 | Max approxime voltage DC/AC | | 250 Vac or above, 60 | |
| 7.1. | Max. operation voltage DC/AC | Vac / Vdc | Vdc or above | |
| 7.2. | Make and carry for 0.5 sec | А | Min 8A | |
| 7.3. | Carry continuously | А | Min 5A | |
| 7.4. | Break (DC) - resistive | W | Insert | |
| 8. | Interface for Data Communication | | | |
| 8.1. | Full definition compression | Yes/No | Yes | |
| 8.2. | Maximum transmission rate | bits / sec | Insert | |
| 0.2. | | 5113 / 300 | | l |



| Na | Description | Minim | um Requirements | Guarantaad |
|-------|---|----------|-----------------|------------|
| No. | Description | Unit | Data | Guaranteed |
| 8.3. | Standard serial port (EIA-232-D) | Yes / No | Yes | |
| 8.4. | Printer port | Yes/No | Yes | |
| 8.5. | Dedicated serial port for modem | Yes/No | Yes | |
| 9. | Printer Data | | | |
| 9.1. | Printer amplitude (scaling peak to peak) | | Insert | |
| 9.2. | Time scale | mm/s | Insert | |
| 9.3. | Printer resolution | - | Insert | |
| 9.4. | Auto printing | Yes/No | Yes | |
| 9.5 | Fault priority transmission | Yes/No | Yes | |
| 9.6 | Fault location (distance calculation) | Yes/No | Yes | |
| 10. | Communication and remote analysing | unit | | |
| 10.1. | Processor Pentium | MHz | Minimum 450 MHz | |
| 10.2. | Co-processor Pentium | Yes/No | Yes | |
| 10.3. | Main memory capacity | Mb | Minimum 64 MB | |
| 10.4. | Colour graphics board S-VGA | Yes/No | Yes | |
| 10.5 | Screen S-VGA | Yes/No | Yes | |
| 10.6 | Hard disk unit | GB | Minimum 40 GB | |
| 10.7 | Printer | Yes/No | Yes | |
| 10.8 | Modem | Yes/No | Yes. | |
| | Overall compliance with the requirements (yes/no) | | | |



5.2.7 Technical Information

5.2.7.1 Drawings and Other Technical Information to be Provided

| Ref. | Description | Denomination / Description of Material in the Bid | Reference in the Bid |
|------|---|--|----------------------|
| 1. | Contractor's quality control system | | |
| 1.1 | Copy of the QA system accreditation certificates | | |
| 1.2 | Quality system manual with typical procedures and quality control sheets | | |
| 1.3 | Environmental management manual | | |
| 1.4 | Occupational health and safety manual | | |
| 2. | Standards | | |
| 2.1 | Copy of technical standards proposed for use instead of a relevant IEC or other international standard, with list of differences from relevant international standard, if any | | |
| 3. | Substation arrangement | | |
| 3.1 | Substation Single Line Diagrams | | |
| 3.2 | Substation Layout drawing | | |
| 4. | Circuit breakers | | |
| 4.1 | Manufacturer's authorization letter | | |
| 4.2 | Manufacturer's QA certificates | | |
| 4.3 | Technical data sheet | | |
| 4.4 | List of performed type tests | | |
| 4.5 | Type test certificates | | |
| 4.6 | Reference list for the last five years for the offered type | | |
| 5. | Disconnectors | | |
| 5.1 | Manufacturer's authorization letter | | |
| 5.2 | Manufacturer's QA certificates | | |
| 5.3 | Technical data sheet | | |
| 5.4 | List of performed type tests | | |
| 5.5 | Type test certificates | | |
| 5.6 | Reference list for the last five years for the offered type | | |
| 6. | Current transformers | | |
| 6.1 | Manufacturer's authorization letter | | |
| 6.2 | Manufacturer's QA certificates | | |
| 6.3 | Technical data sheet | | |
| 6.4 | List of performed type tests | | |
| 6.5 | Type test certificates | | |
| 6.6 | Reference list for the last five years for the offered type | | |



| Ref. | Description | Denomination / Description of Material in the Bid | Reference in the Bid |
|------|--|--|----------------------|
| 7. | Voltage transformers | | |
| 7.1 | Manufacturer's authorization letter | | |
| 7.2 | Manufacturer's QA certificates | | |
| 7.3 | Technical data sheet | | |
| 7.4 | List of performed type tests | | |
| 7.5 | Type test certificates | | |
| 7.6 | Reference list for the last five years for | | |
| 7.6 | the offered type | | |
| 8. | Surge arresters | | |
| 8.1 | Manufacturer's authorization letter | | |
| 8.2 | Manufacturer's QA certificates | | |
| 8.3 | Technical data sheet | | |
| 8.4 | List of performed type tests | | |
| 8.5 | Type test certificates | | |
| 9.6 | Reference list for the last five years for | | |
| 8.6 | the offered type | | |
| 9. | Control system | | |
| 9.1 | Manufacturer's authorization letter | | |
| 9.2 | Manufacturer's QA certificates | | |
| 9.3 | Technical data sheet | | |
| 9.4 | List of performed type tests | | |
| 9.5 | Type test certificates | | |
| 9.6 | Reference list for the last five years for | | |
| 9.0 | the offered type | | |
| 10. | Relay Protection System | | |
| 10.1 | Manufacturer's authorization letter | | |
| 10.2 | Manufacturer's QA certificates | | |
| 10.3 | Technical data sheet | | |
| 10.4 | List of performed type tests | | |
| 10.5 | Type test certificates | | |
| 10.6 | Reference list for the last five years for | | |
| 10.0 | the offered type | | |
| 11. | Metering System | | |
| 11.1 | Manufacturer's authorization letter | | |
| 11.2 | Manufacturer's QA certificates | | |
| 11.3 | Technical data sheet | | |
| 11.4 | List of performed type tests | | |
| 11.5 | Type test certificates | | |
| 11 0 | Reference list for the last five years for | | |
| 11.6 | the offered type | | |
| 12. | Communication System | | |
| 12.1 | Manufacturer's authorization letter | | |
| 12.2 | Manufacturer's QA certificates | | |
| 12.3 | Technical data sheet | | |
| 12.4 | List of performed type tests | | |



| Ref. | Description | Denomination / Description of Material in the Bid | Reference in the Bid |
|------|---|--|----------------------|
| 12.5 | Type test certificates | | |
| 12.6 | Reference list for the last five years for the offered type | | |
| | Overall compliance with the requiren | | |



6. Schedule F: Subcontractors

The following form shall be filled and attached to the bid.

Bidders are free to propose/list more than one Subcontractor for each item. Quoted rates and prices are deemed to apply to whichever Subcontractor is appointed, and no adjustment of the rates and prices will be permitted.

In case that more than one Subcontractor has been proposed, the Employer has the right to choose one or more of them, or can ask for replacement.

Should a Subcontractor be determined to be unacceptable, the Bid will not be rejected, but the Bidder will be required to substitute by an acceptable Subcontractor without any change to the bid price.

Prior to signing the contract, the corresponding appendix to the contract agreement shall be completed, listing the approved Subcontractor for each item concerned.

If the Bidder will carry out any of the works and services, they shall put own name in the form

Subcontractors

| ltem | Works and Service | Subcontractor's Name and Address | Nationality |
|------|--|----------------------------------|-------------|
| 11. | Design | | |
| 11.2 | Civil works | | |
| 11.3 | Electrical works / installation, testing and commissioning | | |
| 11.4 | NLDC | | |
| | Name of Bidder: | | |
| | Signature of Piddor: | | |
| | Signature of Bidder: | | |
| | | | |

The following Subcontractors are proposed for carrying out the facilities:

