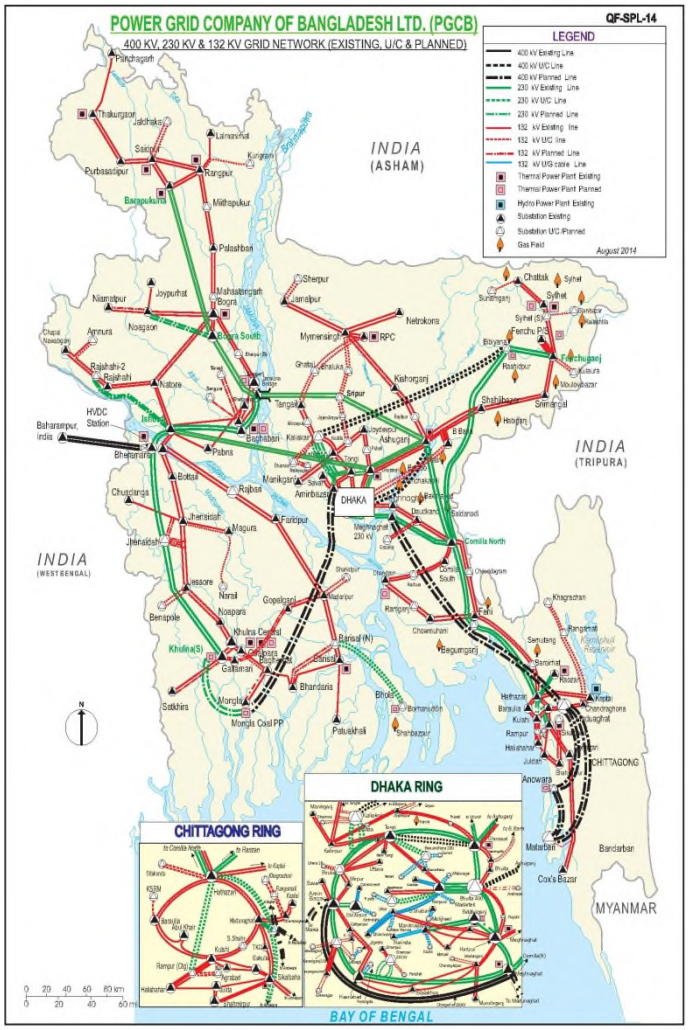
Financial Cooperation between Bangladesh and Germany

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

Volume 3, January 2019

Employer:

Power Grid Company of Bangladesh (PGCB)
IEB Bhaban (4th Floor), IEB
Ramna, Dhaka-1000, Bangladesh

Consultant:

GOPA-International Energy Consultants GmbH
Justus-von-Liebig-Str. 1, 61352 Bad Homburg, Germany
Phone: +49 (6172) 1791-800; Fax: +49 (6172) 944 95 20
eMail: info@gopa-intec.de; www.gopa-intec.de

Contents of the Tender Dossier

Volume 1

Volume 2

Volume 3

Table of Contents Page

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 as-built 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 SF_6 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
B	132 kV switchgear
C	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.
H	Fibre optic multiplexer equipment for communication and protection
I	Multicore low voltage power and control cables
J	Batteries, chargers and DC distribution
K	LVAC distribution
L	Civil works, building and foundations
M	Building lighting, small power and air conditioning
N	Switchyard lighting
P	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.**

The equipment to be supplied, installed and commissioned is shown on the bid drawings.

No.	Equipment	Unit	Qty.
B	**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:	Set	8
	• Q0 - One (1) set of three pole, GIS type, SF_6 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		
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:	Set	4
	• Q0 - One (1) set of three pole, GIS type, SF_6 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		
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:	Set	1
	• Q0 - One (1) set of three pole, GIS type, SF_6 gas circuit breaker with **one** spring-stored energy operating mechanism		

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, 650/275 kV BIL, equipped with:	Set	1
	• 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, 50Hz, 650/275 kV BIL, equipped with:	Set	1
	• 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 discharge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide type	Set	36
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 switchgear, 145 kV, 3150 & 2000 A & 1250 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
C	**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** 36 kV, 50Hz, 170/70 kV BIL, single phase, 33/V3 / 110/V3 / 110/V3 kV/V/V, 2 secondary windings, inductive type	Set	12

No.	Equipment	Unit	Qty.
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 & 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 metering for 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.		
	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.		

No.	Equipment	Unit	Qty.
	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
H	**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.	Lot	1
	• 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		
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.	Lot	1
	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.		
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.	Lot	1

No.	Equipment	Unit	Qty.
	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.		
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.	Lot	1
	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 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 three-storey GIS 132 kV and control 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
M	**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

No.	Equipment	Unit	Qty.
P	**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 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.
B	**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** 145 kV, 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

No	Equipment	Unit	Qty.
C	**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 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:	Lot	1
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** **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	0
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**, 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	Lot	1

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
H	**Fibre Optic Multiplexer Equipment for Teleprotection and Communication**		
H1.XE	**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
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**		
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
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

No	Equipment	Unit	Qty.
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 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 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
P	**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

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**

The equipment to be supplied, installed and commissioned is shown on the bid drawings.

No	Equipment	Unit	Qty.
B	**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:	Set	8
	• Q0 - One (1) set of three pole, GIS type, SF_6 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		
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:	Set	4
	• Q0 - One (1) set of three pole, GIS type, SF_6 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		
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:	Set	1
	• Q0 - One (1) set of three pole, GIS type, SF_6 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		

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, 650/275 kV BIL, equipped with:	Set	1
	• 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, 50Hz, 650/275 kV BIL, equipped with:	Set	1
	• 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	**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
C	**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** 36 kV, 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 & 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

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 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 metering for 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.		
	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.
H	**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.	Lot	1
	• 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		
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.	Lot	1
	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.		
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.	Lot	1
	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.		

No	Equipment	Unit	Qty.
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 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
L3.1X	One (1) lot of complete design, supply and construction of civil works and facilities for one new three-storey GIS 132 kV and control 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
M	**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

No	Equipment	Unit	Qty.
P	**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 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 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

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.

The equipment to be supplied, installed and commissioned is shown on the bid drawings.

No	Equipment	Unit	Qty.
B	**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 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

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 **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:	Lot	1
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** **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.XE	**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 **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.	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 Teleprotection and Communication**		
H1.XE	**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	Lot	1

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 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**		
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
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
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 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 facilities for **adaptation of the existing** control building, including finishing works such as rendering, painting, floor finishing, etc.	Lot	1

No	Equipment	Unit	Qty.
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
P	**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 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	2

1.2.5 Extension of Existing 230/132 kV AIS Substation Barisal (N)

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.

The equipment to be supplied, installed and commissioned is shown on the bid drawings.

No	Equipment	Unit	Qty.
B	**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 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	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**/1/1/1/1/1 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 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
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.		

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** **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.XE	**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 **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.	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 Teleprotection and Communication**		
H1.XE	**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
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

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, 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** 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
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 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 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
P	**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	Lot	1

No	Equipment	Unit	Qty.
	and provide supporting design calculations and **for connection of new equipment 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 back-up 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.

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.
   7. 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).
   11. 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 Tele-communication System

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.

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)
	Renovation/New 132/33/11 kV GIS Substation SHAHJIBAZAR					
B	**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, 3200-1600-800/1/1/1/1/1 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: Signature of Bidder:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)
BG.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 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	Set	1			
BG.5	A complete indoor GIS **Busbars Earthing bay** 145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: Q81, Q82 - Two (2) set of three pole, make-proof, motor operated earthing switch	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	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			
C	**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: Signature of Bidder:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (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 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**					
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:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (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.	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			
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 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: Signature of Bidder:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (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			
M	**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			
P	**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 SHAHJIBAZAR

Subtotal - to Schedule 5 - Grand Total

Name of Bidder: Signature of Bidder:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)
	Renovation/Upgading of 132/33 kV AIS Substation SATHKHIRA					
B	**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			
C	**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. 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	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					

Name of Bidder: Signature of Bidder:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) 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			
H	**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			
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**					
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					

Name of Bidder: Signature of Bidder:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (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			
P	**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 SATHKHIRA Subtotal - to Schedule 5 - Grand Total						

Name of Bidder: Signature of Bidder:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)
	Renovation/New 132/33 kV GIS Substation SYLHET					
B	**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, 3200-1600-800/1/1/1/1/1 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: Signature of Bidder:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)
BG.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 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	Set	1			
BG.5	A complete indoor GIS **Busbars Earthing bay** 145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: Q81, Q82 - Two (2) set of three pole, make-proof, motor operated earthing switch	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	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			
C	**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: Signature of Bidder:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (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. 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			
H	**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: Signature of Bidder:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (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			
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			
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 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: Signature of Bidder:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (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 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			
M	**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			
P	**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			

Name of Bidder: Signature of Bidder:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (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						

Name of Bidder: Signature of Bidder:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)
	Extension of 132/33 kV AIS Substation BHANDARIA					
B	**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 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:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (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, 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:	Lot	1			
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			
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**	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			
H	**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	Lot	1			

Name of Bidder: Signature of Bidder:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (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**					
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			
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**					
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			

Name of Bidder: Signature of Bidder:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (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			
P	**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						

Name of Bidder: Signature of Bidder:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)
	Extension of 230/132/33 kV AIS Substation BARISAL (N)					
B	**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 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:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (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, 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:	Lot	1			
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			
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**	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			
H	**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	Lot	1			

Name of Bidder: Signature of Bidder:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (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**					
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			
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**					
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			

Name of Bidder: Signature of Bidder:

Schedule 1: Plant & Equipment supplied from Abroad

No	Equipment	Unit	Quantity (1)	Code	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (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			
P	**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						

Name of Bidder: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price EXW
			(1)	(2)	(3) = (1) x (2)	(4)	(5)=(1)x(4)
	Renovation/New 132/33/11 kV GIS Substation SHAHJIBAZAR						
B	**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, 3200-1600-800/1/1/1/1/1 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: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price EXW
			(1)	(2)	(3) = (1) x (2)	(4)	(5)=(1)x(4)
BG.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 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	Set	1				
BG.5	A complete indoor GIS **Busbars Earthing bay** 145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: Q81, Q82 - Two (2) set of three pole, make-proof, motor operated earthing switch	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	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				
C	**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: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity (1)	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)	Local Currency (in BDT) Unit Price EXW (4)	Local Currency (in BDT) Total Price EXW (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. 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				
H	**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: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price 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				
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				
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 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: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price EXW
			(1)	(2)	(3) = (1) x (2)	(4)	(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				
M	**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				
P	**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 SHAHJIBAZAR Subtotal - to Schedule 5 - Grand Total							

Name of Bidder: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity (1)	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)	Local Currency (in BDT) Unit Price EXW (4)	Local Currency (in BDT) Total Price EXW (5)=(1)x(4)
	Renovation/Upgading of 132/33 kV AIS Substation SATHKHIRA						
B	**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				
C	**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. 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	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: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price EXW
			(1)	(2)	(3) = (1) x (2)	(4)	(5)=(1)x(4)
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**	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				
H	**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				
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**						
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: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price EXW
			(1)	(2)	(3) = (1) x (2)	(4)	(5)=(1)x(4)
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				
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				
P	**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 SATHKHIRA Subtotal - to Schedule 5 - Grand Total						
	Renovation/New 132/33 kV GIS Substation SYLHET						
B	**132 kV switchgear, equipment connection and steel structures**						

Name of Bidder: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity (1)	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)	Local Currency (in BDT) Unit Price EXW (4)	Local Currency (in BDT) Total Price EXW (5)=(1)x(4)
	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, 3200-1600-800/1/1/1/1/1 A, GIS type current transformers X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay	Set	1				
BG.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 T5 - Three (3) single-phase, 2-winding, 132/V3 / 110/V3 / 110/V3 kV/V/V, GIS type voltage transformers	Set	1				

Name of Bidder: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price 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						
BG.5	A complete indoor GIS **Busbars Earthing bay** 145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: Q81, Q82 - Two (2) set of three pole, make-proof, motor operated earthing switch	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	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				
C	**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				
G	**Control, Protection, SCADA System and Metering**						

Name of Bidder: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price 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				
H	**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**						

Name of Bidder: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				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. (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				
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 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: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price 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				
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				
M	**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				
P	**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				

Name of Bidder: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price 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: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity (1)	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)	Local Currency (in BDT) Unit Price EXW (4)	Local Currency (in BDT) Total Price EXW (5)=(1)x(4)
	Extension of 132/33 kV AIS Substation BHANDARIA						
B	**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: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price 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, 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:	Lot	1				
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				
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**	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				
H	**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)	Lot	1				

Name of Bidder: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price 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						
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**						
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				
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**						
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**						

Name of Bidder: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	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				
P	**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						

Name of Bidder: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				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 230/132/33 kV AIS Substation BARISAL (N)						
B	**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: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price 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, 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:	Lot	1				
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				
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**	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				
H	**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)	Lot	1				

Name of Bidder: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price 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						
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**						
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				
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**						
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**						

Name of Bidder: Signature of Bidder:

Schedule 2: Plant & Equipment Supplied from Within the Employer's Country

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	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				
P	**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						

Name of Bidder: Signature of Bidder:

Schedule 3: Design Services

Renovation/New 132/33 kV GIS Substation SHAJIBAZAR

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

Name of Bidder: Signature of Bidder:

Schedule 3: Design Services

Extension of 132/33 kV AIS Substation BHANDARIA

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price foreign portion	Total Price foreign portion	Unit Price local portion	Total Price local portion
			(1)	(2)	(3) = (1) x (2)	(4)	(5)=(1) x (4)
	Design and engineering services, local and foreign part	Lump sum	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	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price foreign portion	Total Price foreign portion	Unit Price local portion	Total Price local portion
			(1)	(2)	(3) = (1) x (2)	(4)	(5)=(1) x (4)
	Design and engineering services, local and foreign part	Lump sum	1				
	Extension of 132/33 kV AIS Substation BARISAL (N) Subtotal - to Schedule 5 - Grand Total						

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity (1)	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)	Local Currency (in BDT) Unit Price EXW (4)	Local Currency (in BDT) Total Price EXW (5)=(1)x(4)
Renovation/New 132/33/11 kV GIS Substation SHAHJIBAZAR							
B	**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:	Set	8				
	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						
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:	Set	4				
	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						
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:	Set	1				
	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, 3200-1600-800/1/1/1/1/1 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:						

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity (1)	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)	Local Currency (in BDT) Unit Price EXW (4)	Local Currency (in BDT) Total Price EXW (5)=(1)x(4)
BG.4	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	Set	1				
BG.5	A complete indoor GIS **Busbars Earthing bay** 145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: Q81, Q82 - Two (2) set of three pole, make-proof, motor operated earthing switch	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	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				
C	**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				

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity (1)	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)	Local Currency (in BDT) Unit Price EXW (4)	Local Currency (in BDT) Total Price EXW (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.						
	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,**	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				
H	**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.	Lot	1				
	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						
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**						

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				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. (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				
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 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				
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				

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				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				
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				
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				
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				
M	**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**						

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price EXW
			(1)	(2)	(3) = (1) x (2)	(4)	(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				
P	**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				
X	**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				

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price 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							

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity (1)	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)	Local Currency (in BDT) Unit Price EXW (4)	Local Currency (in BDT) Total Price EXW (5)=(1)x(4)
Renovation/Upgading of 132/33 kV AIS Substation SATHKHIRA							
B	**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				
C	**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	Lot	1				
	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.						
	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						

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price EXW
			(1)	(2)	(3) = (1) x (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				
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				
H	**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				
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**						
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** **Extension of existing LV DC 48 V Auxiliary Power Supply**	Lot	1				

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity (1)	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)	Local Currency (in BDT) Unit Price EXW (4)	Local Currency (in BDT) Total Price EXW (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**						
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				
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				

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price EXW
			(1)	(2)	(3) = (1) x (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				
P	**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				
X	**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				
Renovation/Upgading of 132/33 kV AIS Substation SATHKHIRA							
Subtotal - to Schedule 5 - Grand Total							

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity (1)	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)	Local Currency (in BDT) Unit Price EXW (4)	Local Currency (in BDT) Total Price EXW (5)=(1)x(4)
Renovation/New 132/33 kV GIS Substation SYLHET							
B	**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:	Set	8				
	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						
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:	Set	4				
	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						
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:	Set	1				
	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, 3200-1600-800/1/1/1/1/1 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:						

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity (1)	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)	Local Currency (in BDT) Unit Price EXW (4)	Local Currency (in BDT) Total Price EXW (5)=(1)x(4)
BG.4	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	Set	1				
BG.5	A complete indoor GIS **Busbars Earthing bay** 145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: Q81, Q82 - Two (2) set of three pole, make-proof, motor operated earthing switch	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	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				
C	**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				

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity (1)	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)	Local Currency (in BDT) Unit Price EXW (4)	Local Currency (in BDT) Total Price EXW (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.						
	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,**	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				
H	**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.	Lot	1				
	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						
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**						

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				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. (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				
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 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				
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				

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				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				
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				
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				
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				
2	Complete Super structures works.	Lot	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				

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity (1)	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)	Local Currency (in BDT) Unit Price EXW (4)	Local Currency (in BDT) Total Price EXW (5)=(1)x(4)
M	**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				
P	**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				
X	**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				
Renovation/New 132/33 kV GIS Substation SYLHET							
Subtotal - to Schedule 5 - Grand Total							

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity (1)	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)	Local Currency (in BDT) Unit Price EXW (4)	Local Currency (in BDT) Total Price EXW (5)=(1)x(4)
Extension of 132/33 kV AIS Substation BHANDARIA							
B	**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				

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity (1)	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)	Local Currency (in BDT) Unit Price EXW (4)	Local Currency (in BDT) Total Price EXW (5)=(1)x(4)
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 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.						
	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				
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**	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				
H	**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				
	Distance relay carrier signal (main and back-up)						
	Bus protection / breaker failure relay						
	SCADA data from switchgear and control system						
	Hot-line telephone system						

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price 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				
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**						
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				
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**						
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**						
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				

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price 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				
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				
P	**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				
X	**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				

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity (1)	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)	Local Currency (in BDT) Unit Price EXW (4)	Local Currency (in BDT) Total Price EXW (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				
X3	Transport of material and equipment	Lump sum	1				
X4	Insurance of material and equipment during transport	Lump sum	1				
Extension of 132/33 kV AIS Substation BHANDARIA							
Subtotal - to Schedule 5 - Grand Total							

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity (1)	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)	Local Currency (in BDT) Unit Price EXW (4)	Local Currency (in BDT) Total Price EXW (5)=(1)x(4)
Extension of 230/132/33 kV AIS Substation BARISAL (N)							
B	**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				

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity (1)	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)	Local Currency (in BDT) Unit Price EXW (4)	Local Currency (in BDT) Total Price EXW (5)=(1)x(4)
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 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.						
	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				
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**	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				
H	**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				
	Distance relay carrier signal (main and back-up)						
	Bus protection / breaker failure relay						
	SCADA data from switchgear and control system						
	Hot-line telephone system						

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity (1)	Foreign Currency (in…….) Unit Price CIP (2)	Foreign Currency (in…….) Total Price CIP (3) = (1) x (2)	Local Currency (in BDT) Unit Price EXW (4)	Local Currency (in BDT) Total Price EXW (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				
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**						
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				
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**						
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**						
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				

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price 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				
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				
P	**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				
X	**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				

Name of Bidder: Signature of Bidder:

Schedule 4: Installation and Other Services

No	Equipment	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price CIP	Total Price CIP	Unit Price EXW	Total Price EXW
			(1)	(2)	(3) = (1) x (2)	(4)	(5)=(1)x(4)
X3	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							

Name of Bidder: Signature of Bidder:

Schedule 5: Grand Summary (Schedules 1 to 4)

		Total price	
		Foreign Currency	Local Currency
		(in…….)	(in BDT)
Renovation/New 132/33 kV GIS Substation SHAJIBAZAR			
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:

Schedule 5: Grand Summary (Schedules 1 to 4)

	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		

Name of Bidder: Signature of Bidder:

Country of Origin

Item	Country	Code

Name of Bidder: Signature of Bidder:

Schedule 6: Recommended Spare Parts

No	Description	Unit	Quantity	Foreign Currency (in…….)		Local Currency (in BDT)	
				Unit Price EXW	Total Price EXW	Unit Price EXW	Total Price EXW
			(1)	*(2)*	*(3)=(1)x(2)*	*(4)*	*(5)=(1)x(4)*

Name of Bidder: Signature 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.

Schedule C : Bar Chart Programme for Key Activities - Time for Delivery and Completion

New 132/33 kV GIS Substation SHAHAJIBAZAR																														
Activity	Duration	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
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																														
G2-Site levelling, cable duct, path and internal fence																														
G3-Foundations for 132 kV switchyard																														
G4-Foundations for 33 kV switchyard																														
G5-Transformation tub and foundation																														
G6-Oil pit and oil sewerage																														
G7-Steel structure for 132 kV equipment																														
G8-Steel structure for 33 kV equipment																														
G9-Control building & relay houses																														
G10-Lightning and reflector poles																														
G11-Water supply and sewerage																														
IV MECHANICAL DESIGN																														
M1-Air conditioning and ventilation of control building																														
MANUFACTURING of the EQUIPMENT																														
Design of the equipment																														
Manufacturing																														
Training																														
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																														
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 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																														
Installation of ACU Batteries																														
Installation of Telecommunication equipment																														
Installation of cable channels																														
Installation of cables																														
Secondary connections																														
Earthing/Grounding of equipment																														
Parametrization																														
Testing of the equipment																														
Commissioning																														
Finishing works and demobilization																														

Name of Bidder:
Signature of Bidder:

Shahajibazar

Schedule C : Bar Chart Programme for Key Activities - Time for Delivery and Completion

Extension of 132/33 kV AIS Substation SATKHIRA																														
Activity	Duration	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
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																														
G2-Site levelling, cable duct, path and internal fence																														
G3-Foundations for 132 kV switchyard																														
G4-Foundations for 33 kV switchyard																														
G5-Transformation tub and foundation																														
G6-Oil pit and oil sewerage																														
G7-Steel structure for 132 kV equipment																														
G8-Steel structure for 33 kV equipment																														
G9-Control building & relay houses																														
G10-Lightning and reflector poles																														
G11-Water supply and sewerage																														
IV MECHANICAL DESIGN																														
M1-Air conditioning and ventilation of control building																														
MANUFACTURING of the EQUIPMENT																														
Design of the equipment																														
Manufacturing																														
Training																														
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																														
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 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																														
Installation of ACU Batteries																														
Installation of Telecommunication equipment																														
Installation of cable channels																														
Installation of cables																														
Secondary connections																														
Earthing/Grounding of equipment																														
Parametrization																														
Testing of the equipment																														
Commissioning																														
Finishing works and demobilization																														

Name of Bidder:	
Signature of Bidder:	

Schedule C : Bar Chart Programme for Key Activities - Time for Delivery and Completion

New 132/33 kV GIS Substation SYLHET																														
Activity	Duration	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
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																														
G2-Site levelling, cable duct, path and internal fence																														
G3-Foundations for 132 kV switchyard																														
G4-Foundations for 33 kV switchyard																														
G5-Transformation tub and foundation																														
G6-Oil pit and oil sewerage																														
G7-Steel structure for 132 kV equipment																														
G8-Steel structure for 33 kV equipment																														
G9-Control building & relay houses																														
G10-Lightning and reflector poles																														
G11-Water supply and sewerage																														
IV MECHANICAL DESIGN																														
M1-Air conditioning and ventilation of control building																														
MANUFACTURING of the EQUIPMENT																														
Design of the equipment																														
Manufacturing																														
Training																														
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																														
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 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																														
Installation of ACU Batteries																														
Installation of Telecommunication equipment																														
Installation of cable channels																														
Installation of cables																														
Secondary connections																														
Earthing/Grounding of equipment																														
Parametrization																														
Testing of the equipment																														
Commissioning																														
Finishing works and demobilization																														

Name of Bidder:
Signature of Bidder:

Sylhet

Schedule C : Bar Chart Programme for Key Activities - Time for Delivery and Completion

Extension of 132/33 kV AIS Substation BHANDARIA																														
Activity	Duration	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
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																														
G2-Site levelling, cable duct, path and internal fence																														
G3-Foundations for 132 kV switchyard																														
G4-Foundations for 33 kV switchyard																														
G5-Transformation tub and foundation																														
G6-Oil pit and oil sewerage																														
G7-Steel structure for 132 kV equipment																														
G8-Steel structure for 33 kV equipment																														
G9-Control building & relay houses																														
G10-Lightning and reflector poles																														
G11-Water supply and sewerage																														
IV MECHANICAL DESIGN																														
M1-Air conditioning and ventilation of control building																														
MANUFACTURING of the EQUIPMENT																														
Design of the equipment																														
Manufacturing																														
Training																														
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																														
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 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																														
Installation of ACU Batteries																														
Installation of Telecommunication equipment																														
Installation of cable channels																														
Installation of cables																														
Secondary connections																														
Earthing/Grounding of equipment																														
Parametrization																														
Testing of the equipment																														
Commissioning																														
Finishing works and demobilization																														

Name of Bidder:	
Signature of Bidder:	

Schedule C : Bar Chart Programme for Key Activities - Time for Delivery and Completion

Extension of 230/132 kV AIS Substation BARISAL (N)																														
Activity	Duration	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
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																														
G2-Site levelling, cable duct, path and internal fence																														
G3-Foundations for 132 kV switchyard																														
G4-Foundations for 33 kV switchyard																														
G5-Transformation tub and foundation																														
G6-Oil pit and oil sewerage																														
G7-Steel structure for 132 kV equipment																														
G8-Steel structure for 33 kV equipment																														
G9-Control building & relay houses																														
G10-Lightning and reflector poles																														
G11-Water supply and sewerage																														
IV MECHANICAL DESIGN																														
M1-Air conditioning and ventilation of control building																														
MANUFACTURING of the EQUIPMENT																														
Design of the equipment																														
Manufacturing																														
Training																														
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																														
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 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																														
Installation of ACU Batteries																														
Installation of Telecommunication equipment																														
Installation of cable channels																														
Installation of cables																														
Secondary connections																														
Earthing/Grounding of equipment																														
Parametrization																														
Testing of the equipment																														
Commissioning																														
Finishing works and demobilization																														

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

The following Manufacturers are proposed for carrying out the facilities:

Item	Equipment	Type of Equipment	Manufacturer's Name and Address	Place of Manufacture and Testing	Nationality
Power Transformer					
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 Equipment					
4.1.	Circuit breakers 33 kV				
4.2.	Disconnectors 33 kV				
4.3.	Current transformers 33 kV				
4.4.	Voltage transformers 33 kV				

Item	Equipment	Type of Equipment	Manufacturer's Name and Address	Place of Manufacture and Testing	Nationality
4.5.	Surge arresters 33 kV				
Control, Protection, and Metering Equipment					
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				
Conductors, Insulators & Fittings					
8.1.	Conductors				
8.2.	Insulators				
8.3	Fittings				
Multicore LV Auxiliary Power and Control Cables					
9.	Cables				
Name of Bidder:					
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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Switchgear 1320 kV - General**			
1.1.	Manufacturer		Insert	
1.2	Type		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 U_n	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 f_r	Hz	50	
1.10	Rated current I_r			
	• Busbars	A	≥ 3150	
	• Line bay	A	≥ 2000	
	• Transformer bay	A	≥ 2000	
	• Bus Coupler bay	A	≥ 3150	
1.11	Rated short-circuit breaking current I_{sc}	kA_{rms}	≥ 40	
1.12	Duration of short-circuit	s	≥ 1	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.13	Rated peak withstand current I_p (equal short-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**	
2.7	D.C. component of the rated short-circuit breaking current	%	> 30	
2.8	Rated operating sequence		O-0.3 s-CO-3 min-CO	
2.9	Auto reclosing			
	• Line bay		**1p+3p**	
	• Transformer bay		**3p**	
	• Bus Coupler bay		**3p**	
2.10	Maximum total break time (trip initiation to final arc extinction) pos.3.7.135 acc. to IEC 62271-100)	ms	≤ 60	
2.11	Time of final arc extinction (3.7..134 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 Isc		 ≥ 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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
3.	**Disconnector**			
3.1	Type		GIS / Indoor	
3.2	Type of disconnector			
	• Three pole, three position (close/open/earthed), motor operated, insulated, with earthing switch		Yes	
	• Three pole, make-proof, motor operated earthing switch		Yes	
	• Three pole, Disconnector Link, hand operated		Yes	
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	Type		GIS / Indoor	
	Characteristics of Current Transformers are pre-liminary and for Tender purpose only. The Contractor has to make Engineering and to provide detail calculation and detail design, which will be subject of the PGCB's approval		Yes	
4.2	Rated continuous thermal current (40°C): • I core • II core • III core • IV core • V core	 % In % In % In % In % In	 200 200 120 120 120	
4.3	Rated transformer ratio: • I core • II core • III core • IV core • V core	 A/A A/A A/A A/A A/A	 **3200-1600-800/1** **3200-1600-800/1** **3200-1600-800/1** **3200-1600-800/1** **3200-1600-800/1**	
4.4	Accuracy class: • I core • II core • III core • IV core • V core		 0.2 0.2 5P20 5P20 5P20	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
4.5	Security factor: • I core • II core		 Fs=10 Fs=10	
4.6	Rated power: • I core • II core • III core • IV core • V core	 VA VA VA VA VA	 10 15 30 30 30	
5.	**Voltage Transformer**			
5.1	Type		GIS / Indoor	
5.2	Rated primary voltage	kV	132/√3	
5.3	Rated secondary voltage • I winding • II winding	 V V	 110√3 110√3	
5.4	Accuracy class: • I winding • II winding		 0.2 1/3P	
5.5	Rated power: • I winding • II winding	 VA VA	 25 75	
5.6	Load		Simultaneously	
6.	**Surge Arresters**			
6.1	Type		GIS / outdoor	
	Quantity, Position & Characteristic of Surge Arresters are preliminary and for Tender purpose only. The Contractor has to make Engineering and to provide detail calculation and detail design, which will be subject of the PGCB's approval		Yes	
6.2	Rated voltage of surge arrester U_r	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 voltage)	kJ/ kV	≥ 6.5	
6.8	Long duration current impulse (2000 µs)	A	≥ 850	
6.9	Maximum residual voltage U_{res}			
	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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
	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 possible without interruption of adjacent bays		Yes	
	Overall compliance with the requirements (yes/no)			

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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Circuit Breaker - General**			
1.1.	Manufacturer		Insert	
1.2	Type		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 f_r	Hz	50	
2.6	Rated current I_r	A	**≥ 3150**	
2.7	Rated short-circuit breaking current I_{sc}	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		**1p+3p**	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 current • 100 % 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 Isc		 ≥ 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	Mpa	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	
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 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	
3.1.3.6	Material suitable for		Al terminal	
3.2	Operating mechanism			
3.2.1	Type		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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 operating 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 mechanism 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)			

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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Circuit Breaker - General**			
1.1.	Manufacturer		Insert	
1.2	Type		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 f_r	Hz	50	
2.6	Rated current I_r	A	**≥ 20000**	
2.7	Rated short-circuit breaking current I_{sc}	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		**1p+3p**	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 current • 100 % 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 Isc		 ≥ 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	Mpa	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	
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 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	
3.1.3.6	Material suitable for		Al terminal	
3.2	Operating mechanism			
3.2.1	Type		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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 operating 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 mechanism 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)			

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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Circuit Breaker - General**			
1.1.	Manufacturer		Insert	
1.2	Type		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 f_r	Hz	50	
2.6	Rated current I_r	A	**≥ 1250**	
2.7	Rated short-circuit breaking current I_{sc}	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		**1p+3p**	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 current • 100 % 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 Isc		 ≥ 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	Mpa	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	
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 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	
3.1.3.6	Material suitable for		Al terminal	
3.2	Operating mechanism			
3.2.1	Type		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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 operating 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 mechanism 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)			

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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Circuit Breaker - General**			
1.1.	Manufacturer		Insert	
1.2	Type		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 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 f_r	Hz	50	
2.6	Rated current I_r	A	**≥ 3150**	
2.7	Rated short-circuit breaking current I_{sc}	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**	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 current • 100 % 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 Isc		 ≥ 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	Mpa	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	≥ 1750	
2.30.2	Static horizontal force, transversal F_{thB}	N	≥ 1250	
2.30.3	Static vertical force F_{tv}	N	≥ 1500	
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**			
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 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	
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	
3.1.5.3	Pole weight	kg	Insert	

No.	Description	Minimum Requirements		Guaranteed
		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	Type		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	
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 operating 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 mechanism 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)			

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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Circuit Breaker - General**			
1.1.	Manufacturer		Insert	
1.2	Type		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 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 f_r	Hz	50	
2.6	Rated current I_r	A	**≥ 2000**	
2.7	Rated short-circuit breaking current I_{sc}	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**	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 current • 100 % 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 Isc		 ≥ 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	Mpa	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	≥ 1750	
2.30.2	Static horizontal force, transversal F_{thB}	N	≥ 1250	
2.30.3	Static vertical force F_{tv}	N	≥ 1500	
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**			
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 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	
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	
3.1.5.3	Pole weight	kg	Insert	

No.	Description	Minimum Requirements		Guaranteed
		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	Type		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	
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 operating 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 mechanism 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)			

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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Circuit Breaker - General**			
1.1.	Manufacturer		Insert	
1.2	Type		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 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 f_r	Hz	50	
2.6	Rated current I_r	A	**≥ 1250**	
2.7	Rated short-circuit breaking current I_{sc}	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**	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 current • 100 % 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 Isc		 ≥ 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	Mpa	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	≥ 1750	
2.30.2	Static horizontal force, transversal F_{thB}	N	≥ 1250	
2.30.3	Static vertical force F_{tv}	N	≥ 1500	
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**			
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 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	
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	
3.1.5.3	Pole weight	kg	Insert	

No.	Description	Minimum Requirements		Guaranteed
		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	Type		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	
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 operating 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 mechanism 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)			

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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Disconnector- General**			
1.1	Manufacturer		Insert	
1.2	Type		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 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 f_r	Hz	50	
2.7	Rated current I_r	A	**≥ 3150**	
2.8	Rated short withstand current I_k	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 Ip	kA	≥ 100	
2.12	Capacity of making and breaking transfer load of busbar system at 300 V (rms)	A	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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Type		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 Al or stainless steel		Yes	
	Overall compliance with the requirements (yes/no)			

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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Disconnector- General**			
1.1	Manufacturer		Insert	
1.2	Type		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 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 f_r	Hz	50	
2.7	Rated current I_r	A	**≥ 2000**	
2.8	Rated short withstand current I_k	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 Ip	kA	≥ 100	
2.12	Capacity of making and breaking transfer load of busbar system at 300 V (rms)	A	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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Type		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 Al or stainless steel		Yes	
	Overall compliance with the requirements (yes/no)			

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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Disconnector- General**			
1.1	Manufacturer		Insert	
1.2	Type		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 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 f_r	Hz	50	
2.7	Rated current I_r	A	**≥ 1250**	
2.8	Rated short withstand current I_k	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 Ip	kA	≥ 100	
2.12	Capacity of making and breaking transfer load of busbar system at 300 V (rms)	A	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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Type		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 Al or stainless steel		Yes	
	Overall compliance with the requirements (yes/no)			

5.2.1.11 B2.4: Disconnector 132 kV, 3150 A

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Disconnector- General**			
1.1	Manufacturer		Insert	
1.2	Type		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 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 f_r	Hz	50	
2.7	Rated current I_r	A	**≥ 3150**	
2.8	Rated short withstand current I_k	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 Ip	kA	≥ 100	
2.12	Capacity of making and breaking transfer load of busbar system at 300 V (rms)	A	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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Type		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 Al or stainless steel		Yes	
	Overall compliance with the requirements (yes/no)			

5.2.1.12 B2.5: Disconnector 132 kV, 2000 A

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Disconnector- General**			
1.1	Manufacturer		Insert	
1.2	Type		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 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 f_r	Hz	50	
2.7	Rated current I_r	A	**≥ 2000**	
2.8	Rated short withstand current I_k	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 Ip	kA	≥ 100	
2.12	Capacity of making and breaking transfer load of busbar system at 300 V (rms)	A	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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Type		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 Al or stainless steel		Yes	
	Overall compliance with the requirements (yes/no)			

5.2.1.13 B2.6: Disconnector 132 kV, 1250 A

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Disconnector- General**			
1.1	Manufacturer		Insert	
1.2	Type		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 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 f_r	Hz	50	
2.7	Rated current I_r	A	**≥ 1250**	
2.8	Rated short withstand current I_k	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 Ip	kA	≥ 100	
2.12	Capacity of making and breaking transfer load of busbar system at 300 V (rms)	A	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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Type		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 Al or stainless steel		Yes	
	Overall compliance with the requirements (yes/no)			

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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Current Transformers - General**			
1.1.	Manufacturer		Insert	
1.2	Type		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	Type		Outdoor	
1.8	Shape / design		Head type	
1.9	Sealing		Hermetically closed	
2.	**Current Transformers - 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 f_r	Hz	50	
2.6	Rated short-time thermal current Ith, 1 s	kA	40	
2.7	Rated dynamic current I_{dyn}	kV peak	100	
2.8	Rated continuous thermal current (40°C): • I core • II core • III core • IV core • V core	 % In % In % In % In % In	 200 200 120 120 120	
2.9	Rated transformer ratio: • I core • II core • III core • IV core • V core	 A/A A/A A/A A/A A/A	 **4000-2000/1** **4000-2000/1** **4000-2000/1** **4000-2000/1** **4000-2000/1**	
2.10	Accuracy class: • I core • II core • III core • IV core • V core		 0.2 0.2 5P20 5P20 5P20	
2.11	Security factor: • I core • II core		 Fs=10 Fs=10	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
2.12	Rated power: • I core • II core • III core • IV core • V core	 VA VA VA VA VA	 10 15 30 30 30	
3.	**Current Transformers - Design and Construction**			
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	
3.5	Permissible level of partial discharges: • Test voltage $1.2*U_M/\sqrt{3}$ • 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		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)			

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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Current Transformers - General**			
1.1.	Manufacturer		Insert	
1.2	Type		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	Type		Outdoor	
1.8	Shape / design		Head type	
1.9	Sealing		Hermetically closed	
2.	**Current Transformers - 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 f_r	Hz	50	
2.6	Rated short-time thermal current Ith, 1 s	kA	40	
2.7	Rated dynamic current I_{dyn}	kV peak	100	
2.8	Rated continuous thermal current (40°C): • I core • II core • III core • IV core • V core	 % In % In % In % In % In	 200 200 120 120 120	
2.9	Rated transformer ratio: • I core • II core • III core • IV core • V core	 A/A A/A A/A A/A A/A	 **2000-1000/1** **2000-1000/1** **2000-1000/1** **2000-1000/1** **2000-1000/1**	
2.10	Accuracy class: • I core • II core • III core • IV core • V core		 0.2 0.2 5P20 5P20 5P20	
2.11	Security factor: • I core • II core		 Fs=10 Fs=10	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
2.12	Rated power: • I core • II core • III core • IV core • V core	 VA VA VA VA VA	 10 15 30 30 30	
3.	**Current Transformers - Design and Construction**			
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	
3.5	Permissible level of partial discharges: • Test voltage $1.2*U_M/\sqrt{3}$ • 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		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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Voltage Transformers - General**			
1.1	Manufacturer		Insert	
1.2	Type		Capacitive	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 60044-2 IEC 60273 IEC 60694 IEC 60815	
1.6	Quality control		ISO 9001	
1.7	Type		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 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 f_r	Hz	50	
2.8	Rated primary voltage	kV	132/√3	
2.9	Rated secondary voltage • I winding • II winding	 V V	 110√3 110√3	
2.10	Accuracy class: • I winding • II winding		 0.2 1/3P	
2.11	Rated power: • I winding • II winding	 VA VA	 25 75	
2.12	Load		Simultaneously	
3.	**Voltage Transformers - Design and Construction**			
3.1	Insulator material		Porcelain, brown	
3.2	Insulating medium		Oil-paper - Mixed dielectric	
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 $1.2*U_M/\sqrt{3}$ • 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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 (sealing possibilities)		Yes	
3.13	Outdoor metal part made of aluminium or stainless 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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Surge Arresters - General**			
1.1	Manufacturer		Insert	
1.2	Type		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 U_n	kV_{rms}	145	
2.4	Rated voltage of surge arrester U_r	kV_{rms}	120	
2.5	Max. continuous operating voltage U_c	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 Construction**			
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)	A	≥ 850	
3.4	Maximum residual voltage U_{res}			

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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})	N	≥ 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 requirements (yes/no)			

5.2.1.18 B6: Post Insulator 132 kV

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Post Insulators - General**			
1.1	Manufacturer		Insert	
1.2	Type		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 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 f_r	Hz	50	
2.6	Minimum creepage distance	mm/ kV	Min. ≥ 25 mm/ kV	
2.7	Failing load bending (p0) (C10)	N	≥ 10000	
2.8	Failing load torsion	Nm	≥ 4000	
3.	**Post Insulators - Design and Construction**			
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 (yes/no)			

5.2.2 C: Switchgear 33 kV

5.2.2.1 C1: Circuit Breaker 33 kV

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Circuit Breaker - General**			
1.1.	Manufacturer		Insert	
1.2	Type		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		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 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 f_r	Hz	50	
2.6	Rated current I_r	A	≥ 2000	
2.7	Rated short-circuit breaking current I_{sc}	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 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 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		3p	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
2.17	Maximum total break time (trip initiation to final arc extinction) pos.3.7.135 acc. to IEC 62271-100)	ms	≤ 100	
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 interrupters	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 current • 100 % 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 Isc		 ≥ 10000 ≥ 2500 ≥ 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	Mpa	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**			
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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Type		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	Operating mechanism material		Al or stainless steel	
3.2.19	Local/remote control selector switch		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 structure with minimum 70 µm zinc layer		Yes	
	Overall compliance with the requirements (yes/no)			

5.2.2.2 C2.1: Disconnector 33 kV

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Disconnector- General**			
1.1	Manufacturer		Insert	
1.2	Type		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 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 f_r	Hz	50	
2.7	Rated current I_r	A	**≥ 2000**	
2.8	Rated short withstand current I_k	kA_{rms}	≥ 25	
2.9	Rated duration of short-circuit	s	3	
2.10	Rated maximum withstand current Ip	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	N	Insert	
2.17.2	Transversal loading, static F_b	N	Insert	
2.17.3	Vertical force F_c	N	Insert	
2.17.4	Direct loading, dynamic	N	Insert	
2.17.5	Transversal loading, dynamic	N	Insert	
3.	**Disconnector - Design and Construction**			
3.1	Disconnector			
3.1.1	Insulator material		Porcelain, brown	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Type		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 Al or stainless steel		Yes	
3.2.9	Equipotential bonding rails		Yes	
	Overall compliance with the requirements (yes/no)			

5.2.2.3 C2.2: Disconnector 33 kV with Integrated Fuse

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Disconnector- General**			
1.1	Manufacturer		Insert	
1.2	Type		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, **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 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 f_r	Hz	50	
2.7	Rated current I_r	A	**≥ 100**	
2.8	Rated short withstand current I_k	kA $_{rms}$	≥ 25	
2.9	Rated duration of short-circuit	s	3	
2.10	Rated maximum withstand current Ip	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	N	Insert	
2.17.2	Transversal loading, static F_b	N	Insert	
2.17.3	Vertical force F_c	N	Insert	
2.17.4	Direct loading, dynamic	N	Insert	
2.17.5	Transversal loading, dynamic	N	Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	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	Type		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 Al 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)			

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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Current Transformers - General**			
1.1.	Manufacturer		Insert	
1.2	Type		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	Type		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 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 continuous thermal current (40°C): • I core • II core • III core • IV core	 % In % In % In % In	 200 200 120 120	
2.9	Rated transformer ratio: • I core • II core • III core • IV core	 A/A A/A A/A A/A	 **2000/1** **2000/1** **2000/1** **2000/1**	
2.10	Accuracy class: • I core • II core • III core • IV core		 0.2 0.2 5P20 5P20	
2.11	Security factor: • I core • II core		 Fs=10 Fs=10	
2.12	Rated power: • I core • II core • III core • IV core	 VA VA VA VA	 10 15 30 30	
3.	**Current Transformers - Design and Construction**			
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 (acc. IEC 60694)	µV	Max. 2500	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
3.5	Permissible level of partial discharges: • Test voltage 1.2*$U_M/\sqrt{3}$ • 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		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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Current Transformers - General**			
1.1.	Manufacturer		Insert	
1.2	Type		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	Type		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 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 continuous thermal current (40°C): • I core • II core • III core • IV core	 % In % In % In % In	 200 200 120 120	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
2.9	Rated transformer ratio: • I core • II core • III core	 A/A A/A A/A	 **10/1** **10/1** **10/1**	
2.10	Accuracy class: • I core • II core • III core		 0.2 5P20 5P20	
2.11	Security factor: • I core		 Fs=10	
2.12	Rated power: • I core • II core • III core	 VA VA VA	 15 30 30	
3.	**Current Transformers - Design and Construction**			
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 (acc. IEC 60694)	µV	Max. 2500	
3.5	Permissible level of partial discharges: • Test voltage 1.2*$U_M/\sqrt{3}$ • 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		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)			

5.2.2.6 C4: Voltage Transformer 33 kV

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Voltage Transformers - General**			
1.1	Manufacturer		Insert	
1.2	Type		Inductive	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 60044-2 IEC 60273 IEC 60694 IEC 60815	
1.6	Quality control		ISO 9001	
1.7	Type		Outdoor, post type	
2.	**Voltage 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 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	
2.9	Rated secondary voltage • I winding • II winding	 V V	 110√3 110√3	
2.10	Accuracy class: • I winding • II winding		 0.2 1/3P	
2.11	Rated power: • I winding • II winding	 VA VA	 25 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 windings, 1 min	kV rms	3	
3.	**Voltage Transformers - Design and Construction**			
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 (acc. IEC 60694)	µV	Max. 2500	
3.5	Permissible level of partial discharges: • Test voltage 1.2*UM/√3 • Test voltage UM	 pC pC	 Max. ≤ 5 ≤ 10	
3.7	Min. LV enclosure protection		IP54	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**Surge Arresters - General**			
1.1	Manufacturer		Insert	
1.2	Type		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 U_n	kV $_{rms}$	36	
2.4	Rated voltage of surge arrester U_r	kV $_{rms}$	30	
2.5	Max. continuous operating voltage U_c	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 Construction**			
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)	A	≥ 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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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})	N	≥ 7500	
3.6.2	Specified long-term load SSL (F_{stat})	N	≥ 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 diameter	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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**General**			
1.1	Manufacturer		Insert	
1.2	Type		Power transformer three-phase, oil immersed, two windings, with on-load tap changer, outdoor	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 60044 IEC 60076 IEC 60137 IEC 60214 IEC 60354 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	
2.2.1	Rated power: • Primary / Secondary winding	MVA	**120 / 120**	
2.2.2	Rated power (MVA) by cooling ONAN / ONAF	MVA	ONAN / ONAF **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, all taps	
2.5	Frequency	Hz	50	
2.6	Connection of three-phase windings (group of vector IEC 60076)		Dyn1	

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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 lowest voltage tap			
3.8.1	Top oil	K	≤ 50	
3.8.2	Winding	K	≤ 55	
3.8.3	Hottest spot	K	≤ 65	
4.	**Oil**			
4.1	New		Insert	
4.2	Manufacturer		Insert	
4.3	Type		Insert	
4.4	Standard		IEC 60296	
4.5	Minimum flash point	°C	Insert	
4.6	Viscosity at 20°C	mm^2/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	Type		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	Type		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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
7.	**Weights and dimensions**			
7.1	Total weight of transformer, ready for service	kg	Insert	
7.2	Outer dimensions: • Length • Width	 mm mm	 Insert 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 the power transformer**			
10.1	CT in HV bushings, for protection, WTI and Tap Changer		In all phases, 3 cores Characteristics shall be defined in design stage **One core shall be 800/1 for protection**	
10.2	CT in MV bushings, for protection, WTI and Tap Changer		In all phases, 3 cores Characteristics shall be defined in design stage **One core shall be 2400/1 for protection One core shall be for metering**	
11.	**Layout**			
11.1	Primary winding bushings		Longitudinal axis	
11.2	Secondary winding bushings		Longitudinal axis (opposite to HV)	
11.3	Conservator tank		To be defined in design stage	
11.4	Tap changer		To be defined in design stage	
11.5	Control cabinet		To be defined in design stage	
11.6	Coolers		To be defined in design stage	
12.	**Cooling groups**			
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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
13.	**Dehydrating breather**			
13.1	Type of dehydrating breather		Insert	
13.2	Dehumidifying agent	kg	Insert	
14.	**Autotransformer tank**			
14.1	Type of design			
14.2	Thickness of transformer tank: • Sides • Bottom • Top	 mm mm mm	 Insert Insert 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	Type		With diaphragm	
15.2	Number of compartments	pcs.	2	
15.3	Oil level indicators with alarm for minimum oil level	pcs.	2	
15.4	Membrane provided inside the conservator for ''breathing'' of the transformer		Yes	
16.	**Operating conditions**			
16.1	At the altitude (above sea level)	m	≤ 1000	
16.2	Maximum ambient temperature	°C	+ 45	
16.3	Average daily temperature	°C	+ 35	
16.4	Average annual temperature	°C	+ 30	
16.5	Minimum ambient temperature	°C	– 5	
	Overall compliance with the requirements (yes/no)			

5.2.4 F: Auxiliary Transformers

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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**General**			
1.1	Manufacturer		Insert	
1.2	Type		Power transformer three-phase, oil immersed, two windings, without tertiary winding, with off-load tap changer, 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 changing • Tapping range • Tapping step • Rating	 % % 	 Off-load ±5 2.5 Rated power 200 kVA, all taps	
2.5	Frequency	Hz	50	
2.6	Connection of three-phase windings (group of vector IEC 60076)		**ZNyn11**	
3.	**Special technical requirements**			
3.1	Power transformer capacity to withstand external short circuits			
3.1.1	Short-circuit duration	s	3	
3.1.2	Symmetrical short-circuit with-stand capacity and asymmetrical short-circuit withstand capacity 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 position, 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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	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	Type		Insert	
4.4	Standard		IEC 60296	
4.5	Minimum flash point	°C	Insert	
4.6	Viscosity at 20°C	mm^2/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	
5.1.3	Manufacturer		Insert	
5.1.4	Type		Insert	
5.1.5	Rated current	A	≥ 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	Type		Insert	
5.2.5	Rated current	A	≥ 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	
6.2	Outer dimensions: • Length • Width	 mm mm	 Insert Insert	
6.3	Informative dimensional sketch		To be enclosed with bid	
7.	**Dehydrating breather**			
7.1	Type of dehydrating breather		Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
7.2	Dehumidifying agent	kg	Insert	
8.	**Conservator**			
8.1	Type		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	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**General**			
1.1	Manufacturer		Insert	
1.2	Type		Power transformer three-phase, oil immersed, two windings, without tertiary winding, with off-load tap changer, 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 changing • Tapping range • Tapping step • Rating	 % % 	 Off-load ±5 2.5 Rated power 200 kVA, all taps	
2.5	Frequency	Hz	50	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
2.6	Connection of three-phase windings (group of vector IEC 60076)		**Dyn11**	
3.	**Special technical requirements**			
3.1	Power transformer capacity to withstand external short circuits			
3.1.1	Short-circuit duration	s	3	
3.1.2	Symmetrical short-circuit with-stand capacity and asymmetrical short-circuit withstand capacity 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 position, 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 lowest voltage tap			
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	Type		Insert	
4.4	Standard		IEC 60296	
4.5	Minimum flash point	°C	Insert	
4.6	Viscosity at 20°C	mm^2/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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
5.1.3	Manufacturer		Insert	
5.1.4	Type		Insert	
5.1.5	Rated current	A	≥ 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	Type		Insert	
5.2.5	Rated current	A	≥ 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	
6.2	Outer dimensions: • Length • Width	 mm mm	 Insert 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**			
8.1	Type		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)			

5.2.5 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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14291	**Control Cubicle for OHL & Bus Couplers with Switch / Code 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	Minimum Requirements		Guaranteed
		Unit	Data	
14292	**Control Cubicle for Power Transformers HV Side with LAN Switch / Code number: 14292**			
1.1	Control cubicle for power transformers HV side with LAN switch			
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)			

5.2.5.3 14293 - Control Cubicle for Power Transformers LV Side

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14293	**General (Control Cubicle for Power Transformers LV Side / Code number: 14293)**			
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)			

5.2.5.4 14294 - Control Cubicle for LV AC & DC Switchgear

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14294	**Control Cubicle for LV AC & DC SWG / Code number: 14294**			
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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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)			

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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 design)	
1.1.6	Test socket (Code: 14013)	pcs.	3	
	Overall compliance with the requirements (yes/no)			

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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14104	**Protection Cubicle No. 4 for Power Transformer HV Side / Code number: 14104)**			
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 design)	
1.1.5	Test socket (Code: 14013)	pcs.	2	
	Overall compliance with the requirements (yes/no)			

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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14105	**Protection Cubicle No. 5 for Power Transformer LV Side / Code number: 14105**			
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 design)	
1.1.6	Test socket (Code: 14013)	pcs.	3	
	Overall compliance with the requirements (yes/no)			

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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14106	**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 design)	
1.1.5	Test socket (Code: 14013)	pcs.	2	
	Overall compliance with the requirements (yes/no)			

5.2.5.10 14251 - Bay Control Unit for OHL and Bus Couplers

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14251	**Bay Control Unit for OHL and Bus Couplers / Code number: 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 %	
2.1.2	Interruption in auxiliary d.c. voltage: • Without resetting • Restart time	 ms s	 > 50 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		4xIr	
2.2.4	Permissive overload, 1 s		100xIr	
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. 45	
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. 8	
2.4.3	Rated voltage	V d.c.	110	
2.5	Binary outputs		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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	°	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 requirements (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.

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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14252	**Bay Control Unit for Power Transformers HV&LV / 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**			
2.1	Auxiliary supply voltage			
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %	
2.1.2	Interruption in auxiliary d.c. voltage: • Without resetting • Restart time	 ms s	 > 50 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		4xIr	
2.2.4	Permissive overload, 1 s		100xIr	
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 L/R<40 ms, at rated voltage	A	0.1	
2.6.4	Current carrying capacity at rated voltage for signalling contacts, continuous	A	Insert	
2.6.5	Number of tripping contacts (high-speed output)	pcs.	Insert	
2.6.6	Current carrying capacity at rated voltage for tripping contacts, continuous	A	5	
2.7	LED indications			
2.7.1	Number of LED's		Min. 16	
2.7.2	Multi-colour LED's	Yes/No	Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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, signalling 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	°	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 (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	Minimum Requirements		Guaranteed
		Unit	Data	
14253	**Bay Control Unit for LV AC&DC -SWG / Code number: 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 %	
2.1.2	Interruption in auxiliary d.c. voltage: • Without resetting • Restart time	 ms s	 > 50 Insert	
2.2	a.c. current inputs			
2.2.1	Number of inputs		Min. 3	
2.2.2	Rated current Ir	A	5	
2.2.3	Permissive overload, continuous		4xIr	
2.2.4	Permissive overload, 1 s		100xIr	
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		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 L/R<40 ms, at rated voltage	A	0.1	
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	A	5	
2.7	LED indications			
2.7.1	Number of LED's		Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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, signalling and control		Yes	
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 requirements (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.

5.2.5.13 14254 - Back-Up Control Panel

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14254	**Back-up Control Panel / Code number: 14254**			
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 requirements (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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14255	**Front Panel annunciation for OHL & TR / Code number: 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-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 (yes/no)			

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

5.2.5.15 14256 - Front Panel Annunciation for Control Room

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 (yes/no)			

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

5.2.5.16 14261 - SCADA Server

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14261	**SCADA Server / Code number: 14261**			
1.1	Manufacturer		Insert	
1.2	Country of origin		Insert	
1.3	Type		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		Guaranteed
		Unit	Data	
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	Type		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 requirements (yes/no)			

SCADA servers must be in hot-standby redundant configuration.

5.2.5.17 14262- Operator Workstation

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14262	**Operator Workstation / Code number: 14262**			
1.1	Manufacturer		Insert	
1.2	Country of origin		Insert	
1.3	Type		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	Type		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	Power consumption	W	Insert	
2.19	Visible diagonal	"	Insert	
2.20	Vertical frequency	Hz	Insert	
2.21	Max. resolution		Insert	
	Overall compliance with the requirements (yes/no)			

5.2.5.18 14263 - Printer

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Type		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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14264	**Monitoring Workstation / Code number: 14264**			
1.1	Manufacturer		Insert	
1.2	Country of origin		Insert	
1.3	Type		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	Type		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 requirements (yes/no)			

5.2.5.20 14273- Ethernet Switch Process LAN

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14273	**Ethernet Switch-Process LAN / Code number: 14273**			
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. 6xRJ45 or Min. 6xFO for IED connections 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		0..50°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 (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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14274	**Ethernet Switch-Control Room / Code number: 14274**			
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		0..50°C	
2.4.2	Storage		–20..+70°C	
2.5	Switching method an layer		Store & Forward Layer 3 (IEC 61850), RSTP (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 (yes/no)			

5.2.5.22 14281 - Protection Monitoring Software

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 (yes/no)			

5.2.5.24 14298 - Fibre Optic Cables & Terminal Equipment

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14298	**Fibre Optic Cables & Terminal Equipment / Code number: 14298**			
1.1	Sufficient quantity of adequate glass fibre optic cables for overall Protection & Control & Monitoring & Metering system should be foreseen and included in the bid.		Yes	
1.2	Below proposed quantities shall be verified according to specific Bidder's design.		Yes	
1.3	Final quantities must be estimated and delivered as per Single Line Diagram and Substation layouts.		Yes	
1.4	At least 20% spare in cable length, as well as in number of fibres in cable, should be foreseen.		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**			
2.1	Fibre optic terminations Overall quantities of specific fibre optic terminations should be closely related to number of fibres in each cable (each fibre, used or spare, should be properly terminated). At least 20% spare terminations for each proposed type should be foreseen.		Yes	
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	
2.2	Optical distributor with connectors Overall quantity of optical distributor with connectors should be closely related to number of relay houses. Optical distributors with connectors should be foreseen for both cable ends. At least 10% spare optical distributors with connectors should be foreseen.		Yes	
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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
2.3	Patch-cord with optical connectors Overall quantity of fibre optic patch-cord cables should be closely related to number of protection and control devices (terminals) in each particular 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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14299	**Special Control Equipment and Tools / Code number: 14299**			
1.1	Special Control Equipment and Tools			
1.1.1	Special equipment and tools for setting, repairing, handling and maintaining of control system	set	1	
1.1.2	Software needed for configuration, setting, commissioning, testing, communication, interfacing 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)			

5.2.5.26 14003 - Protection Terminal 132 kV OHL Main 1

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14003	**Protection Terminal 132 kV OHL Main 1 / Code number: 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 %	
2.1.2	Interruption in auxiliary d.c. voltage: • Without resetting • Restart time	 ms s	 > 50 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		4xIr	
2.2.4	Permissive overload, 1 s		100xIr	
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	A	0.1	
2.5.6	Current carrying capacity at rated voltage for signalling contacts, continuous	A	Insert	
2.5.7	Number of tripping contacts (high-speed output)	pcs.	6	
2.5.8	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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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			
2.11.3.1	Type of fibre optic	µm	Insert	
2.11.3.2	Connector type		Insert	
2.11.3.3	Wavelength	nm	1300	
2.11.3.4	Optical transmitter injected power	dBm	Insert	
2.11.3.5	Optical receiver sensitivity	dBm	Insert	
2.11.3.6	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			
2.13.1	Operational modes		Intertrip Permissive under-reach Permissive overreach Blocking	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
2.14	Power swing detection		Yes	
2.15	Secondary circuits supervision: • VT circuits supervision • CT circuits supervision		 Yes Yes	
2.16	Automatic switch onto fault logic • Impedance criteria • Instantaneous overcurrent criteria		 Yes 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	
2.17.4.4	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			
2.18.5.1	Definite time delayed	Yes/no	Yes	
2.18.5.2	Normal inverse	Yes/No	Yes	
2.18.5.3	Very inverse	Yes/No	Insert	
2.18.5.4	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			
2.20.4.1	Definite time delayed	Yes/no	Yes	
2.20.4.2	Normal inverse	Yes/No	Yes	
2.20.4.3	Very inverse	Yes/No	Insert	
2.20.4.4	Extremely inverse	Yes/No	Insert	
2.20.5	Minimum polarizing voltage	% Ur	3 %	
2.20.6	Communication scheme logic		Yes	
2.20.6.1	Permissive and blocking		Yes	
2.20.7	Single and three-pole tripping schemes		Yes	
2.21	Power system supervision			
2.21.1	Broken conductor check		Yes	
2.21.2	Overload protection			
2.21.2.1	Setting range of 1 stage	% Ir	Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 AR		Yes	
2.22.9	Evolving faults treatment		Yes	
2.22.10	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	°	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 binary 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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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)			

5.2.5.27 14004 - Protection Terminal 132 kV OHL Main 2

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14004	**Protection Terminal 132 kV OHL Main 2 / Code number: 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 %	
2.1.2	Interruption in auxiliary d.c. voltage: • Without resetting • Restart time	 ms s	 > 50 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		4xIr	
2.2.4	Permissive overload, 1 s		100xIr	
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	
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 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	A	5	
2.6	LED indications			
2.6.1	Number of LED's		Insert	
2.6.2	Multi-colour LED's	Yes/No	Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	
2.13	Secondary circuits supervision: • VT circuits supervision • CT circuits supervision		 Yes Yes	
2.14	Automatic switch onto fault logic • Impedance criteria • Instantaneous overcurrent criteria		 Yes 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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Definite time delayed	Yes/no	Yes	
2.16.5.2	Normal inverse	Yes/No	Yes	
2.16.5.3	Very inverse	Yes/No	Insert	
2.16.5.4	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	Definite time delayed	Yes/no	Yes	
2.17.4.2	Normal inverse	Yes/No	Yes	
2.17.4.3	Very inverse	Yes/No	Insert	
2.17.4.4	Extremely inverse	Yes/No	Insert	
2.17.5	Minimum polarizing voltage	% Ur	3 %	
2.17.6	Communication scheme logic		Yes	
2.17.6.1	Permissive and blocking		Yes	
2.17.7	Single and three-pole tripping schemes		Yes	
2.18	Current negative sequence protection			
2.18.1	Number of stages		Insert	
2.18.2	Setting range	% Ir	Insert	
2.18.3	Characteristic		Definite time	
2.19	Power system supervision			
2.19.1	Broken conductor check		Yes	
2.19.2	Overload protection			
2.19.2.1	Setting range of 1 stage	% Ir	Insert	
2.19.2.2	Time delay range of 1 stage	min	> 20	
2.19.2.3	Setting range of 2 stage	% Ir	Insert	
2.19.2.4	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, etc.)		Insert	
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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
2.20.11	AR operation 1/3ph in 1st and 2nd 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	°	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 binary 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 Terminal approved by Engineer		Yes	
	Overall compliance with the requirements (yes/no)			

5.2.5.28 14005 - Protection Terminal for Power Transformers Main 1

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14005	**Protection Terminal for Power Transformers Main 1 / Code number: 14005**			
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 %	
2.1.2	Interruption in auxiliary d.c. voltage: • Without resetting • Restart time	 ms s	 > 50 Insert	
2.2	a.c. current inputs			
2.2.1	Number of inputs		Min. 9	
2.2.2	Rated current Ir	A	1	
2.2.3	Permissive overload, continuous		4xIr	
2.2.4	Permissive overload, 1 s		100xIr	
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	
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 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	A	5	
2.6	LED indications			
2.6.1	Number of LED's		Insert	
2.6.2	Multi-colour LED's	Yes/No	Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Autotransformer / Transformer Differential protection			
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		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 compensation		Yes	
2.10.8	Cross block function		Yes	
2.10.9	Zero sequence subtraction		Yes	
2.11	Restricted earth fault protection for autotransformer / 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 inrush 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	
2.13.2.3.2	Normal inverse	Yes/No	Yes	

No.	Description	Minimum Requirements		Guaranteed
		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 $I > 10*I_{set}$	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	
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 Terminal approved by Engineer		Yes	
	Overall compliance with the requirements (yes/no)			

5.2.5.29 14006 - Protection Terminal for Power Transformers Main 2

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14006	**Protection Terminal for Power Transformers Main 2 / Code number: 14006**			
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 %	
2.1.2	Interruption in auxiliary d.c. voltage: • Without resetting • Restart time	 ms s	 > 50 Insert	
2.2	a.c. current inputs			
2.2.1	Number of inputs		Min. 9	
2.2.2	Rated current Ir	A	1	
2.2.3	Permissive overload, continuous		4xIr	
2.2.4	Permissive overload, 1 s		100xIr	
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	
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 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	A	5	
2.6	LED indications			
2.6.1	Number of LED's		Insert	
2.6.2	Multi-colour LED's	Yes/No	Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Autotransformer / Transformer Differential 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 compensation		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 protection	pcs.	Min. 2	
2.13.1	Instantaneous overcurrent protection with inrush 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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 protection 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 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	
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 Terminal approved by Engineer		Yes	
	Overall compliance with the requirements (yes/no)			

5.2.5.30 14007 - Protection Terminal for LV side of Power Transformer

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14007	**Protection Terminal for LV side of Power Transformer / Code number: 14007**			
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 %	
2.1.2	Interruption in auxiliary d.c. voltage: • Without resetting • Restart time	 ms s	 > 50 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		4xIr	
2.2.4	Permissive overload, 1 s		100xIr	
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	
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 signalling contacts, continuous	A	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	A	5	
2.6	LED indications			
2.6.1	Number of LED's		Insert	
2.6.2	Multi-colour LED's	Yes/No	Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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		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)	
2.10.7	Zone 4 direction software selectable		Yes (F/R/ND)	
2.10.8	Zone 5 direction software selectable		Yes (F/R/ND)	
2.10.9	Minimum impedance setting	Ω	Insert	
2.10.10	Full scheme protection phase segregated		Yes	
2.11	Power swing detection		Yes	
2.12	Secondary circuits supervision: • VT circuits supervision • CT circuits supervision		 Yes Yes	
2.13	Automatic switch onto fault logic • Impedance criteria • Instantaneous overcurrent criteria		 Yes Yes	
2.14	Multistage three-phase overcurrent protection			
2.14.1	Number of stages		Min. 2	
2.14.2	Setting range	% Ir	Insert	
2.14.3	Characteristics			
2.14.3.1	Definite time delayed	Yes/no	Yes	
2.14.3.2	Normal inverse	Yes/No	Yes	
2.14.3.3	Very inverse	Yes/No	Insert	
2.14.3.4	Extremely inverse	Yes/No	Insert	
2.15	Multistage earth fault overcurrent protection			
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			
2.15.4.1	Definite time delayed	Yes/no	Yes	
2.15.4.2	Normal inverse	Yes/No	Yes	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 binary 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 (yes/no)			

5.2.5.31 14008 - Automatic Voltage Regulation

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14008	**Automatic Voltage Regulation / Code number: 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**			
2.1	Auxiliary supply voltage			
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %	
2.1.2	Interruption in auxiliary d.c. voltage: • Without resetting • Restart time	 ms s	 > 50 Insert	
2.2	a.c. current inputs			
2.2.1	Number of inputs		1	
2.2.2	Rated current for 110 kV	A	1	
2.2.3	Permissive overload, continuous		3xIr	
2.2.4	Permissive overload, 1 s		100xIr	
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	% I_r	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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 Regulator approved by Engineer		Yes	
	Overall compliance with the requirements (yes/no)			

5.2.5.32 14009 - Protection Terminal for Bus couplers 132 kV

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14009	**Protection Terminal for Bus couplers 132 kV / Code 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**			
2.1	Auxiliary supply voltage			
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %	
2.1.2	Interruption in auxiliary d.c. voltage: • Without resetting • Restart time	 ms s	 > 50 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		4xIr	
2.2.4	Permissive overload, 1 s		100xIr	
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 common root		Insert	
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 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	A	5	
2.6	LED indications			
2.6.1	Number of LED's		Insert	
2.6.2	Multi-colour LED's	Yes/No	Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Multistage three-phase overcurrent protection			
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		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	
2.11	Multistage earth fault overcurrent protection			
2.11.1	Instantaneous earth fault overcurrent protection			
2.11.1.1	Setting range	% Ir	Insert	
2.11.1.2	Min. operating time at $I > 10*I_{set}$	ms	30	
2.11.2	Time delayed earth fault overcurrent protection			
2.11.2.1	Setting range	% Ir	Insert	
2.11.2.2	Type of protection		Non-directional	
2.11.2.3	Characteristics			
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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 and binary signals	s	> 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)			

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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14010	**Busbar and Breaker failure protection for 132 kV Busbars/Code number: 14010**			
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			
2.1.1	CU, BU Rated auxiliary supply voltage	V d.c.	110 ±15 %	
2.1.2	CU auxiliary supply redundant		Yes	
2.1.3	Interruption in auxiliary d.c. voltage: • Without resetting • Restart time	 ms s	 > 50 Insert	
2.2	a.c. current inputs BU			
2.2.1	Number of inputs		Min. 3	
2.2.2	Rated current Ir	A	1	
2.2.3	Permissive overload, continuous		4xIr	
2.2.4	Permissive overload, 1 s		100xIr	
2.2.5	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		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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	
2.7.6	Busbar protection system should be suitable/adaptable for future switchgear extension or modification		Yes	
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		Yes	
2.8.8	2-stage operation bay trip repeat/trip busbar		Insert	
2.8.9	Selectable operation mode (current, unbalance, low current)		Insert	
2.8.10	Independent settable delay times for all operation modes		Yes	
2.8.11	Low current mode using the circuit breaker auxiliary contact		Yes	
2.8.12	End fault protection		Yes	
2.8.13	Independent breaker failure protection per bay unit		Yes	
2.9	Disturbance recorder CU, BU			
2.9.1	Number of digital signals		Insert	
2.9.2	Number of analogue signals		Insert	
2.9.3	External/manual initiation of recording		Insert	
2.9.4	Sampling rate	kHz	Insert	
2.9.5	Pre-fault time	ms	≥ 300	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
2.9.6	Recording time	ms	≥ 2000	
2.9.7	Number of recorded disturbances		Min. 5	
2.9.8	Total recording time with max. analogue and binary signals	s	> 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 Engineer		Yes	
3.4	**Centralised, user-friendly configuration and all necessary software tools for full parameterization, and (re)configuration in case of extensions should be delivered**		**Yes**	
	Overall compliance with the requirements (yes/no)			

5.2.5.34 14011 - Trip Circuit Supervision Relay

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14011	**Trip Circuit Supervision Relay / Code number: 14011**			
1.1	Manufacturer		Insert	
1.2	Country of origin		Insert	
1.3	Type		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)			

5.2.5.35 14012 - Tripping Unit - High-Speed Tripping Relay

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14011	**Trip Circuit Supervision Relay / Code number: 14011**			
1.1	Manufacturer		Insert	
1.2	Country of origin		Insert	
1.3	Type		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)			

5.2.5.36 14013 - Test Socket

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14013	**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

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	
	Overall compliance with the requirements (yes/no)			

5.2.5.38 19002 - Battery Charger

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
19002	**Battery Charger / Code number: 19003)**			
1.1	Manufacturer			
1.2	Type designation			
1.3	Type		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 Earth-fault voltage	
	Overall compliance with the requirements (yes/no)			

5.2.5.39 Fibre Optic Multiplexer Equipment

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**General:**			
	Manufacturer			
	Model No.			
	Type			
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	
3.2	Complying to ITU-T rec.		G.703, transparent G.704, selectable	
3.3	HDSL, 2Mbit/s interface: • no of copper wires • Capacity on 2Mbit/s or on 1Mbit/s • Capacity selectable	No. of channels channels / pair of wire	4 or 2 30 or 15 30 / 2 pairs 30 / 1 pair 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	
4.1.2	Analogue, 4wire with E&M: • Input level • Output level	 dBr dBr	 +7.5 … -16.0 +7.0 … -16.5	
4.1.3	Analogue, 2wire with E&M: • Input level • Output level	 dBr dBr	 +6.5 … -12.5 -1.0 … -20.0	
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 / -7.5 ... -1	
4.2.2	2wire, PABX side	dBr	-5 ... +4 / -7.5 ... -3	
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:**			
4.3.2.1	Electrical interface: G.703	Kbit/s	64	
4.3.2.2	Optical Interface	Kbit/s	Minimum 64	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	
4.4.7	Ethernet: • 10/100 BaseT • WAN capacity • Protocols	 No. Mbit/s -	 4 Min: 2x 2Mbit/s 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 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.

5.2.6 Digital Fault and Disturbance Recorder (DFDR)

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	**General**			
1.1	Manufacturer		Insert	
1.2	Type		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**			
2.1	Number of channels		Minimum 160	
2.1.1	Expandability		Minimum 32	
2.2	Nominal current	Amp	1A / 5A	
2.3.1	Nominal voltage	Vac/Vdc	Insert	
2.3.2	Nominal current	mA/Amp	Insert	
2.4	Frequency response		Insert	
2.5	Cut-off frequency			
2.5.1	Bandwidth	dB	insert	
2.5.2	Attenuation at	dB	Insert	
2.5.3	Auto adjusted anti-aliasing filters for chosen sampling rate	Yes/No	Yes	
2.5.4	Simultaneously programmable sampling rate for all feeders/inputs		Min 2 for FAST and 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 / sec	Insert	
2.5.5.3	Continuous (variable rate)	Samples / 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**			
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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
3.3	Type		Potential or potential free contact	
3.4	Resolution	ms	Insert	
4.	**Memory**			
4.1	Size	MB	64 MB or higher	
4.2	Type		Solid state	
4.3	Pre-fault time (fast scanning rate)	sec	0.1-2 user programmable	
4.4	Post-fault (fast scanning rate	sec	0.1-2 user programmable	
4.5	Pre and post-fault time (slow scanning rate)	sec	min. 180 user programmable	
4.6	In-built hard disk (auto-maintained	GB	min. 4 GB	
5.	**Sensors / Triggering criteria**			
	All sensors/triggers are preferable programmable 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	
6.	**Clock System**			
6.1.	Internal clock	Yes/No	Yes	
6.2.	Accuracy		Insert	
6.3.	External synchronization	Yes/No	Yes	
6.4.	Time resolution between 2 synchronized pulses		Insert	
7.	**Output Alarm Relay Contact**			
7.1.	Max. operation voltage DC/AC	Vac / Vdc	250 Vac or above, 60 Vdc or above	
7.2.	Make and carry for 0.5 sec	A	Min 8A	
7.3.	Carry continuously	A	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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 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		
8.6	• Reference list for the last five years for 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 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 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		
11.6	• Reference list for the last five years for 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 requirements (yes/no)		

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

The following Subcontractors are proposed for carrying out the facilities:

Item	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 Bidder:			