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

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

- New 230/132 kV Substation **FENI**
- Extension of existing 400/230/132 kV Substation **BHULTA**
- New 230/132 kV Substation **BIRULIA**
- New 230/132 kV Substation **NAOGAON**
- New 230/132 kV Substation **PURBASADIPUR**
- Extension of existing 230/132 kV Substation **BOGRA**
- Extension of existing 230/132 kV Substation **BARAPUKURIA**
- Extension of existing 132/33 kV Substation **NIAMATPUR**

And:

- Existing 230/132 kV Substation Comilla North,
- Existing 230/132 kV Substation Hathazari,
- Existing 132/33 kV Substation Feni,
- Existing 132/33 kV Substation Chowmuhani,
- Existing 132/33 kV Substation Comilla South,
- Existing 132/33 kV Substation Narshingdi,
- Existing 230/132 kV Substation Aminbazar,
- Existing 230/132 kV Substation Kaliakoir,
- Existing 132/33 kV Substation Mirpur,
- Existing 132/33 kV Substation Tongi,
- Existing 132/33 kV Substation Thakurgaon, and
- Existing 132/33 kV Substation Saidpur.

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.

PLC is not required.

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).

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

Map of the Bangladeshi telecommunication system

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

- **SDH Telecommunication System and**

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.

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.

Line Trap is not required.

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/armored optical fibre cables shall be carried out under this contract; it includes supply & installation of fibre optic cable of a size similar to the OPGW.

- Inter cabling between signal box, control box and Fire Extinguishing Cubicle (FEC).
- Butterfly valves /Gate valves on oil drain pipe and nitrogen injection pipe which should be able to withstand full vacuum.
- Supports, signal box, etc. which are to be painted with enamelled paint.

Technical Particulars

• Fire extinction period from commencement of nitrogen injection:	30 s. (max.)
• Total duration from activation of fire protection system to complete cooling:	30 minutes (max.)
• Fire detectors' heat sensing temperature:	141 °C
• Heat sensing area per detector:	Up to R = 800 mm
• Transformer Conservator Isolation valve setting (minimum):	60 litre / min
• Capacity of nitrogen cylinder (minimum water capacity):	68 litre
• Capacity of nitrogen cylinder (minimum gas capacity, at 150 kg/cm² pressure:	10 m³
• Power supply, for control box and for fire extinguishing cubicle for lighting:	110 V DC / 240 V AC

Mandatory Spare Parts - Per Substation

• Cylinder filled with nitrogen of required capacity per substation:	1 piece
• Fire detectors:	3 pieces
• Regulator assembly:	1 piece

Tests

Reports of all type tests conducted as per relevant IEC standards including test reports for the degree of protection for FEC / control box / signal box shall be submitted with the bid.

The performance test of the complete system shall be carried out after installation of the system on site. Detailed layout drawings, equipment drawing along with 4 sets of the operation and maintenance manual along with soft copies (on CDs) shall be submitted by the Contractor.

4.12.4 Water Spray System

The new power transformers shall be equipped with the Water Spray System made in EU/USA/Japan.

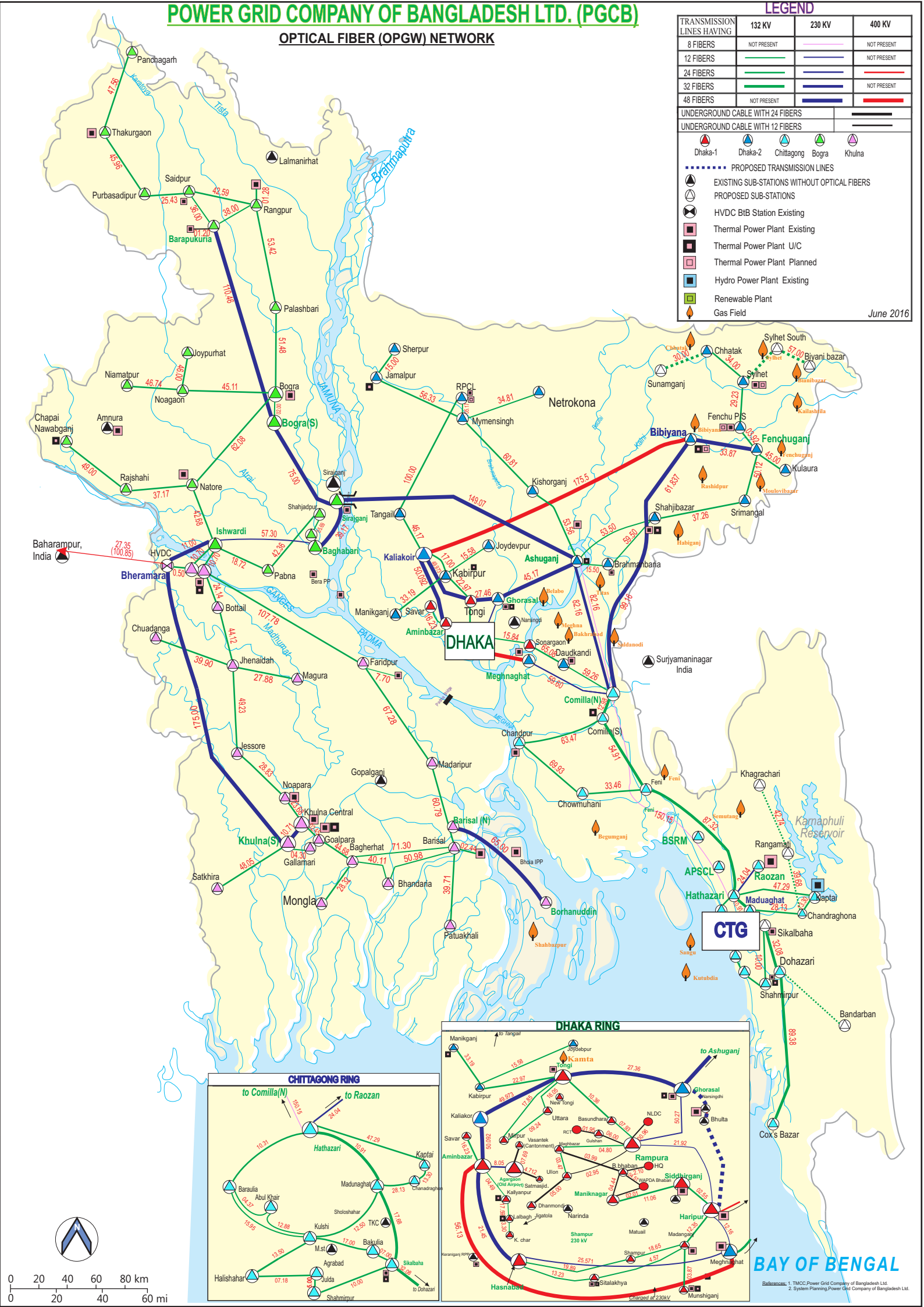
One transformer water spray system.

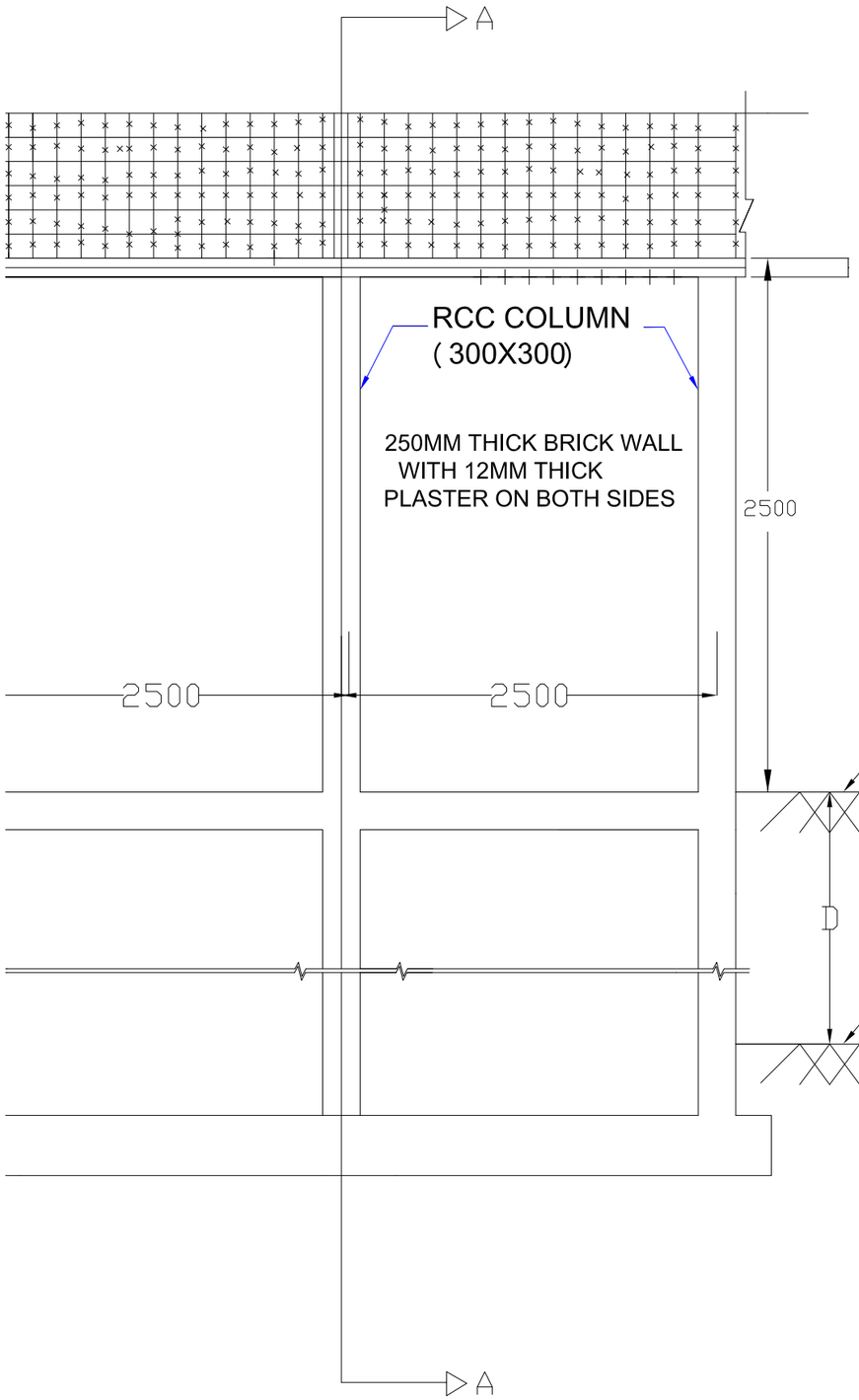
To the water spray system is to be allowed one valve station including necessary control and monitoring cabinet, to be designed for manual, automatic and electrical remote operation and must be provided in free-standing and self-supporting design, with the following basic equipment:

- the required number of triggering and fire extinguishing nozzles, with galvanized pipes and mountings,
- the necessary galvanized connecting lines from the appropriate valve station to the nozzles pipe network,
- the necessary drainage valve, struts, diaphragms, sleeve valve, single chamber valve stations with

POWER GRID COMPANY OF BANGLADESH LTD. (PGCB)

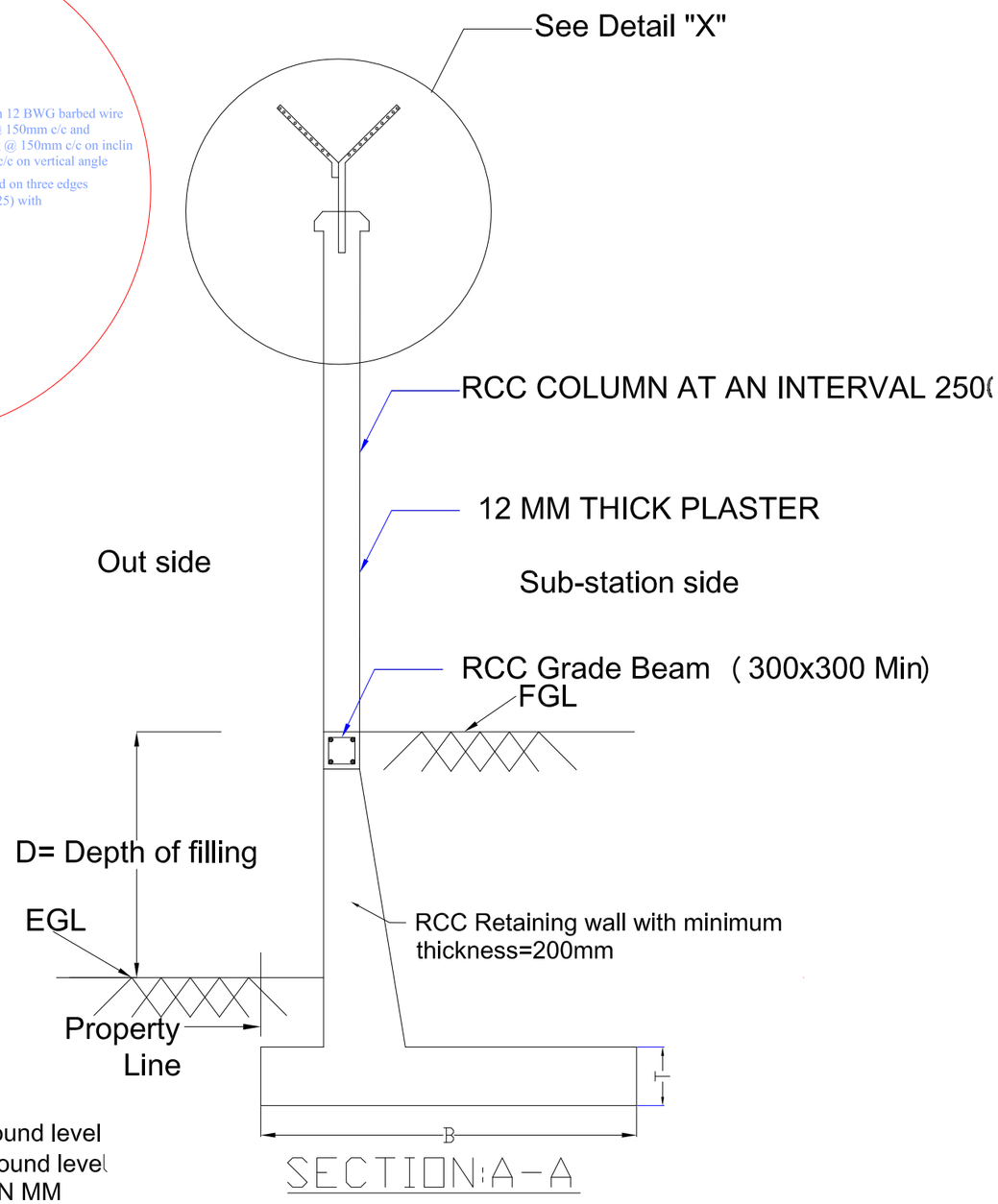
OPTICAL FIBER (OPGW) NETWORK





FRONT ELEVATION

Detail "X"



SECTION A-A

NOTE:
(1) "EGL" means Existing Ground level
(2) "FGL" means Finished Ground level
(3) ALL DIMENSIONS ARE IN MM
(4) 'D'=Depth of Earth Filling for Land Development (as per site condition)
(5) Expansion Joints shall have to be provided at 25m Interval.
(6) B, T- shall be designed considering wind force, lateral earth pressure, depth of filling (D) and soil bearing capacity.

The drawing is Prelimilina is for Bidding Purpose On

	Power Grid Company of Bangladesh Limit
Project	Energy Efficiency in Grid Based Power Su
Drawing Title	Boundary wall with RCC retaining wa
Drawing No.	

No.	Equipment	Unit	Qty.
	• X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay		
AG.3	A complete indoor GIS **bus coupler bay** 245 kV, 3150A busbars / 3150 A feeder, 50 kA, 50Hz, 1050/460 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		
AG.4	A complete indoor GIS **metering bay** 245 kV, 3150A busbars, 50 kA, 50Hz, 1050/460 kV BIL, equipped with:	Set	1
	• Q21, Q22 - Two (2) set of three pole, three position, motor operated, insulated disconnector		
	• **T5 – Two (2) sets of three (3) single-phase, 2-winding, 230/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		
AG.5	A complete indoor GIS **busbars earthing bay** 245 kV, 3150A busbars, 50 kA, 50Hz, 1050/460 kV BIL, equipped with:	Set	1
	Q81, Q82 - Two (2) set of three pole, make-proof, motor operated earthing switch		
A5	**Surge arrester** 245 kV, 192 kV continuous operating voltage, 10kA nominal discharge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide type	Set	21
A6.2	**Line trap**, for **digital PLC**, one set shall be provided for each 230 kV Transmission Line, characteristics shall be defined during the Design	Set	**0**
A7.X	**Conductors** for double busbar system and for connection of the 230 kV switchgear, 245 kV, 3150 & 2000 A, 50 kA.	Lot	1
A8.X	**Insulators and fittings incl. all necessary clamps and connectors** required for completing 230 kV switchgear	Lot	1
A9.X	**Gantry steel structures and equipment** supports required for completing 230 kV switchgear.	Lot	1
A10.X	**All other necessary material and equipment** required for completing 230 kV switchgear	Lot	1
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		

No.	Equipment	Unit	Qty.
	• 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	3
	• 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.3.1	A complete indoor GIS **bus sectionalize bay** 145 kV, 3150A busbars / 3150 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with:	Set	1
	• **Q0 - One () set of three pole, GIS type, SF6 gas circuit breaker with one spring-stored energy operating mechanism**		
	• **Q11, Q12, - Two (2) sets of three pole, three position, motor operated, insulated disconnector with earthing switch**		
	• X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay		
BG.3.2	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		

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 (to cover both busbars and both sections on busbar 1)** 145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: • Q21, Q22, **Q31 - Three (3) sets** of three pole, three position, motor operated, insulated disconnector • T5 - **Three (3) sets of** 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 (to cover both busbars and both sections on busbar 1)**145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: • Q81, Q82, **Q83 - Three (3) sets** of three pole, make-proof, motor operated earthing switch	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	33
B6	**Post Insulator** 132 kV, 50 Hz, 650/275 kV BIL, 10 kN	Set	9
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, comprise 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	3
C2.1	**Disconnector** 36 kV, **2000 A**, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated	Set	3
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	0
C3	**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	9
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	9
C5	**Surge arrester** 36 kV, 30 kV continuous operating voltage, 10 kA nominal discharge current, 50 Hz, single phase, gapless, metal oxide type	Set	9
C7.X	**Conductors** for single busbar system and for connection of the 33 kV switchgear, 36 kV, 2000 A & 1250 A & 630 A, 25 kA	Lot	1

No.	Equipment	Unit	Qty.
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**		
D1	**Autotransformer** 230/132/33 kV three phase 225/300 MVA, YNa0d1, ONAN/ONAF	Set	3
D9	**Water Spray System**	**Set**	**3**
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	3
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.	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:		
	Extension of the existing control, protection, SCADA system and metering	Lot	0
	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 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:		
G1.1	**Control, protection and SAS** set for 230 kV overhead line circuit, (including the other end)	Set	4
G1.1	**Control, protection and SAS** set for 132 kV overhead line circuit, (including the other end)	Set	8
G2.1	**Control, protection and SAS** set for 230/132/33 kV auto transformer circuits and associated earthing / auxiliary transformer circuits	Set	3
G2.2	**Control, protection and SAS** set for 132/33 kV power transformer circuits	Set	0
G3.1	**Control, protection and SAS** set for busbar 230 kV	Set	1
G3.2	**Control, protection and SAS** set for busbar 132 kV	Set	1
G4	**Control, Protection and SAS set for complete Switchgear 33 kV**	**Set**	**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
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	0
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	**GIB and/or Cable Connections**		
Q1.1	One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three-phase or equivalent three single phase gas insulated busbars (GIB) with corresponding GIS connections and SF6/air bushings and/or three single phase XLPE cables with corresponding GIS connections and cable end terminals, with all required equipment; 245 kV, 2,000 A, 50 kA / 1 sec, 50 Hz, for connection of one 230 kV bay. Approximate lengths are 15 to 30 meters	Lot	7
Q.2.1	One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three phase or equivalent three single phase Gas Insulated Busbars (GIB) with corresponding GIS connections and SF6/Air bushings and/or three single phase XLPE cables with corresponding GIS connections and Cable End Terminals; with all required equipment; 145 kV, **1,600 A**, 40 kA / 1 sec, 50 Hz, for connection of one 132 kV bay. Approximate lengths are 15 to 100 meters	Lot	11
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	3

No	Equipment	Unit	Qty.
C2.1	**Disconnector** 36 kV, **2000 A**, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated	Set	2
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	0
C3	**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	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	6
C5	**Surge arrester** 36 kV, 30 kV continuous operating voltage, 10 kA nominal discharge current, 50 Hz, single phase, gapless, metal oxide type	Set	6
C7.X	**Conductors** for single busbar system and for connection of the 33 kV switchgear, 36 kV, 2000 A & 1250 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**		
D1	**Autotransformer** 230/132/33 kV three phase 225/300 MVA, YNa0d1, 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 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	0
	The control and protection panels shall mirror the switchyard layout.		
	Enough space shall be reserved for future circuits.		
	The system comprise the following:		
	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.		

No	Equipment	Unit	Qty.
	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 230 kV Overhead Line circuit, (including the other end)	Set	0
G1.1	**Control, Protection and SAS** set for 132 kV Overhead Line circuit, (including the other end)	Set	6
G2.1	**Control, Protection and SAS** set for 230/132/33 kV Auto Transformer circuits and associated Earthing / Auxiliary Transformer circuits	Set	2
G2.2	**Control, Protection and SAS** set for 132/33 kV Power Transformer circuit	Set	0
G3.1	**Control, Protection and SAS** set for Busbar 230 kV	Set	1
G3.2	**Control, Protection and SAS** set for Busbar 132 kV	Set	1
G4	**Control, Protection and SAS set for complete Switchgear 33 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	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.X	**Digital Fault and Disturbance Recorder (DFDR)** to accommodate all feeders	Lot	0
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	0
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**.	Lot	1

No	Equipment	Unit	Qty.
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.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	0
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
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, **1,600 A**, 40 kA / 1 sec, 50 Hz, for connection of one 132 kV bay. Approximate lengths are 100 meters	Lot	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	2

No.	Equipment	Unit	Qty.
AG.3	A complete indoor GIS **bus coupler bay** 245 kV, 3150A busbars / 3150 A feeder, 50 kA, 50Hz, 1050/460 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		
	• 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		
AG.4	A complete indoor GIS **metering bay** 245 kV, 3150A busbars, 50 kA, 50Hz, 1050/460 kV BIL, equipped with:	Set	1
	• Q21, Q22 - Two (2) set of three pole, three position, motor operated, insulated disconnector		
	• **T5 – Two (2) sets of three (3) single-phase, 2-winding, 230/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		
AG.5	A complete indoor GIS **busbars earthing bay** 245 kV, 3150A busbars, 50 kA, 50Hz, 1050/460 kV BIL, equipped with:	Set	1
	• Q81, Q82 - Two (2) set of three pole, make-proof, motor operated earthing switch		
A5	**Surge arrester** 245 kV, 192 kV continuous operating voltage, 10kA nominal discharge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide type	Set	21
A6.2	**Line trap,** for **digital PLC**, one set shall be provided for each 230 kV Transmission Line, characteristics shall be defined during the Design	Set	**0**
A7.X	**Conductors** for double busbar system and for connection of the 230 kV switchgear, 245 kV, 3150 & 2000 A, 50 kA.	Lot	1
A8.X	**Insulators and fittings incl. all necessary clamps and connectors** required for completing 230 kV switchgear.	Lot	1
A9.X	**Gantry steel structures and equipment supports** required for completing 230 kV switchgear.	Lot	1
A10.X	**All other necessary material and equipment** required for completing 230 kV switchgear.	Lot	1
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	4
	• 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		

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		
	• 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	3
	• 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		
	• 1-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.3.1	A complete indoor GIS **bus sectionalize bay** 145 kV, 3150A busbars / 3150 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with:	Set	1
	• **Q0 - One () set of three pole, GIS type, SF6 gas circuit breaker with one spring-stored energy operating mechanism**		
	• **Q11, Q12, - Two (2) sets of three pole, three position, motor operated, insulated disconnector with earthing switch**		
	• X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay		
BG.3.2	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		
	• T1-Three (3) single-phase, 5-core, multi ratio, **3200-1600-800/1/1/1/1/1** A, GIS type current transformers		

No.	Equipment	Unit	Qty.
	• X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay		
BG.4	A complete indoor GIS **metering bay (to cover both busbars and both sections on busbar 1)** 145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with:	Set	1
	• Q21, Q22, **Q31 - Three (3) sets** of three pole, three position, motor operated, insulated disconnector		
	• T5 - **Three (3) sets of** 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 (to cover both busbars and both sections on busbar 1)**145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with:	Set	1
	• Q81, Q82, **Q83 - Three (3) sets** 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	21
B6	**Post Insulator** 132 kV, 50 Hz, 650/275 kV BIL, 10 kN	Set	9
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 commiss., comprise 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	3
C2.1	**Disconnector** 36 kV, **2000 A**, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated	Set	3
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	0
C3	**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	9
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	9
C5	**Surge arrester** 36 kV, 30 kV continuous operating voltage, 10 kA nominal discharge current, 50 Hz, single phase, gapless, metal oxide type	Set	9
C7.X	**Conductors** for single busbar system and for connection of the 33 kV switchgear, 36 kV, 2000 A & 1250 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**		
D1	**Autotransformer** 230/132/33 kV three phase 225/300 MVA, YNa0d1, ONAN/ONAF	Set	3
D9	**Water Spray System**	**Set**	**3**
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	3
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.	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:		
	Extension of the existing Control, Protection, SCADA System and Metering	Lot	0
	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 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:		
G1.1	**Control, Protection and SAS** set for 230 kV Overhead Line circuit, (including the other end)	Set	4
G1.1	**Control, Protection and SAS** set for 132 kV Overhead Line circuit, (including the other end)	Set	4
G2.1	**Control, Protection and SAS** set for 230/132/33 kV Auto Transformer circuits and associated Earthing / Auxiliary Transformer circuits	Set	3
G2.2	**Control, Protection and SAS** set for 132/33 kV Power Transformer circuits	Set	0
G3.1	**Control, Protection and SAS** set for Busbar 230 kV	Set	1
G3.2	**Control, Protection and SAS** set for Busbar 132 kV	Set	1
G4	**Control, Protection and SAS set for complete Switchgear 33 kV**	**Set**	**1**

No.	Equipment	Unit	Qty.
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 5 acres	Lot	1
L2.X	One (1) lot of complete design, supply and construction of outdoor civil works including 230 kV, 132 kV and 33 kV gantry foundation, 230 kV, 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 **Retaining Wall is required. Drawing of retaining wall is included**	Lot	1
L3.1X	One (1) lot of complete design, supply and construction of civil works and facilities for one new 230 kV GIS two-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 132 kV GIS 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
L3.3X	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
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

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
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	0
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	**GIB and/or Cable Connections**		
Q1.1	One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three phase or equivalent three single phase Gas Insulated Busbars (GIB) with corresponding GIS connections and SF_6/Air bushings and/or three single phase XLPE cables with corresponding GIS connections and Cable End Terminals; with all required equipment; 245 kV, 2,000 A, 50 kA / 1 sec, 50 Hz, for connection of one 230 kV bay. Approximate lengths are 15 to 30 meters	Lot	7
Q.2.1	One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three phase or equivalent three single phase Gas Insulated Busbars (GIB) with corresponding GIS connections and SF_6/Air bushings and/or three single phase XLPE cables with corresponding GIS connections and Cable End Terminals; with all required equipment; 145 kV, **1,600 A**, 40 kA / 1 sec, 50 Hz, for connection of one 132 kV bay. Approximate lengths are 15 to 30 meters	Lot	7
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	3

No.	Equipment	Unit	Qty.
	• 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		
AG.2	A complete indoor and partly outdoor GIS **transformer feeder** 245 kV, 3150A busbars / 2000 A feeder, 50 kA, 50Hz, 1050/460 kV BIL, equipped with:	Set	3
	• 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		
AG.3	A complete indoor GIS **bus coupler bay** 245 kV, 3150A busbars / 3150 A feeder, 50 kA, 50Hz, 1050/460 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		
	• 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		
AG.4	A complete indoor GIS **metering bay** 245 kV, 3150A busbars, 50 kA, 50Hz, 1050/460 kV BIL, equipped with:	Set	1
	• Q21, Q22 - Two (2) set of three pole, three position, motor operated, insulated disconnector		
	• **T5 – Two (2) sets of three (3) single-phase, 2-winding, 230/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		
AG.5	A complete indoor GIS **busbars earthing bay** 245 kV, 3150A busbars, 50 kA, 50Hz, 1050/460 kV BIL, equipped with:	Set	1
	• Q81, Q82 - Two (2) set of three pole, make-proof, motor operated earthing switch		
A5	**Surge arrester** 245 kV, 192 kV continuous operating voltage, 10kA nominal discharge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide type	Set	15

No.	Equipment	Unit	Qty.
A6.2	**Line trap,** for **digital PLC**, one set shall be provided for each 230 kV Transmission Line, characteristics shall be defined during the Design	Set	**0**
A7.X	**Conductors** for double busbar system and for connection of the 230 kV switchgear, 245 kV, 3150 & 2000 A, 50 kA.	Lot	1
A8.X	**Insulators and fittings incl. all necessary clamps and connectors** required for completing 230 kV switchgear.	Lot	1
A9.X	**Gantry steel structures and equipment supports** required for completing 230 kV switchgear.	Lot	1
A10.X	**All other necessary material and equipment** required for completing 230 kV switchgear.	Lot	1
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	6
	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	7
	• 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		

No.	Equipment	Unit	Qty.
	• 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.3.1	A complete indoor GIS **bus sectionalize bay** 145 kV, 3150A busbars / 3150 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with: • **Q0 - One () set of three pole, GIS type, SF6 gas circuit breaker with one spring-stored energy operating mechanism** • **Q11, Q12, - Two (2) sets of three pole, three position, motor operated, insulated disconnector with earthing switch** • X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay	Set	1
BG.3.2	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, 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 • 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 (to cover both busbars and both sections on busbar 1)** 145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: • Q21, Q22, **Q31 - Three (3) sets** of three pole, three position, motor operated, insulated disconnector • T5 - **Three (3) sets of** 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 (to cover both busbars and both sections on busbar 1)**145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with: • Q81, Q82, **Q83 - Three (3) sets** of three pole, make-proof, motor operated earthing switch	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	39
B6	**Post Insulator** 132 kV, 50 Hz, 650/275 kV BIL, 10 kN	Set	21
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 equip.** requir. for comp. 132 kV SWG	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
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	7
C2.1	**Disconnector** 36 kV, **2000 A**, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated	Set	10
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	0
C3	**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	21
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	21
C5	**Surge arrester** 36 kV, 30 kV continuous operating voltage, 10 kA nominal discharge current, 50 Hz, single phase, gapless, metal oxide type	Set	21
C7.X	**Conductors** for single busbar system and for connection of the 33 kV switchgear, 36 kV, 2000 A & 1250 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**		
D1	**Autotransformer** 230/132/33 kV three phase 225/300 MVA, YNa0d1, ONAN/ONAF	Set	3
D2	**Power transformer** 132/33 kV three phase 80/120 MVA, Dyn1, ONAN/ONAF	Set	2
D9	**Water Spray System**	**Set**	**5**
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	3
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.	Lot	1
	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:		
	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 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	0
G1.1	**Control, Protection and SAS** set for 230 kV Overhead Line circuit, (including the other end)	Set	2
G1.1	**Control, Protection and SAS** set for 132 kV Overhead Line circuit, (including the other end)	Set	6
G2.1	**Control, Protection and SAS** set for 230/132/33 kV Auto Transformer circuits and associated Earthing / Auxiliary Transformer circuits	Set	3
G2.2	**Control, Protection and SAS** set for 132/33 kV Power Transformer circ.	Set	4
G3.1	**Control, Protection and SAS** set for Busbar 230 kV	Set	1
G3.2	**Control, Protection and SAS** set for Busbar 132 kV	Set	1
G4	**Control, Protection and SAS set for complete Switchgear 33 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
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.X	**Digital Fault and Disturbance Recorder (DFDR)** to accommodate all feeders	Lot	1
G5.XE	**Digital Fault and Disturbance Recorder (DFDR)** to accommodate all feeders, **for required part of substation**	Lot	0
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.,	Lot	1

No.	Equipment	Unit	Qty.
	nections and SF_6/Air bushings and/or three single phase XLPE cables with corresponding GIS connections and Cable End Terminals; with all required equipment; 245 kV, 2,000 A, 50 kA / 1 sec, 50 Hz, for connection of one 230 kV bay. Approximate lengths are 15 to 30 meters		
Q.2.1	One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned of three phase or equivalent three single phase Gas Insulated Busbars (GIB) with corresponding GIS connections and SF_6/Air bushings and/or three single phase XLPE cables with corresponding GIS connections and Cable End Terminals; with all required equipment; 145 kV, **1,600 A**, 40 kA / 1 sec, 50 Hz, for connection of one 132 kV bay. Approximate lengths are 15 to 150 meters	Lot	13
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	7

No.	Equipment	Unit	Qty.
	• 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		
AG.2	A complete indoor and partly outdoor GIS **transformer feeder** 245 kV, 3150A busbars / 2000 A feeder, 50 kA, 50Hz, 1050/460 kV BIL, equipped with:	Set	3
	• 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		
AG.3	A complete indoor GIS **bus coupler bay** 245 kV, 3150A busbars / 3150 A feeder, 50 kA, 50Hz, 1050/460 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		
	• 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		
AG.4	A complete indoor GIS **metering bay** 245 kV, 3150A busbars, 50 kA, 50Hz, 1050/460 kV BIL, equipped with:	Set	1
	• Q21, Q22 - Two (2) set of three pole, three position, motor operated, insulated disconnector		
	• **T5 – Two (2) sets of three (3) single-phase, 2-winding, 230/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		
AG.5	A complete indoor GIS **busbars earthing bay** 245 kV, 3150A busbars, 50 kA, 50Hz, 1050/460 kV BIL, equipped with:	Set	1

No.	Equipment	Unit	Qty.
	• Q81, Q82 - Two (2) set of three pole, make-proof, motor operated earth-ing switch		
A5	**Surge arrester** 245 kV, 192 kV continuous operating voltage, 10kA nominal discharge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide type	Set	15
A6.2	**Line trap,** for **digital PLC**, one set shall be provided for each 230 kV Trans-mission Line, characteristics shall be defined during the Design	Set	**0**
A7.X	**Conductors** for double busbar system and for connection of the 230 kV switchgear, 245 kV, 3150 & 2000 A, 50 kA.	Lot	1
A8.X	**Insulators and fittings incl. all necessary clamps and connectors** re-quired for completing 230 kV switchgear.	Lot	1
A9.X	**Gantry steel structures and equipment supports** required for completing 230 kV switchgear.	Lot	1
A10.X	**All other necessary material and equipment** required for completing 230 kV switchgear.	Lot	1
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 bus-bars / 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 **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	7
	• 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		

No.	Equipment	Unit	Qty.
	• 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.3.1	A complete indoor GIS **bus sectionalize bay** 145 kV, 3150A busbars / 3150 A feeder, 40 kA, 50Hz, 650/275 kV BIL, equipped with:	Set	1
	• **Q0 - One () set of three pole, GIS type, SF6 gas circuit breaker with one spring-stored energy operating mechanism**		
	• **Q11, Q12, - Two (2) sets of three pole, three position, motor operated, insulated disconnector with earthing switch**		
	• X - Control cabinet, cables, metal support structure, grounding, etc. and all accessories for complete bay		
BG.3.2	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		
	• 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 (to cover both busbars and both sections on busbar 1)** 145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with:	Set	1
	• Q21, Q22, **Q31 - Three (3) sets** of three pole, three position, motor operated, insulated disconnector		
	• T5 - **Three (3) sets of** 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 (to cover both busbars and both sections on busbar 1)**145 kV, 3150A busbars, 40 kA, 50Hz, 650/275 kV BIL, equipped with:	Set	1
	• Q81, Q82, **Q83 - Three (3) sets** 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	33
B6	**Post Insulator** 132 kV, 50 Hz, 650/275 kV BIL, 10 kN	Set	21
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

No.	Equipment	Unit	Qty.
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	7
C2.1	**Disconnector** 36 kV, **2000 A**, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated	Set	10
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	0
C3	**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	21
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	21
C5	**Surge arrester** 36 kV, 30 kV continuous operating voltage, 10 kA nominal discharge current, 50 Hz, single phase, gapless, metal oxide type	Set	21
C7.X	**Conductors** for single busbar system and for connection of the 33 kV switchgear, 36 kV, 2000 A & 1250 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**		
D1	**Autotransformer** 230/132/33 kV three phase 225/300 MVA, YNa0d1, ONAN/ONAF	Set	3
D2	**Power transformer** 132/33 kV three phase 80/120 MVA, Dyn1, ONAN / ONAF	Set	2
D9	**Water Spray System**	**Set**	**5**
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	3
F10.X	**All other necessary material and equipment** required for completing Earthing / Auxiliary Power transformers.	Lot	1

No.	Equipment	Unit	Qty.
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:		
	Extension of the existing Control, Protection, SCADA System and Metering	Lot	0
	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 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:		
G1.1	**Control, Protection and SAS** set for 230 kV Overhead Line circuit, (including the other end)	Set	2
G1.1	**Control, Protection and SAS** set for 132 kV Overhead Line circuit, (including the other end)	Set	4
G2.1	**Control, Protection and SAS** set for 230/132/33 kV Auto Transformer circuits and associated Earthing / Auxiliary Transformer circuits	Set	3
G2.2	**Control, Protection and SAS** set for 132/33 kV Power Transformer circuits	Set	4
G3.1	**Control, Protection and SAS** set for Busbar 230 kV	Set	1
G3.2	**Control, Protection and SAS** set for Busbar 132 kV	Set	1
G4	**Control, Protection and SAS set for complete Switchgear 33 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
G4.XE	**Extension of the existing Tariff Metering**	Lot	0
	Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for each line and transformer feeder, **for required part of substation**. For each feeder, minimum two (2) meters (main-1 & main-2) shall be provided		
G5.X	**Digital Fault and Disturbance Recorder (DFDR)** to accommodate all feeders	Lot	1
G5.XE	**Digital Fault and Disturbance Recorder (DFDR)** to accommodate all feeders, **for required part of substation**	Lot	0
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		

No.	Equipment	Unit	Qty.
	phase Gas Insulated Busbars (GIB) with corresponding GIS connections and SF_6/Air bushings and/or three single phase XLPE cables with corresponding GIS connections and Cable End Terminals; with all required equipment; 145 kV, **1,600 A**, 40 kA / 1 sec, 50 Hz, for connection of one 132 kV bay. Approximate lengths are 15 to 150 meters		
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	7

No.	Equipment	Unit	Qty.
A2.2	**Disconnector with Earthing Switch** 245 kV, **2000A**, 50kA, 50Hz, 1050/460 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch	Set	4
A2.3	**Disconnector** 245 kV, **3150A**, 50kA, 50Hz, 1050/460 kV BIL, three pole, centre break, post type, motor operated	Set	0
A2.4	**Disconnector** 245 kV, **2000A**, 50kA, 50Hz, 1050/460 kV BIL, three pole, centre break, post type, motor operated	Set	8
A3.1	**Current transformer** 245 kV, 50kA, 50Hz, 1050/460 kV BIL, single phase, **4000-2000**/1/1/1/1/1 A/A, 5-core, multi ratio, post type	Set	0
A3.2	**Current transformer** 245 kV, 50kA, 50Hz, 1050/460 kV BIL, single phase, **3000-1500**/1/1/1/1/1 A/A, 5-core, multi ratio, post type	Set	6
A3.3	**Current transformer** 245 kV, 50kA, 50Hz, 1050/460 kV BIL, single phase, **2000-1000**/1/1/1/1/1 A/A, 5-core, multi ratio, post type	Set	0
A4	**Voltage transformer** 245 kV, 50 Hz, 1050/460 kV BIL, single phase, 230/V3 / 110/V3 / 110/V3 kV/V/V, 2 secondary windings, capacitor type	Set	6
A5	**Surge arrester** 245 kV, 192 kV continuous operating voltage, 10kA nominal discharge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide type	Set	6
A6.1	**Post Insulator** 245 kV, 50 Hz, 1050/460 kV BIL, 10 kN	Set	12
A6.2	**Line trap,** for **digital PLC**, one set shall be provided for each 230 kV Transmission Line, characteristics shall be defined during the Design	Set	**0**
A7.X	**Conductors** for double busbar system and for connection of the 230 kV switchgear, 245 kV, 3150 & 2000 A, 50 kA.	Lot	1
A8.X	**Insulators and fittings incl. all necessary clamps and connectors** required for completing 230 kV switchgear.	Lot	1
A9.X	**Gantry steel structures and equipment supports** required for completing 230 kV switchgear.	Lot	1
A10.X	**All other necessary material and equipment** required for completing 230 kV switchgear.	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.	Lot	0
	The control and protection panels shall mirror the switchyard layout.		
	Enough space shall be reserved for future circuits.		
	The system comprise the following:		
	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 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.		

No.	Equipment	Unit	Qty.
A1.2	**Circuit Breaker** 245 kV, 3150A, 50kA, 50Hz, 1050/460 kV BIL, live tank type, SF6 gas, with **one** spring-stored energy operating mechanism	Set	3
A2.1	**Disconnector with Earthing Switch** 245 kV, **3150A**, 50kA, 50Hz, 1050/460 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch	Set	0
A2.2	**Disconnector with Earthing Switch** 245 kV, **2000A**, 50kA, 50Hz, 1050/460 kV BIL, three pole, centre break, post type, motor operated disconnector with motor-operated earthing switch	Set	6
A2.3	**Disconnector** 245 kV, **3150A**, 50kA, 50Hz, 1050/460 kV BIL, three pole, centre break, post type, motor operated	Set	0
A2.4	**Disconnector** 245 kV, **2000A**, 50kA, 50Hz, 1050/460 kV BIL, three pole, centre break, post type, motor operated	Set	0
A3.1	**Current transformer** 245 kV, 50kA, 50Hz, 1050/460 kV BIL, single phase, **4000-2000**/1/1/1/1/1 A/A, 5-core, multi ratio, post type	Set	0
A3.2	**Current transformer** 245 kV, 50kA, 50Hz, 1050/460 kV BIL, single phase, **3000-1500**/1/1/1/1/1 A/A, 5-core, multi ratio, post type	Set	12
A3.3	**Current transformer** 245 kV, 50kA, 50Hz, 1050/460 kV BIL, single phase, **2000-1000**/1/1/1/1/1 A/A, 5-core, multi ratio, post type	Set	0
A4	**Voltage transformer** 245 kV, 50 Hz, 1050/460 kV BIL, single phase, 230/V3 / 110/V3 / 110/V3 kV/V/V, 2 secondary windings, capacitor type	Set	6
A5	**Surge arrester** 245 kV, 192 kV continuous operating voltage, 10kA nominal discharge current, 50Hz, single phase, heavy duty, station class, gapless, metal oxide type	Set	6
A6.1	**Post Insulator** 245 kV, 50 Hz, 1050/460 kV BIL, 10 kN	Set	24
A6.2	**Line trap,** for **digital PLC**, one set shall be provided for each 230 kV Transmission Line, characteristics shall be defined during the Design	Set	**0**
A7.X	**Conductors** for double busbar system and for connection of the 230 kV switchgear, 245 kV, 3150 & 2000 A, 50 kA.	Lot	1
A8.X	**Insulators and fittings incl. all necessary clamps and connectors** required for completing 230 kV switchgear.	Lot	1
A9.X	**Gantry steel structures and equipment supports** required for completing 230 kV switchgear.	Lot	1
A10.X	**All other necessary material and equipment** required for completing 230 kV switchgear.	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.	Lot	0
	The control and protection panels shall mirror the switchyard layout.		
	Enough space shall be reserved for future circuits.		
	The system comprise the following:		
	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 230, 132, 33 kV as well as LV AC		

No.	Equipment	Unit	Qty.
	and LV DC system, **for required part of substation,** shall be designed, calculated, supplied, delivered, installed, tested and commissioned and **integrated into the existing system**, under this contract. The control and protection panels shall mirror the switchyard layout. Enough space shall be reserved for future circuits. The system comprise the following:		
G1.1	**Control, Protection and SAS** set for 230 kV Overhead Line circuit, (including the other end)	Set	2
G1.1	**Control, Protection and SAS** set for 132 kV Overhead Line circuit, (including the other end)	Set	0
G2.1	**Control, Protection and SAS** set for 230/132/33 kV Auto Transformer circuits and associated Earthing / Auxiliary Transformer circuits	Set	0
G2.2	**Control, Protection and SAS** set for 132/33 kV Power Transformer circuits	Set	0
G3.1	**Control, Protection and SAS** set for Busbar 230 kV	Set	0
G3.2	**Control, Protection and SAS** set for Busbar 132 kV	Set	0
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	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.X	**Digital Fault and Disturbance Recorder (DFDR)** to accommodate all feeders	Lot	0
G5.XE	**Digital Fault and Disturbance Recorder (DFDR)** to accommodate all feeders, **for required part of substation**	Lot	**0**
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	0
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	Lot	1

No.	Equipment	Unit	Qty.
	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:		
G1.1	**Control, Protection and SAS** set for 230 kV Overhead Line circuit, (including the other end)	Set	0
G1.1	**Control, Protection and SAS** set for 132 kV Overhead Line circuit, (including the other end)	Set	1
G2.1	**Control, Protection and SAS** set for 230/132/33 kV Auto Transformer circuits and associated Earthing / Auxiliary Transformer circuits	Set	0
G2.2	**Control, Protection and SAS** set for 132/33 kV Power Transformer circuits	Set	0
G3.1	**Control, Protection and SAS** set for Busbar 230 kV	Set	0
G3.2	**Control, Protection and SAS** set for Busbar 132 kV	Set	0
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	0
G4.XE	**Extension of the existing Tariff Metering**	Lot	1
	Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for each line and transformer feeder, **for required part of substation**. For each feeder, minimum two (2) meters (main-1 & main-2) shall be provided		
G5.X	**Digital Fault and Disturbance Recorder (DFDR)** to accommodate all feeders	Lot	0
G5.XE	**Digital Fault and Disturbance Recorder (DFDR)** to accommodate all feeders, **for required part of substation**	Lot	**0**
G6.X	**Tele-control & Tele-protection & Tele-metering facilities**,	Lot	0
	A complete lot of hardware and software, 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.		