POWER GRID COMPANY OF BANGLADESH LIMITED

BIDDING DOCUMENT

FOR

CONSTRUCTION AND COMPLETION OF 132/33KV GIS SUBSTATION AT DHAMRAI, 230/132KV GIS SUBSTATION AT SHYAMPUR AND ASSOCIATED TRANSMISSION LINES ON TURNKEY BASIS.

ADB LOAN NO. 3078-BAN
CONTRACT NO. PSEEIP(TRANCHE-2)/ADB/PGCB/P01

VOLUME 3 OF 3

BID PRICES AND SCHEDULES

JUNE 2014

POWER GRID COMPANY OF BANGLADESH LIMITED

BIDDING DOCUMENT
FOR
CONSTRUCTION AND COMPLETION OF 132/33KV GIS SUBSTATION AT DHAMRAI, 230/132KV GIS SUBSTATION AT SHYAMPUR AND ASSOCIATED TRANSMISSION LINES ON TURNKEY BASIS.

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POWER GRID COMPANY OF BANGLADESH LIMITED

BIDDING DOCUMENT

FOR

CONSTRUCTION AND COMPLETION OF 132/33KV GIS SUBSTATION AT DHAMRAI, 230/132KV GIS SUBSTATION AT SHYAMPUR AND ASSOCIATED TRANSMISSION LINES ON TURNKEY BASIS.

SCHEDULE A

INTRODUCTION & PREAMBLE TO THE PRICE & TECHNICAL SCHEDULES

POWER GRID COMPANY OF BANGLADESH LIMITED

BIDDING DOCUMENT
FOR
Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

SCHEDULE A

INTRODUCTION & PREAMBLE TO THE PRICE & TECHNICAL SCHEDULES

BRIEF DESCRIPTION OF THE WORKS

The bidder shall 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. 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 contractor is responsible for ensuring that all and/or and 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.**

The scope of work comprises the following: -

DESCRIPTION OF WORKS

The scope of work under this turnkey bid is design, supply, delivery, installation, testing & commissioning of One new 132/33kV Gas Insulated Switchgear (GIS) substation at Dhamrai, One new 230/132kV Gas Insulated Switchgear (GIS) substation at Shyampur and 4km 230kV double circuit overhead Transmission Line in-out from Meghnaghat-Hasnabad 230kV double circuit line & 2km 132kV double Circuit overhead Transmission Line in-out from Hasnabad-Shyampur 132kV double Circuit Line at proposed Shyampur 230/132kV GIS Substation.

The scope of work also includes design, supply, delivery, installation, testing & commissioning of 132/33kV power transformer,230/132kV Auto Transformer and associated control, automation, protection, fiber optic multiplexer equipment for communication & protection, and civil works.

Scope 1: NEW 132/33KV GIS SUBSTATION AT DHAMRAI:

Design, supply, delivery, installation, testing & commissioning of a complete new outdoor type 132/33kV GIS substation at Dhamrai(which is situated at the west side and about 30km away from the Capital city Dhaka).

132kV Gas Insulated Switchgear (GIS):
Complete 132kV GIS consisting of two line bays, two transformer bays and one bus-coupler bay to connect two new 132 kV overhead lines (Kaliakoir-1 & 2) & two 132/33 kV, 50/75MVA power transformers; space provision shall be kept for future extension of five 132 kV bays.The configuration of the 132 kV busbar shall be double busbar scheme. Jointing plugs shall be kept for adding future bays and jointing plugs required for connecting GIS of different makes.

33kV Air Insulated Switchgear (AIS) and Connection:
outdoor type 33 kV AIS switchyard with single busbar and two 33kV incomer bays to connect two 33kV side of 132/33 kV, 50/75MVA power transformers; two(2) 33/.415kV aux. transformer bays in order to facilitate station power supply ;space provision shall be kept for future extension of six(6) outgoing 33kV bays with busbar & skeleton

Two 50/75 MVA, 132/33 kV outdoor type three phase transformers;
Two 33/0.4 kV, 200KVA outdoor type auxiliary transformers to supply the substation auxiliary loads.

Control, Protection, Substation Automation & Metering:
Associated control, metering, protection equipment, synchronizing scheme and substation automation system for complete substation.

Fibre Optic Multiplexer Equipment for Communication and Protection:
Indoor type Fibre Optic Multiplexer and communication Equipment for protection & communication and integration with existing communication network of PGCB.

DC and LVAC System:
Complete set of 110V DC & 48V DC and LVAC system with all necessary materials required for the plant being installed. The system shall be comprises with a backup/standby set.

Land Development, Civil Works, Building and Foundation:
Complete design, supply and construction of all civil items required for land development.
Complete design, supply and construction of all civil items required for the outdoor works suitable for switchyard gantry & equipment foundations, transformer foundations, blast walls, oil pit, entrance & internal roads, outdoor lighting system, cable trenches, septic tank, earth filling, surfacing, drainage, security fences, guard house, earthing & lightning protection, switchyard lighting, etc.
Complete design, supply and construction of all civil items including all necessary architecture & structural requirements; cable trays, fittings and flooring & finishes; air-conditioning and lighting for a two storied control building including cable basement.
SCADA system for Telecontrol and Telemetering:
Complete design, supply, delivery, installation, testing & commissioning of hardware and software to provide the telecontrol & telemetering facilities required at the existing National Load Despatch Center(NLDC) at Rampura for integration of complete new 132/33kV substation. All required electrical signals shall be transmitted to the NLDC through the Industrial Gateway of the substation automation system. All HV breakers, motorized disconnectors, tap changer, etc. shall be controlled form NLDC through the Gateway of the substation automation system using IEC 60870-5-104 protocol. All necessary modification works in the software of master station of NLDC are to be carried out.
Mandatory Spares, Maintenance tools & Test Equipment:
Supply of complete mandatory spare and spare parts of transformer, switchgear, control equipment, protection relays, meters, maintenance tools & test equipment. The materials shall have to be handed over to the designated store as per instruction of the Engineer.

Scope 2: NEW 230/132KV GIS SUBSTATION AT SHYAMPUR:

Design, supply, delivery, installation, testing & commissioning of a complete new indoor type 230/132kV GIS substation at Shyampur (Which is situated at the South side and about 8km away from the Capital city Dhaka).

230kV Gas Insulated Switchgear (GIS):
Complete 230kV GIS consisting of four line bays, two transformer bays and one bus-coupler bay to connect four new 230 kV over head lines (Meghnaghat-1 & 2, Hasnabad-1 & 2) & two new 230/138/33kV transformers; space provision shall be kept for future extension of five 230kV bays. The configuration of the 230kV busbar shall be double busbar scheme. Jointing plugs shall be kept in GIS hall for adding future bays and jointing plugs required for connecting GIS of different makes;

132kV Gas Insulated Switchgear (GIS):
Complete 132kV GIS consisting of six line bays, two transformer bays & one bus coupler bay to connect six new 132 kV over head lines (Shyampur-1 & 2, Fatulla-1 & 2 and Matuail-1 & 2) & 132kV side of two new 230/138/33kV transformers; space provision shall be kept for future extension of four 132 kV bays. The configuration of the 132kV busbar shall be double busbar scheme. Jointing plugs shall be kept in GIS hall for adding future bays and jointing plugs required for connecting GIS of different makes;

Outdoor type 36kV VCB with CT, LA, DS for auxiliary transformer to connect with tertiary side of Auto transformer.

Two 225/300 MVA, 230/138/33 kV outdoor type three phase auto transformers;
Two 33/0.4 kV, 300KVA outdoor type earthing transformers connected to each 230/138/33 kV transformer tertiary side to supply the substation auxiliary loads.
230kV, 132kV & 33kV Underground Power cables.

Control, Protection, Substation Automation & Metering:
Associated control, metering, protection equipment, synchronizing scheme and substation automation system for complete substation.
Digital Fault & Disturbance Recorder (DFDR):
Supply, installation, testing & complete commissioning of DFDR at New Shyampur 230/132kV substation , Existing Tongi 230/132kV Substation and Old Airport 230/132kV substation.
Fibre Optic Multiplexer Equipment for Communication and Protection:
Indoor type Fibre Optic Multiplexer and communication Equipment for protection & communication and integration with existing communication network of PGCB.
DC and LVAC System:
Complete set of 110V DC & 48V DC and LVAC system with all necessary materials required for the plant being installed. The system shall be comprises with a backup/standby set.
Land Development, Civil Works, Building and Foundation:
Complete design, supply and construction of all civil items required for land development.
Complete design, supply and construction of all civil items required for the outdoor

works suitable for switchyard gantry & equipment foundations, transformer foundations, blast walls, oil pit, entrance & internal roads, outdoor lighting system, cable trenches, septic tank, earth filling, surfacing, drainage, security fences, guard house, earthing & lightning protection, switchyard lighting, etc.

Complete design, supply and construction of all civil items including all necessary architecture & structural requirements; cable trays, fittings and flooring & finishes; air-conditioning and lighting for a new GIS building including cable basement, control room, EOT crane etc.

SCADA system for Telecontrol and Telemetering:

Complete design, supply, delivery, installation, testing & commissioning of hardware and software to provide the telecontrol & telemetering facilities required at the existing National Load Despatch Center(NLDC) at Rampura for integration of complete new 230/132kV substation. All required electrical signals shall be transmitted to the NLDC through the Industrial Gateway of the substation automation system. All HV breakers, motorized disconnectors, tap changer, etc. shall be controlled form NLDC through the Gateway of the substation automation system using IEC 60870-5-104 protocol. All necessary modification works in the software of master station of NLDC are to be carried out.

Mandatory Spares, Maintenance tools & Test Equipment:

Supply of complete mandatory spare and spare parts of transformer, switchgear, control equipment, protection relays, meters, maintenance tools & test equipment. The materials shall have to be handed over to the designated store as per instruction of the Engineer.

Scope 3: Construction of Transmission Line:

3.1: Double circuit in-out of Meghnaghat Hasnabad 230kV line at Shyampur 230/132kV Substation.

Design, supply, delivery, installation, testing & commissioning of in-out of existing Meghnaghat–Hasnabad 230kV overhead double circuit line at Shyampur 230/132kV Substation. This 230kV overhead line in and out shall be constructed on four circuit lattice steel tower in vertical configuration with ACSR Mallard Twin conductor and two 7×4.0 steel earthwire equivalent OPGW consisting of 48 fibers approx. 4km; Insulators of 210kN & 120kN ratings, Hardware fittings.

3.2 Double circuit in-out of Shyampur – Hasnabad & Shyampur-Haripur 132kV line at Shyampur 230/132kV Substation.

Design, supply, delivery, installation, testing & commissioning of existing Shyampur–Hasnabad 132kV(Single circuit) line and existing Shyampur– Haripur 132kV(Single circuit) line at Shyampur 230/132kV Substation on same tower(approx 2km). This 132kV overhead line in and out shall be constructed on four circuit lattice steel towers in vertical configuration with ACSR Grossbeak single conductor and two 7×3.25 mm steel earthwire equivalent OPGW of 24 fibers approx 2km.

Proto load tested tower structural and shop drawings will be provided by the Employer. However, if the Contractor need to prepare any additional structural and shop drawings, that have to be prepared by the Contractor without any additional cost. Insulators of 120kN & 70kN ratings, Hardware fittings.

SCHEDULE A1

REQUIREMENTS

SCOPE-1: Dhamrai 132/33 kV GIS Substation:

The equipment to be designed, supplied, installed, tested & commissioned as per detail technical specification and as shown in bid drawings (volume 2 of 3 of this bid document):

Item	Description
1A	**132 kV Outdoor Type Gas Insulated Switchgear (GIS)**
	The 132 kV outdoor type GIS shall comply with the particular requirements as detailed in the Schedule of Technical Requirements included as Appendix A1 to this section and shall comprise the following:-
1A1	Two(2) sets 132kV overhead line circuit bays(1250A), 40kA/1sec, 50Hz, 650kVp BIL including main connections GIS bus duct & Air Insulated Bushing(AIB), protection and control requirements.
1A2	Two(2) sets 132/33 kV Transformer circuit bays(1250A), 40kA/1sec, 50Hz, 650kVp BIL including main connections GIS bus duct & Air Insulated Bushing(AIB), protection and control requirements.
1A3	One(1) set Bus Coupler circuit bay(3000A), 50kA/1sec, 50Hz, 650kVp BIL including main connections, protection and control requirements.
1A4	Double Busbar (3000A), 40kA/1sec, 50Hz, 650kVp BIL with VT and ES including main connections, protection and control requirements in One(1) lot.
1B	**33kV Air Insulated Switchgear(AIS) and Connection:**
	The 33kV AIS shall comply with the particular requirements as detailed in the Schedule of Technical Requirements included as Appendix A1 to this section and bid drawings; shall comprise the following:-
1B1	Two (2) sets of 36kV, 2000A, 25kA/1sec, 50Hz, 170kVp BIL, outdoor Vacuum Circuit Breakers(VCB) with spring-stored energy operating mechanism.
1B2	Seven(7) sets of 36kV, 2000A, 25kA/1sec, 50Hz, 170kVp BIL, single vertical break, post type, disconnectors.
1B3	Six(6) nos. of single-phase, 3-core, multi ratio, 36kV, 25kA/1sec, 50Hz, 170kVp BIL, post type current transformer.
1B4	Twelve(12) nos. of single-phase, 2-core, 36kV, 25kA/1sec, 50Hz, 170kVp BIL, voltage transformers.
1B5	Twelve(12) nos. of 30kV rated voltage, 10kA nominal discharge current,

50Hz, Heavy duty station class, single phase surge arresters.

1B6 One(1) lot of flexible conductors for busbar, jackbus, jumper, equipment connections[ACSR, Twin Mallard(795MCM)], including all necessary clamps & connectors required for completing 33kV busbar and switchgear connection.

1B7 One(1) lot of insulators and fittings including all necessary accessories required to complete 33kV switchyard

1B8 One(1) lot of steel structures for gantry and equipment supports including nuts & bolts and cable tray including all necessary fitting & fixing accessories required for completing 33kV switchyard.

1C Power Transformers & Auxiliary Transformers

1C1 Two (2) sets of 132/33kV, 50/75 MVA (ONAN/ONAF), three phase outdoor type power transformers with associated bushing CTs including all necessary connections, insulators & fittings.

1C2 Two(2) sets 33/0.415kV, 200kVA three phase outdoor type station auxiliary transformers with associated support steel structures including all necessary connections, insulators & fittings.

1D Control, Protection, Substation Automation & Metering 132 kV Circuits

The equipment to be designed, supplied, installed and commissioned shall be as shown in bid drawings and comprise of:-

1D1 Control, Protection, Metering & Substation Automation System including event recording function for Two(2) sets of overhead line circuits to Kaliakoir (Kaliakoir-1 & 2).

1D2 Control, Protection, Metering & Substation Automation System including event recording function for two(2) sets of 132/33 kV power transformer circuits including transformer tap changer control.

1D3 Control, Protection, Metering & Substation Automation System including event recording function for one(1) set of bus coupler circuit.

1D4 Busbar protection system for complete 132kV bus; one(1) lot.

1D5 Tariff metering panel to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for Two(2) 132kV line and two(2) transformer feeder. For each feeder minimum two meters (main & check). The scope of works also includes supply of software(s) & connection cords of the above energy meters for future re-configuration.

33 kV Circuits

The equipment to be supplied, installed and commissioned shall be as shown in bid drawings and comprise of:-

1D6 Control, Protection, Metering & Substation Automation System including event recording function for two sets of power transformer circuits

1D7 Tariff metering panel to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for two transformer feeder circuits (Power X-former-I & II). For each feeder minimum two meters (main & check).

1E Surge Arrester, Conductor, Steel Structure, Insulator & Hardware & Fittings

132 kV Circuit

1E1 Twelve(12) nos. of 120kV rated voltage, 102kV(rms) continuous operating vo ltage at 500c, 10kA nominal discharge current, 50Hz, Heavy duty station class , gapless metal oxide type, single phase surge arresters.

1E2 One(1) lot of flexible conductors for jackbus, jumper, equipment connection [ACSR, Single Grosbeak(636 MCM)], including all necessary clamps & connectors required for completing termination of 132kV overhead incoming line and Transformer HV side.

1E3 One(1) lot of insulators & fittings including all necessary accessories required to complete 132kV interfacing.

1E4 One(1) lot of steel structures for gantry and outdoor equipment supports includ ing nuts & bolts and cable tray including all necessary fitting & fixing accesso ries required to complete 132kV interfacing.

1F Multicore Cables

1F1 One(1) lot complete set of multicore low voltage 0.6/1.1kV, XLPE insulated power and control cables (IEC 60502) shall be supplied, installed, glanded, terminated and have individual cores identified to be used for connection of all equipment supplied under this Contract. The overall substation cable routing and core schedules shall also be provided.

1G **Earthing and Lightning Protection**

1G1 One(1) lot of design, supply and installation of earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations.

1H Batteries, Chargers and DC Distribution

1H1 110V substation NiCad batteries complete with chargers and distribution switchboard to be supplied, installed and commissioned to provide all DC supplies to equipment being supplied.

The system shall generally be as shown in bid drawing and shall include:

(a) Two (2) sets of 100% batteries complete, each capacity shall not be less than 250Ah at the 5-hour rate of discharge.

(b) Two (2) sets of battery chargers complete, each charger shall not be less than 75A rating.

(c) One (1) set of DC distribution board. The DC distribution board shall be with 50% spare MCBs for future use.

(d) Two(2) sets of online UPS, 3kVA for Substation Automation system panels.

(e) Two(2) sets of DC/DC Converter 110/48V, 1kVA for communication panels and one(1) set 48V DC distribution board. The DC distribution board shall be with 50% spare MCBs for future use.

1I LVAC Distribution

1I1 One (1) lot of LVAC switchboard for substation services to be supplied, installed and commissioned, to provide the 415/240V supplies to all equipment being supplied under this turnkey Bid.

1I2 One (1) lot of Tariff metering panel to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for two 33/0.415 kV station auxiliary transformer feeder circuits. For each feeder minimum two meters (main & check).

1I3 One(1) set 125A outdoor weatherproof 3-phase with neutral and earth switched socket outlet and plug as per IEC 309; to be installed, cabled and connected adjacent to the power transformers.

1J Civil Works, Building and Foundation

1J1 Complete earth filling by imported carried earth free from foreign solid particles and organic materials in addition to the earth recovered from digging of foundation, to make the top of the final ground level of substation 4.0m high from highest flood level and final compaction to be achieved 95% for total volume 40,500 cubic meter. The volume of earth filling may be varied but the payment shall be as per actual measurement of work done.

1J2 One(1) lot of complete design, supply and construction of all civil items required for the outdoor works suitable for switchyard gantry & equipment foundations, transformer foundations, blast walls, oil pit, entrance & internal roads, cable trenches, septic tank, soak way, surfacing, gravel laying, drainage, security fences, boundary wall, sentry post, guard house, car port, etc.

1J3 One (1) lot of complete design, supply and construction of all civil items and facilities required for the two storied control building including cable basement.

1J4 One (1) lot of complete design, supply and construction of all civil items and facilities required for the three storied dormitory building on six storied foundation with kitchen,toilet facilities for each unit.

1K Lighting, Small Power, Air Conditioning and Ventilation

1K1 One (1) lot of complete design, supply, installation and commissioning of equipment to provide lighting, LV power supply, air conditioning system, ventilation system and emergency DC lighting for the control building.

1K2 One (1) lot of complete set of design, supply, installation and commissioning of equipment to provide lighting (flood light LED type) for security, roadway, switchyard and emergency DC lighting at strategic locations for equipment operation and inspection.

1L Fibre Optic Multiplexer Equipment for Communication and Protection

1L1 The equipment to be supplied, installed and commissioned shall be as shown on bid drawing. One(1) lot complete set of design, supply, installation and commissioning of fibre optic multiplexer equipment including necessary works to interface with existing system is to be provided for:
-87 or 21 relay for each transmission line protection (through fibre cores)
-SCADA data from switchgear and control system
-Hot-line telephone system

1L2 Underground optical fibre cables (24cores, single mode) from terminal box gantry structure at each 132kV double circuit transmission line termination point to MDF (Main distribution Frame) to be installed in control room. The Contract includes supply and installation of MDF and pigtail cables with adequate length.

1M SCADA system for Telecontrol and Telemetering

1M1 One (1) lot of complete design, supply, delivery, installation, testing & commissioning of hardware and software to provide the telecontrol & telemetering facilities required at the existing National Load Despatch Center (NLDC) at Rampura for integration of complete new 132/33kV substation. All required electrical signals shall be transmitted to the NLDC through the Industrial Gateway of the substation automation system. All HV breakers, motorized disconnectors, tap changer, etc. shall be controlled form NLDC through the Gateway of the substation automation system using IEC 60870-5-104 protocol. All necessary modification works in the software of master station of NLDC are to be carried out.

1N Mandatory Spares, Erection & Test Equipment

Supply of complete spares and spare parts of transformer, switchgear, control equipment, protection relays, meters, erection & test equipment as per quantity mentioned in Schedule B. Test equipment are to be supplied from Europe, USA or Japan origin. Printed catalogue, operation and service manual are to be provided. The materials shall have to be handed over to the designated store as per instruction of the Employer's Engineer.

SCOPE-2: Shyampur 230/132kV GIS Substation:

The equipment to be designed, supplied, installed, tested & commissioned as per detail technical specification and as shown in bid drawings (volume 2 of 3 of this bid document):

Item	Description
2A	**230 kV Indoor Type Gas Insulated Switchgear (GIS)**
	The 230kV GIS shall comply with the particular requirements as detailed in the Schedule of Technical Requirements included as Appendix A1 to this section and shall comprise the following:-
2A1	Four(4) sets 230 kV Overhead Line circuit bays(1600A), 50kA/1sec, 50Hz, 1050kVp BIL including main connections (termination of underground XLPE cable, 2000sqmm, cu at GIS bay end), protection and control requirements.
2A2	Two(2) sets 230/138/33kV Transformer circuit bays(1600A), 50kA/1sec, 50Hz, 1050kVp BIL including main connections GIS bus duct & Air Insulated Bushing(AIB), protection and control requirements.
2A3	One Bus Coupler circuit bay(2000A), 50kA/1sec, 50Hz, 1050kVp BIL including main connections, protection and control requirements.
2A4	Double Busbar 2000A, 50kA/1sec, 50Hz, 1050kVp BIL with VT and ES including main connections, protection and control requirements one(1) lot.
2B	**132 kV Indoor Type Gas Insulated Switchgear (GIS)**
	The 132kV GIS shall comply with the particular requirements as detailed in the Schedule of Technical Requirements included as Appendix A1 to this section and shall comprise the following:-
2B1	Six (6) sets 132 kV Overhead Line circuit bays(1250A), 40kA/1sec, 50Hz, 650kVp BIL including main connections GIS (termination of underground XLPE cable, 1000sqmm, cu at GIS bay end), protection and control requirements.
2B2	Two(2) sets 230/138/33kV Transformer circuit bays(2000A), 40kA/1sec,

50Hz, 650kVp BIL including main connections GIS (termination of underground XLPE cable, 1000sqmm, cu, 2 run per phase at GIS bay end).

2B3 One Bus Coupler circuit bay(3000A), 40kA/1sec, 50Hz, 650kVp BIL including main connections, protection and control requirements.

2B4 Double Busbar 3000A, 40kA/1sec, 50Hz, 650kVp BIL with VT and ES including main connections, protection and control requirements one(1) lot.

2C 33kV Air Insulated Switches(AIS) and Connection For Auxiliary Transformer:

The 33kV AIS shall comply with the particular requirements as detailed in the Schedule of Technical Requirements included as Appendix A1 to this section and bid drawings; shall comprise the following:-

2C1 Two (2) sets of 36kV, 630A, 25kA/1sec, 50Hz, 170kVp BIL, outdoor Vacuum Circuit Breakers(VCB) with spring-stored energy operating mechanism.

2C2 Two(2) sets of 36kV, 630A, 25kA/1sec, 50Hz, 170kVp BIL, single vertical break, post type, disconnectors.

2C3 Six(6) nos. of single-phase, 3-core, multi ratio, 36kV, 25kA/1sec, 50Hz, 170kVp BIL, post type current transformer.

2C4 Six(6) nos. of 30kV rated voltage, 10kA nominal discharge current, 50Hz, Heavy duty station class, single phase surge arresters.

2C5 One(1) lot of flexible conductors for jumper, equipment connections[ACSR, Grosbeak(636MCM)], including all necessary clamps & connectors required for completing 33kV switchgear connection for Auxiliary/Earthing Transformer connection from auto transformer tertiary terminal.

2C6 Six(6) nos. of single-phase, 36kV, 25kA/1sec, 50Hz, 170kVp BIL, post insulators and fittings including all necessary accessories required to complete 33kV switchyard.

2C7 One(1) lot of steel structures for equipment supports including nuts & bolts and cable tray including all necessary fitting & fixing accessories required for completing 33kV switchyard.

2D Power Transformers & Earthing/Auxiliary Transformers

2D1 Two (2) sets of 230/138/33KV, 225/300 MVA (ONAN/ONAF), three phase outdoor type Auto transformers with associated bushing CTs including all necessary connections, insulators & fittings.

2D2 Two(2) sets 33/0.415kV, 300kVA three phase outdoor type earthing

transformers and associated steel support structures including all necessary connections, insulators & fittings.

2E **Control, Protection, Substation Automation & Metering 230 kV Circuits**

The equipment to be designed, supplied, installed and commissioned is shown in bid drawings are comprising of:-

2E1 Control, Protection, Metering & Substation Automation System including event recording function for Four(4) sets of overhead line circuits to Meghnaghat-1 & 2 and Hasnabad-1 & 2.

2E2 Control, Protection, Metering & Substation Automation System including event recording function for two(2) sets of 230/138/33 kV power transformer circuits including transformer tap changer control.

2E3 Control, Protection, metering & Substation Automation System including event recording function for one(1) set of bus coupler circuit.

2E4 Busbar protection system for complete 230kV bus; one(1) lot.

2E6 Tariff metering panel to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for Four(4) 230kV line and two(2) transformer feeder. For each feeder minimum two meters (main & check). The scope of works also includes supply of software(s) & connection cords of the above energy meters for future re-configuration.

2F **Control, Protection, Substation Automation & Metering 132kV Circuits**

The equipment to be designed, supplied, installed and commissioned is shown in bid drawings are comprising of:-

2F1 Control, Protection, Metering & Substation Automation System including event recording function for Six(6) sets of overhead line circuits to Shyampur-1 & 2, Fatulla-1 & 2 and Matuail-1 & 2.

2F2 Control, Protection, Metering & Substation Automation System including event recording function for two(2) sets of 230/138/33kV power transformer circuits.

2F3 Control, Protection, metering & Substation Automation System including event recording function for one(1) set of bus coupler circuit.

2F4 Busbar protection system for complete 132kV bus; one(1) lot.

2F5 Tariff metering panel to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for Six(6) 132kV line and two(2) transformer feeder. For each feeder

minimum two meters (main & check).

33 kV Circuits

The equipment to be supplied, installed and commissioned is shown in bid drawings are comprising of:-

2G1 Control, Protection & Metering for two sets of Auxiliary/earthing transformer circuits.

2H Power Cables & Cable Termination, Surge Arrester, Conductor, Steel Structure, Insulator & Hardware fittings

230 kV Circuit

2H1 230kV XLPE, 2000sqmm cu cables & cable termination for connecting four(4) 230kV overhead line to GIS bay. The cable sealing ends at overhead line ter mination side shall be outdoor type and at GIS bay end shall be indoor type.

2H2 Eighteen (18) nos. of 186kV rated voltage, 160kV(rms) continuous operating voltage at 50^{o}C, 10kA nominal discharge current, 50Hz, Heavy duty station class, gapless metal oxide type, single phase surge arresters.

2H3 One(1) lot of flexible conductors for jack bus, jumper, equipment connection [ACSR, Twin Mallard(795 MCM)], including all necessary clamps & connec tors required for completing 230kV overhead incoming line and Transforme r HV side interfacing.

2H4 One(1) lot of insulators and fittings including all necessary accessories require d to complete 230kV interfacing.

2H5 One (1) lot of steel structures for gantry and outdoor equipment supports inclu ding nuts & bolts and cable tray including all necessary fitting & fixing access ories required to complete 230kV interfacing.

132 kV Circuit

2H6 132 kV XLPE, 1000sqmm cu cables & cable termination for connecting four(4) 132kV overhead line to GIS bay. The cable sealing ends at overhead line termi nation side shall be outdoor type and at GIS bay end shall be indoor type.

2H7 Eighteen (18) nos. of 120kV rated voltage, 102kV(rms) continuous operating v oltage at 500c, 10kA nominal discharge current, 50Hz, Heavy duty station class , gapless metal oxide type, single phase surge arresters.

2H8 One(1) lot of flexible conductors for jackbus, jumper, equipment connection [ACSR, Grossbeak(636 MCM)], including all necessary clamps & connectors required for completing 132kV overhead outgoing line and Transformer LV side interfacing.

2H9 One (1) lot of insulators and fittings including all necessary accessories requird to complete 132kV interfacing.

2H10 One (1) lot of steel structures for gantry and outdoor equipment supports inclu ding nuts & bolts and cable tray including all necessary fitting & fixing access ories required to complete 132kV interfacing.

33 kV Circuit

2H11 33 kV 185sqmm XLPE cable & cable termination at transformer & switchgear ends for connecting the tertiary side of 230/138/34.5kV transformers with 33 kV switchgear with one spare cable & cable sealing ends as shown in drawing no.

2I Multicore Cables

2I1 One (1) lot complete set of multicore low voltage 0.6/1.1kV, XLPE insulated power and control cables (IEC 60502) shall be supplied, installed, glanded, terminated and have individual cores identified to be used for connection of all equipment supplied under the Contract. The overall substation cable routing and core schedules shall also be provided.

2J **Earthing and Lightning Protection**

2J1 One (1) lot of design, supply and installation of earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations.

2J2 One (1) set of 3-phase portable (maintenance) earthing equipment devices with connectors and telescopic glass fibre operating pole suitable for plant supplied.

2K Batteries, Chargers and DC Distribution

2K1 110V substation NiCad batteries complete with chargers and distribution switchboard to be supplied, installed and commissioned to provide all DC supplies to equipment being supplied.

The system shall generally be as shown in bid drawing and shall include:

(a) Two (2) sets of 100% batteries complete, each capacity shall not be less than 460Ah at the 5-hour rate of discharge.

(b) Two (2) sets of battery chargers complete, each charger shall not be less than 120A rating.

(c) One (1) set of DC distribution board. The DC distribution board shall be with 50% overall spare MCB's for future use.

(d) Two(2) sets of online UPS, 3kVA for Substation Automation system panels.

(e) Two(2) sets of DC/DC Converter 110/48V, 1kVA for communication panels

and one(1) set 48V DC distribution board. The DC distribution board shall be with 50% spare MCBs for future use.

2L LVAC Distribution

2L1 One (1) lot of LVAC switchboard for substation services to be supplied, installed and commissioned, to provide the 415/240V supplies to all equipment being supplied under this turnkey Bid.

2L2 One (1) lot of Tariff metering panel to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVArh meters (accuracy class 0.2) for two 33/0.415 kV station auxiliary transformer feeder circuits. For each feeder minimum two meters (main & check). The system and requirements shall generally be as shown in Bid drawing and technical specification of Volume 2 and shall include

2L3 One 125A outdoor weatherproof 3-phase with neutral and earth switched socket outlet and plug as per IEC 309; to be installed, cabled and connected adjacent to the Power Transformer.

2M Civil Works, Building and Foundation

2M1 Complete earth filling by imported carried earth free from foreign solid particles and organic materials in addition to the earth recovered from digging of foundation, to make the top of the final ground level of substation 3.0m high from highest flood level and final compaction to be achieved 95% for total volume 24300 cubic meter. The volume of earth filling may be varied but the payment shall be as per actual measurement of work done.

2M2 One (1) lot of complete design, supply and construction of all civil items required for the outdoor works suitable for switchyard gantry & equipment foundations, transformer foundations, blast walls, oil pit, entrance & internal roads, cable trenches, septic tank, soak way, surfacing, gravel laying, drainage, security fences, boundary wall, sentry post, guard house, car port, etc.

2M3 One (1) lot of Complete design, supply and construction of all civil items including all necessary architecture & structural requirements; cable trays, fittings and flooring & finishes; for a new GIS building including cable basement, control room and EOT crane etc.

2N Lighting, Small Power, Air Conditioning and Ventilation & DFDR.

2N1 One (1) lot of complete design, supply, installation and commissioning of equipment to provide lighting, LV power supply, air conditioning system, ventilation system and emergency DC lighting for the GIS building.

2N2 One (1) lot of complete set of design, supply, installation and commissioning of equipment to provide lighting (flood light LED type) for security, roadway, switchyard and emergency DC lighting at strategic locations for equipment

operation and inspection.

2N3.1 Digital Fault & Disturbance Recorder (DFDR), complete for all 230kV & 132kV bays for new Shyampur 230/132kV Substation; one(1) lot.

2N3.2 Digital Fault & Disturbance Recorder (DFDR), complete for all 230kV & 132kV bays for existing Old Airport Substation; one(1) lot.

2N3.3 Digital Fault & Disturbance Recorder (DFDR), complete for all 230kV & 132kV bays for existing Tongi Substation; one(1) lot.

2O Fibre Optic Multiplexer Equipment for Communication and Protection

2O1 The equipment to be supplied, installed and commissioned shall be as shown on bid drawing. One(1) lot complete set of design, supply, installation and commissioning of fibre optic multiplexer equipment including necessary works to interface with existing system is to be provided for:
-87 or 21 relay for each transmission line protection (through fibre cores)
-SCADA data from switchgear and control system
-Digital Telephone exchange including hot-line telephone system

2O2 Underground optical fibre cables (24cores for 132kV switchyard and 48cores for 230kV switchyard) from terminal box gantry structure at each 230kV and 132kV circuit transmission line termination point to MDF (Main distribution Frame) to be installed in control room. The Contract includes supply and installation of MDF and pigtail cables with adequate length.

2P SCADA system for Telecontrol and Telemetering

2P1 One (1) lot of complete design, supply, delivery, installation, testing & commissioning of hardware and software to provide the telecontrol & telemetering facilities required at the existing National Load Despatch Center (NLDC) at Rampura for integration of complete new 230/132kV substation. All required electrical signals shall be transmitted to the NLDC through the Industrial Gateway of the substation automation system. All HV breakers, motorized disconnectors, tap changer, etc. shall be controlled form NLDC through the Gateway of the substation automation system using IEC 60870-5-104 protocol. All necessary modification works in the software of master station of NLDC are to be carried out.

2Q Mandatory Spares, Erection & Test Equipment

Supply of complete spares and spare parts of transformer, switchgear, control equipment, protection relays, meters, erection & test equipment as per quantity mentioned in Schedule B. Test equipment are to be supplied from Europe, USA or Japan origin. Printed catalogue, operation and service manual are to be
provided. The materials shall have to be handed over to the designated store as per instruction of the Engineer.

APPENDIX A1.1

SCHEDULE OF TECHNICAL REQUIREMENTS OF 230 kV and 132 kV INDOOR/OUTDOOR TYPE GAS INSULATED SWITCHGEAR (GIS)

SL. No.	Description	Unit	230 kV	132 kV
1.	**Site Condition**			
	Max. Altitude above sea level	m	not more than 1000	not more than 1000
	Max. Ambient temperature outdoor	℃	+45	+45
	Min. Ambient temperature outdoor	℃	+4	+4
	Max. Ambient relative humidity	%	100	100
	Max. Seismic acceleration at floor level			
	- horizontal	g	0.1	0.1
	- vertical	g	0.1	0.1
2.	**Type Designation**			
	Enclosure			
	- busbar		three phase	three phase
	- bay		single phase	three phase
	Enclosure Material		Al	Al
	Standards		IEC	IEC
3.	**Electrical Data**			
	Rated Voltage	kV	245	145
	Rated Frequency	Hz	50	50
	Insulation Level			
	- lightning impulse withstand	kV	1050	650
	- 50 Hz withstand 1 minute	kV	460	275
	Rated continuous current at 40℃ ambient temperature			
	- main busbar and bus coupler	A	3000	3000(Shyampur) 3000(Dhamrai)
	- transformer bay	A	1600	2000 (for Auto Tr.) 1250 (for 132kV Tr.)
	- line bay	A	1600	1250
	Rated short time withstand			
	- current	kA	50	40(Shyampur) 40(Dhamrai)
	- duration	sec	1	1
	Rated peak withstand current	kA	160	125
4.	**Secondary Circuit**			
	Auxiliary voltage			
	- for control and signal	V dc	110	110
	- for remote control	V dc	110	110
	- for heating	V ac	415/230	415/230
	- tolerances	%	-15/+15	-15/+15
5.	**Circuit Breaker**			

	Enclosure		single phase	three phase
	Enclosure material		Al	Al
	Rated short time breaking current	kA	50	40(Shyampur) 40(Dhamrai)
	Rated peak withstand current	kA	160	125
	Percentage D.C component	%	40	40
	First-pole-to-clear-factor		1.3	1.3
	Rated breaking current			
	- cable charging	A	250	160
	Switching overvoltage	p.u.	2.5	2.5
	Operating mechanism		single/three phase	three phase
	Operating mechanism(for closing/opening)		spring	spring
	Number of making coil per operating mechanism	pcs	1	1
	Number of tripping coil per operating mechanism	pcs	2	2
	Rated motor voltage	V dc	110	110
	Rated operating sequence		O-t-CO-t'-CO	O-t-CO-t'-CO
	- t	sec	0.3	0.3
	- t'	min	3	3
6.	**Disconnector & Earthing Switch**			
	Enclosure		three/single phase	three phase
	Operating mechanism(for closing/opening)		manual & motorised	manual & motorised
	Rated motor voltage	V dc	110	110
7.	**Surge Arrester**			
	Rated voltage	kV	186	120
	Nominal discharge current	kA	10	10
	Discharge class		heavy duty class 3	heavy duty class 3
8.	**CT ratio, class and output**			
	(a) Line bay	A	1600/1,1,1 A, 30 VA, 5P20 (2 Cores) for protection, Cl 0.2(1 Core) for measuring 1600/1 A, 30 VA (BBP)	1200/1,1,1 A , 30 VA, 5P20 (2 Cores) for protection, Cl 0.2 (1 Core) for measuring 1200/1 A, 30 VA (BBP)
	(b) 230/138/34.5 kV Transformer bay	A	1200/1,1,1 A, 30 VA, 5P20 (2 Cores) for protection, Cl 0.2 (1 Core) for measuring 1200/1 A, 30 VA (BBP)	1600/1,1,1 A, 30 VA, 5P20 (2 Cores) for protection, Cl 0.2 (1 Core) for measuring 1600/1 A, 30 VA (BBP)
	(c) 132/33 kV Transformer bay	A		800/1,1,1 A, 30 VA, 5P20 (2 Cores) for protection, Cl 0.2 (1 Core) for measuring, 800/1A,30VA(BBP)
	(d) Bus coupler bay	A	3000/1,1 A, 30 VA, 5P20 (1 Cores) for protection, Cl 0.5 (1 Cores) for measuring	3000/1,1, A, 30 VA, 5P20 (1 Cores) for protection, Cl 0.5 (1 Cores) for measuring

9. VT ratio, class and output

Ratio	kV	230/√3/0.11/√3/0.11/√3	132/√3/0.11/√3/0.11/√3
Total burden	VA	10	10
Accuracy class		3P & 0.2	3P & 0.2

10. Degree of Protection

for indoor GIS	IP54
for outdoor GIS	IP55W

APPENDIX- A1.2
SCHEDULE OF TECHNICAL REQUIREMENTS OF
132kV and 33kV AIR INSULATED SWITCHGEAR (AIS)

Sl. No.	Description	Unit	230kV	132kV	33kV
1.	**Site Condition**				
	Max. Altitude above sea level	meter	not more than 1000		
	Max. Ambient temperature outdoor	ºC	+45		
	Min. Ambient temperature outdoor	ºC	+4		
	Max. Ambient relative humidity	%	100		
	Max. Seismic acceleration at floor level				
	- horizontal	*g*	*0.1*		
	- vertical	*g*	*0.1*		
2.	**Electrical Data**				
	Nominal system Voltage	kV	230	132	33
	Rated Voltage	kV	245	145	36
	Rated Frequency	Hz	50	50	50
	Insulation Level				
	- lightning impulse withstand	kVp	1050	650	170
	- switching impulse withstand	kVp	—	—	—
	- 50 Hz withstand 1 minute	kV	460	275	70
	Rated continuous current at 40°C ambient temperature				
	- main busbar and bus coupler	A			3000
	- transformer bay	A			2000
	- line bay	A			-
	Rated short time withstand				
	- current	kA	50	40(Shaympur) 40(Dhamrai)	25
	- duration	Sec	1	1	1
	Rated peak withstand current	kA	125	100	62.5
3.	**Secondary Circuit**				
	Auxiliary voltage				
	- for control and signal	V dc	110		
	- for remote control	V dc	110		
	- for heating	V ac	415/240		
	- tolerances	%	-15/+10		

4. Circuit Breakers

4.1 36kV Class Circuit Breakers

1	Type	Outdoor type VCB
2	Standard	IEC 62271-100
3	Rated voltage	36 kV
4	Rated short-duration power frequency withstand voltage (1 min.)	70 kV rms
5	Rated lightning impulse withstand voltage	170 kV peak

6	First pole to clear factor	1.3
7	Rated current	2000 A(for Dhamrai) 630 A(for Shyampur)
8	Rated short circuit breaking current	25 kA rms
9	Rated short circuit making current	65 kA peak
10	Short time withstand current for 1 sec.	25 kA rms
11	Total closing time	Not more than 150 ms
12	*Total breaking time*	*100 ms*
13	Operating mechanism	Motor spring stored energy
14	Rated duty cycle	O-0.3S-CO-3min-CO
15	Number of closing coils	1
16	Number of tripping coils	2
17	Number of auxiliary contacts for: - Making - Breaking - Middle position	 Min. 8 Min. 8 0
18	Protection class	IP55

5. Disconnector Switches/Isolators

5.1 36kV Class Isolators

1	Type	Outdoor, Single vertical break
2	Standard	IEC 62271-102
3	Rated voltage	36 kV
4	Rated short-duration power frequency withstand voltage (1 min.)	70 kV rms
5	Rated lightning impulse withstand voltage	170 kV peak
6	Rated normal current	2000 A
7	Rated short circuit current (Ith), 1s	25 kA rms
8	Rated short circuit current (Idyn)	65 kA peak
9	Creepage distance of insulator	25 mm/kV
10	Operating mechanism of isolator	manual operated
11	Number of auxiliary contacts for main switch - Making / Breaking	 Min. 6 / 6

6. Instrument Transformers

6.1 Instrument Transformers

			36kV	
1	Rated lightning impulse withstand voltage		170 kVp	
2	Rated switching impulse withstand voltage			
3	Power frequency withstand voltage (1 min.)		70 kVrms	
4	Corona extinction voltage			
5	Radio interference level for 0.5 MHz to 2 MHz		1000 micro V (at 92 kVrms)	
6	Partial discharge level		10 pC	
7	Type of insulation		Class A	

6.1.1 36kV Class Current Transformers (for transformer bay)

1	No. of Cores	3 (Metering-1 plus Protection-3)
2	Ratio	1600/1/1/1[for 50/75MVA]-Dhamrai
3	Class of accuracy	- Protection : 5P20 - Metering : Class 0.2
4	Burden (VA)	30
5	Min. knee point voltage at lowest ratio (Volts)	>1kV@ max ratio for protection core <150V@ max ratio for metering core
6	Max. magnetizing current guaranteed at knee point voltage & the lowest ratio (mA)	M.R.
7	Max. resistance of secondary winding at 75 ^{0}C and at lowest ratio (ohms)	M.R.

6.1.2 36kV Class Voltage Transformer

1	Rated voltage levels	36 kV		
2	Rated Voltage Factor	1.2 continuous; 1.5 for 30 seconds		
3	Phase angle error (minutes)	20		
4	Core details		Core-I :	Core-II :
5	Purpose		Protection	Metering
6	Secondary Voltage		110/√3	110/√3
7	Burden (VA)		50	25
8	Class of accuracy		3P	0.2
9	One minute power frequency withstand voltage between LV	4(10 if the low voltage terminal is		

	terminal and earth(kV rms)	exposed)
10	Withstand voltage for secondary winding (kV rms)	2

7 Surge Arresters

1	Max. highest system voltage		245kV	145kV	36kV
2	Type	Outdoor type, ZnO, Gapless			
3	Standard	IEC 60099-4			
4	Rated voltage		186kV	120kV	30kV
5	Max. continuous operating voltage		160kVrms	102kVrms	
6	Nominal discharge current		10kA	10kA	10kA
7	Discharge class		Heavy duty 3	Heavy duty 3	Heavy duty 3
8	Surge counter		Yes	Yes	Yes
9	Leakage current detector		Yes	Yes	Yes

APPENDIX A2.1

SCHEDULE OF TECHNICAL REQUIREMENTS OF 230/138/33 kV POWER TRANSFORMER

Sl. No.	Description		
	RATING AND PERFORMANCE		
1	Maximum continuous rating (MCR)	MVA	300
2	Number of Phases		3
3	Number of windings		Auto plus stabilising
4	Normal ratio of transformation at no load and at principle tap - HV/LV/TV	kV	230/138/33
5.1	Corresponding highest system voltages	kV	245/145/36
5.2	Corresponding lowest system frequency	Hz	48
6	Minimum withstand voltages:		
	- Full wave impulse withstand		
	of windings	kVp	1050/650/170
	of line terminal bushings	kVp	1050/650/170
	- Induced over voltage	kV rms	460/275/70
	- Power frequency withstand of neutral	kV rms	38
7	Type of cooling		ONAN/ONAF
8	Minimum continuous rating	MVA	225/300
9	Rating of tertiary windings	MVA	75/100
10	Service conditions:		
	- External cooling medium	-	Air
	- Altitude not exceeding	m	150
	- Air temperature not exceeding	°C	45
	Average air temperature in any one year not exceeding:		
	- In any one day	°C	35
	- Average in one year	°C	25
11.1	Maximum temperature :		
	- Top oil rise normal	°C	50
	- Average ONAN winding rise	°C	55
	- Average ONAF winding rise	°C	55
11.2	Maximum hot spot temperature at maximum continuous rating at yearly average ambient temperature	°C	98
11.3	Winding hot spot temperature on emergency overload not exceeding	°C	140
12	Phase connections:		

	- HV winding - LV winding - TV winding - Vector group - HV/LV/TV		Star Star Delta YNa0d1
13	Short circuit withstand fault level at terminals of: - 230 kV busbars - 132 kV busbars - 33 kV busbars	 kA kA kA	 50 40 25
14	Impedance voltage at 75°C and at normal tap and MCR between windings (% on HV Base): - HV & LV % on HV base	 %	 13
15	Delta connected tertiary winding - Nominal voltage - External load	 kV kVA	 33 300 kVA
16.1	Total range of variation of on load transformation ratio (on HV side) as sl. no. 4: - Ratio - Size of steps	 % %	 ±10 1.25
16.2	Type of control		On load local, remote and supervisory electrical and hand operation
17	Line drop compensation		Yes
18	Whether automatic control required and referenced voltage		Yes, 110V, 50Hz
19	Whether separate remote control panel required		Yes
20	DC supply: - Nominal - Maximum float voltage	 V V	 110 125
21	Whether provision for supervisory control required, including AVR setting		Yes
22	Whether marshalling kiosk required		Tankside Cubicle
23	Number of transformers for which automatic control is to be suitable		2 (and provision for future 3rd)
24	**TERMINATIONS** Bushing insulators or cable boxes on line and neutral terminals: i) HV line ii) Neutral iii) LV line		 AIB termination Air Bushings

	iv) Tertiary winding		
25	**BCT PARTICULARS**		
	i) HV (230 kV) Side: Core 1		1200/1A, 30VA
	Core 2 & 3		Ratio & burden matched with WTI, OLTC
	ii) LV (138 kV) Side: Core 1		1600/1A, 30VA
	Core 2		Ratio & burden matched with WTI
	iii) Tertiary Side : Core 1&2		800/1/1A, 30VA
	Core 3		Ratio & burden matched with WTI
	iv) Neutral Bushing (core 1):		1600/1A, 30VA
26	Pollution category of bushing insulators		25 mm/kV of system rated (highest) voltage
27	**COOLING**		
	i) Number of cooler banks required per transformer		To suit transformer design
	ii) Rating of each cooler bank as percentage of tota lloss at CMR	%	50
	iii) Standby cooling requirement		One fan in each group
	GENERAL		
28	Type of oil preservation system		Air Cell
29	Maximum acceptable noise level		78 dBA

APPENDIX- A2.2
SCHEDULE OF TECHNICAL REQUIREMENTS OF
132/33 kV POWER TRANSFORMER (50/75MVA)

Sl. No.	Description		
	RATING AND PERFORMANCE		
1	Maximum continuous rating (MCR)	MVA	75
2	Number of Phases		3
3	Number of windings		2
4	Normal ratio of transformation at no load and at principle tap - HV/LV	kV	132/33
5.1	Corresponding highest system voltages	kV	145/36
5.2	Corresponding lowest system frequency	Hz	48
6	Minimum withstand voltages: - Full wave impulse withstand of windings of line terminal bushings - Induced over voltage - Power frequency withstand of neutral	 kVp kVp kVrms kV rms	 650/170 650/170 275/70 38
7	Type of cooling		ONAN/ONAF
8	Minimum continuous rating	MVA	50/75
9	Rating of tertiary windings	MVA	NA
10	Service conditions: - External cooling medium - Altitude not exceeding - Air temperature not exceeding Average air temperature in any one year not exceeding: - In any one day - Average in one year	 - m 0C 0C 0C	 Air 150 45 45 35
11.1	Maximum temperature : - Top oil rise normal - Average ONAN winding rise - Average ONAF winding rise	 0C 0C 0C	 50 55 55
11.2	Maximum hot spot temperature at maximum continuous rating at yearly average ambient temperature	0C	98
11.3	Winding hot spot temperature on emergency overload not exceeding	0C	140
12	Phase connections: - HV winding - LV winding - TV winding - Vector group - HV/LV/TV		 Delta Star - DYN1

13	Short circuit withstand fault level (one sec.)at terminals of: - 132 kV busbars - 33 kV busbars	 kA kA	 40 25
14	Impedance voltage at 75ºC and MCR (75 MVA) between windings (% on HV Base) at Nominal tap at maximum tap at minimum tap	 % % %	 10 ~14 10 ~14 10 ~14
15	Not used		
16.1	Total range of variation of on load transformation ratio (on HV side) as sl. no. 4: - Ratio - Size of steps	 % %	 ±10 1.25
16.2	Type of control		On load local, remote and supervisory electrical and hand operation
17	Line drop compensation		Yes
18	Whether automatic control required and referenced voltage		Yes, 110V, 50Hz
19	Whether separate remote control panel required		Yes
20	DC supply: - Nominal - Maximum float voltage	 V V	 110 125
21	Whether provision for supervisory control required, including AVR setting		Yes
22	Whether marshalling kiosk required		Tank side Cubicle
23	Number of transformers for which automatic control is to be suitable		2 (and provision for future 3rd)
24	TERMINATIONS Bushing insulators or cable boxes on line and neutral terminals: i) HV line ii) Neutral iii) LV line		 Oil/Air Bushings Oil/Air Bushings Oil/Air Bushing
25	BCT PARTICULARS i) HV (132kV) Side Core 1 & 2		 400/1, Cl-5P20, 30VA

	Core 3		Ratio, burden and accuracy class shall be matched with WTI meter
	ii) LV (33 kV) Side (Core 1 & 2):		1600/1, Cl-5P20, 30VA
	Core 3		for WTI meter
	Core 4		for Tapchanger
	iii) Neutral Bushing (core 1 & 2):		1600/1, Cl-5P20, 30VA
26	Pollution category of bushing insulators		25 mm/kV of system rated (highest) voltage
27	COOLING i) Number of cooler banks required per transformer ii) Rating of each cooler bank as percentage of total loss at CMR iii) Standby cooling requirement	%	i)To suit transformer design ii)100% iii)One fan in each group
28 29	GENERAL Type of oil preservation system Maximum acceptable noise level		Air Cell 78 dBA

APPENDIX A3.1

SCHEDULE OF TECHNICAL REQUIREMENTS OF 33/0.415 kV EARTHING(STATION SERVICE) TRANSFORMER

SL. No.	Description		
	EARTHING TRANSFORMER		
1.	Nominal rating	kVA	300
2.	Number of phase		3
3.	Frequency	Hz	50
4.	No-load voltage ratio	kV	33/0.415
5.	Corresponding highest system voltage	kV	36/1.1
6.	Type of cooling		ONAN
7.	Coolant		Mineral Oil
8.	Type		Core, Conservator Type
9.	Installation		Outdoor, Tropical and high rainfall and humidity
10.	Earthing		Neutral solidly earthed in interconnected star winding Neutral earthed in LT 3 phase, 4 wire system
11.	Windings		Double wound of high conductivity copper
12.	Test voltage		
	Impulse test voltage (1.2/50 μs)	kV	170/10 (HT/LT)
	Power frequency withstand voltage for 1 min	kV	70/2.5 (HT/LT)
13.	Vector group		ZNyn11
14.	Neutral to be brought out		HT: Yes, LT: Yes
15.	Neutral insulation		Full insulation and 100% loading capacity
16.	LT bushing		4 nos.
17.	Impedance voltage	%	5
18.	Tapping range		Off load tap changer $\pm$5% in the step of 2.5
19.	Tap changer control		Manual
20.	BCT Particulars:		
	i. HV side Neutral(core-1)		100/1A
	ii. LV side (core-1)		600/1A

APPENDIX- A3.2
SCHEDULE OF TECHNICAL REQUIREMENTS OF 33/0.415 kV AUXILIARY (STATION SERVICE) TRANSFORMER

SL. No.	Description		
	AUXILIARY TRANSFORMER		
1.	Nominal rating	kVA	200
2.	Number of phase		3
3.	Frequency	Hz	50
4.	No-load voltage ratio	kV	33/0.415

5.	Corresponding highest system voltage	kV	36/1.1
6.	Type of cooling		ONAN
7.	Coolant		Mineral Oil
8.	Type		Core, Conservator Type
9.	Installation		
	Outdoor, Tropical and high rainfall and humidity		
10.	Earthing		
	Neutral solidly earthed in interconnected star winding		
	Neutral earthed in LT 3 phase, 4 wire system		
11.	Windings		
	Double wound of high conductivity copper		
12.	Test voltage		
	Impulse test voltage (1.2/50 μs)	kV	170/10 (HT/LT)
	Power frequency withstand voltage for 1 min	kV	70/2.5 (HT/LT)
13.	Vector group		dyn11
14.	Neutral to be brought out		HT: no, LT: Yes
15.	Neutral insulation		
	Full insulation and 100% loading capacity		
16.	LT bushing		4 nos.
17.	Impedance voltage	%	4-5
18.	Tapping range		Off load tap changer ±5% in the step of 2.5
19.	Tap changer control		Manual

APPENDIX A4.1

SCHEDULE OF TECHNICAL REQUIREMENTS OF XLPE POWER CABLES

SL. No.	Description	230kV	132 kV	33kV
1	Rated system voltage	230kV	132 kV	33kV
2	Max. permissible system voltage	245kV	145kV	36kV
3	Rated frequency	50Hz	50Hz	50Hz
4	Max. operating current			
5	No. of cable	2/Phase	1/Phase (For Line) 2/Phase(For Auto Tr)	1/phase
6	Cross sectional area	1000 mm^2 Cu	1000 mm^2 Cu	185 mm^2 Cu
7	Impulse withstand voltage	1050kV	650 kV	170 kV
8	Power frequency withstand voltage	460kV	275 kV	70 kV
9	Shape of conductor	Segment	Segment	Compact round
10	Insulation thickness	23mm	17-18 mm	8-9 mm
11	Min. bending radius	20 D D is external diameter of cable	15 D D is external diameter of cable	15 D D is external diam eter of cable
12	DC resistance at 20^0C	0.009 ohm/km	0.0113 ohm/km	0.0366 ohm/km
13	Short circuit rating for 1 sec	50kA	40kA	25kA
14	Three phase symmetrical fault current f or 1 sec	280kA	90 kA	70 kA

APPENDIX A4.2

SCHEDULE OF TECHNICAL REQUIREMENTS OF OUTDOOR CABLE SEALING END

Item	Description	Unit	Requirement	
			230kV	132kV
1	Voltage rating	kV	230	132
2	Current rating	amp	As per cable	As per cable
3	Type		Elastomeric stress cone with porcelain insulator.	Elastomeric stress cone with porcelain insulator.
4	Insulator material		Porcelain	Porcelain
5	Total creepage distance of shedding	mm	6250mm (approx)	3625mm (approx)
6	Impulse withstand voltage (External)			
	(a) Positive	kV	1050	650
	(b) negative	kV	1050	650
7	Standards		IEC 62067	IEC 62067
8	Height of steel mounting Structure over the finished switchyard level	mm	2500 (min.)	2500 (min.)

APPENDIX- A5
SCHEDULE OF TECHNICAL REQUIREMENTS OF
NI-CAD BATTERY

SL. No.	Description	
1.	Installation	: Indoor
2.	Cell type	: Ni-cd
3.	Voltage (Normal)	: 1.2 volts per cell
4.	Float voltage	: 1.40-1.42 volt/cell
5.	Equalizing voltage	: 1.55 - 1.65 volt/cell
6.	Capacity in AH at 20°C	: 460 AH @ 5 Hr (for 110 V DC) at Shyampur SS 250 AH @ 5 Hr (for 110 V DC) at Dhamrai SS
7.	Ambient temperature	: 45°C
8.	Positive plate	: Tubular
9.	Negative plate	: Pasted
10.	Type of container	: Plastic polymer
11.	Discharge voltage	: 1.0 V/Cell
12.	Sp. gravity of electrolyte	: 1.19 ± 1%
13.	Sp. gravity of electrolyte (Charged)	: 1.23 ± .010 at 20°C
14.	Vent plug	: Anti-corrosive & fire proof
15.	Cell condition	: Pre-charged.
16.	Battery stand	: Steel frame of step type
17.	Standard	: IEC or equivalent

APPENDIX- A6
SCHEDULE OF TECHNICAL REQUIREMENTS OF
110 V BATERY CHARGER

SL. No.	Description	
	A) GENERAL	
1.	Installation	: Indoor
2.	Rectifier type	: Thyristor controlled.
3.	Rated D.C. voltage	: 110V ±5%
4.	Rated output current	: 75 Amps(For Dhamrai) 120 Amps(For Shyampur)
5.	Charging mode	:Both constant current & constant voltage
6.	High Voltage Insulation	: 1000 V AC for 1 minute between input to output and input to ground
7.	Insulation resistance	: 10 MΩ with 500 V DC for 1 minute
8.	Cooling system	: Self & natural air cooled.
9.	Relative humidity	: Up to 98%
10.	Ambient temperature	: 45°C (max.)
11.	Noise level	: 65 dB (max)
12.	Altitude	: 1000 m
13.	Applicable Standard	: IEC or equivalent.

B) TECHNICAL DATA

A.C. INPUT

1.	Voltage	: 415 Volts
2.	Phase	: 3 Phase
3.	Frequency	: 50 ± 5% Hz
4.	Input AC voltage variation	: ± 5%
5.	Power factor (Full range)	: 0.8
6.	Efficiency (Full load)	: 85%
7.	Charge Characteristics (During float charge)	: Constant current /Constant voltage
8.	Current limitation	: 110%

D.C. OUTPUT

1.	Voltage	: 110 ± 5% volt
2.	Ripple Voltage (Full load)	: ± 3%
3.	Charge modes (3 level)	: Charge, Float charge & Boost charge
4.	Float Voltage (adjustable)	: 1.42 volt/cell
5.	Boost Voltage (adjustable)	: 1.53 volt/cell

APPENDIX A7

SCHEDULE OF TECHNICAL REQUIREMENTS OF SUBSTATION AUTOMATION SYSTEM

1. General Requirement:		
	Standards to be complied with Substation Automation system	
	Test Ca. Damp heat steady state	IEC 60068-2-3
	Test Db and guidance; Damp heat cyclic	IEC 60068-2-30
	Digital I/O, Analogue I/O dielectric Tests	IEC 60870-3 class 2
	Digital I/O, Surge withstand test	IEC 60801-5/Class 2
	Radio interference test	IEC 60870-3/Calss 2
	Transient fast burst test	IEC 60801-4/4
	Static Discharge	IEC 60801-2/4
	Electromagnetic fields	IEC 60801-3-3
	Temperature range (min/max)	℃ 0/50
	Relative humidity	% 93
	Intelligent Electronic Devices (IED's)	Yes
	- serial communication interface included?	Yes
	- Protection & Control IED's connected same bus?	Yes
	- self monitoring	Yes
	- display of measured values	Yes
	- remote parameterization	Yes
	- disturbance record upload and analysis	Yes
	Availability Calculation shall be furnished for each equipments as well as for the entire system	Yes
2. Detailed Requirements:		
	Number of years of proven field experience of offered system. (Note: proof of experience should be furnished. The components used in the offered system and those with field experience should be the same)	5 Yrs.
	Design life of substation Automation System	20 Yrs
	Manufacturers quality assurance system	ISO 9001/9002 or equivalent
	Dimensions of cubicle	
	- Width	mm
	- Depth	mm
	- Height	mm
	- Floor load	N/m^2 max.600
3. Station Level Equipment:		
	Station Controller	Industrial PC
	MTBF (Mean time between Failures)	Hrs
	MTTR (Mean time to repair)	Hrs

	Dual Station Computers Provided in redundant hot standby	Yes
	Hot standby take over time	Seconds
	Annunciator for Station PC system software	16 Windows
	Number of years of proven field experience of offered software	5 Yrs
	Operating System	Windows
	All standard picture as per spec included in HMI	Yes
	Process Status Display & Command Procedures	Yes
	Event processing as per spec	Yes
	Alarm processing as per spec	Yes
	Reports as per spec	Yes
	Trend Display as per spec	Yes
	User Authority levels as per spec	Yes
	System supervision & monitoring as per spec	Yes
	Automatic sequence control as per spec	Yes
4. Gateway to National Load dispatch Center		
	Number of years of proven filed experience of offered unit	5Yrs
	Insulation tests	IEC 60255-5
	Fast disturbance tests	IEC 61000-4-4,Calss 4
	Industrial environment	EN 50081-2 Class A
	Industrial grade hardware with no moving parts (PC based gateway is not accepted)	Yes
	Design life of offered equipment	20 Yrs
	Redundant communication channel	Yes
	Redundant CPU	Yes
	Redundant DC/DC Supply	Yes
	MTBF (Mean time between Failures)	Hrs
	MTTR (Mean time to repair)	Hrs
5. Station Bus:		
	Physical Meduim	Glass fibre optic
6. Interbay Bus		
	Physical Meduim	Glass fibre optic
7. Printer server		
	MTBF	Hrs
8. Event Printer		
	MTBF	Hrs
9. Hard Copy colour Printer		
	MTBF	Hrs
10. Master Clock – GPS (Global Positioning System) Receiver:		

	MTBF	Hrs
11. Bay control Unit - HV		
	Number of years of proven field experience of offered unit	5 Yrs
	Separate Bay controller unit provided for each bay & feeder	Yes
	Type of bay controller offered HV/MV	HV
	Select Before Operate with Open Execute & Close Execute	Yes
	Single bit dependence	No
	Interlocking, bay & Station wide	Yes
	Synchrocheck function	
	- Maximum Voltage difference	Specify range
	- Maximum Frequency difference	Specify range
	- Maximum Phase difference	Specify range
	Double command blocking	Yes
	Independent settable parameter groups	4
	Local Display Unit	Yes
	Sequence of event recorder	
	- Events	256
	- Time resolution	1 ms
	Disturbance recorder function	Yes
	Comprehensive self-supervision	Yes
	Battery free backup of events and disturbance records	Yes
	Insulation tests	IEC 60255-5
	Fast disturbance tests	IEC 61000-4-4, Class 4
	MTBF	Hrs
	MTTR	Hrs
	Temperature range: IED's	
	- Operation	℃ -10 to +50
	- Transport and storage	℃ -10 to +50
	Relative humidity:	
	- Operating max./min	% 93
	- Transport and storage	% 93
12. Back up control mimic -HV		

	Control functionality: Control of breaker as well as all isolators/earthing switch (Control functionality should not be affected if bay controller fails) Key-Locked Interlock override function Separate backup control mimic provided for each bay & feeder	 Yes Yes Yes Yes
13. Bay Control Unit - MV		
	Number of years of proven field experience of offered unit Separate Bay controller unit provided for each bay & feeder Control functionality implementation in software: Select before Operate with Open Execute & Close Execute Interlocking, Bay & Station Wide Synchrocheck function - Maximum Voltage difference - Maximum Frequency difference - Maximum Phase difference Local Display Unit Sequence of event recorder - Events - Time resolution Disturbance recorder function Comprehensive self-supervision Insulation tests Fast disturbance tests MTBF MTTR Temperature range: IED's - Operation - Transport and storage Relative humidity: - Operating max./min - Transport and storage	5 Yrs Yes Yes Yes Specify range Specify range Specify range Yes Specify 1 ms Yes Yes IEC 60255-5 IEC 61000-4-4, Class 4 Hrs Hrs ℃ -10 to +50 ℃ -10 to +70 % 93 % 93
14. Back up control mimic - MV		
	Control functionality: Control of breaker as well as all isolators/earthing switches	Yes Yes

	Separate backup control mimic provided for each bay & feeder	
15. System Performance:		
	Exchange of display (First reaction) Presentation of a binary change in the process displa y Presentation of an analogue change in the process display From order to process output From order to updated of display	< 1 S < 0.5 S < 1 S < 0.5 S < 1.5 S

APPENDIX A8

SCHEDULE OF TECHNICAL REQUIREMENTS OF FIBRE OPTIC MULTIPLEXER EQUIPMENT

SL.No.	DESCRIPTION	UNIT	REQUIRED
1.0	**GENERAL:**		
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
2.0	**Available AGGREGATES:**		
2.1	Optical aggregates (ITU-T G.957)		L-1.1, L-1.2
3.0	**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. ch ch / pair of wire	4 or 2 30 or 15 30 / 2 pairs 30 / 1 pair 15 / 1 pair
4.0	**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	+7.5 .. –16 +7.0 .. –16.5
4.1.3	Analogue, 2wire with E&M: Input level Output level	dBr	+6.5 .. –12.5 –1.0 .. -20
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	Vpeak	250
4.3.1.4	1 + 1 com path protection		yes
4.3.2	**Interface(s) for Distance Protection:**		
4.3.2.1	Electrical interface: G.703	kbit/s	64
4.3.2.2	Optical Interface	kbit/s	Minimum 64
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	1 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 Ethernit / OSI
4.7	**Ambient Conditions:**		
4.7.1	Storage: ETS 300 019-1-1, class 1.2	°C / % hum	-25 .. + 55 / class 1.2
4.7.2	Transport: ETS 300 019-1-2, class 2.2	°C / % hum	-25 .. + 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	VDC	48 / 60 (-15/+20%)
4.8.2	Fully redundant power supply		yes

APPENDIX A9

SCHEDULE OF TECHNICAL REQUIREMENTS OF OPERATIONAL TELEPHONE SYSTEM (PABX)

SL.No.	DESCRIPTION	UNIT	REQUIRED
1.0	**GENERAL:**		
1.1	Type		IP PABX
1.2	Complying to ITU-T rec.		Yes
1.3	Analogue Trunk Connectivity		Yes
1.4	Digital Trunk Connectivity(E1/T1)		Yes
1.5	10/100 BaseT Ethernet Connection		Yes
1.6	No of Subscribers	No.	Up to 32
2.0	**Trunk Connectivity**		
2.1	Analogue Trunk		
2.1.1	- Loop Start/Ground Start(Via peripheral)		Yes
2.1.2	- E&M		Yes
2.1.3	- DID(Direct Inward Dial)		Yes
2.2	Digital Trunk		
2.2.1	- T1		Yes
2.2.2	- E1		Yes
2.2.3	- ISDN Connectivity using BRI/PRI		Yes
2.3	IP Trunk		
2.3.1	- 10/100 Mbps Ethernet(IEEE 802.3)		Yes
2.3.2	- TCP/IP, H.323, T.38(Switching)		Yes
2.3.3	- Voice Compressor : G.711, G729		Yes
2.3.4	- QoS(Quality of Signal) : 802.1		Yes
2.3.5	- SIP(Session Initiation Protocol): RFC 3261		Yes
3.0	**Main Features**		
3.1	- Ring Back		Yes
3.2	- Call Forwarding, park, waiting, pick-up		Yes
3.3	- Call/Message waiting lamp		Yes
3.4	- Hands Free operation		Yes
3.5	- Speed Calling, Stored number redial		Yes
3.6	- Account Code		Yes
3.7	- Automatic Attendant, Auto Answer		Yes
3.8	- Automatic Route Selection		Yes
3.9	- Call-by- call Service, Call Duration Display		Yes
3.10	- Call Transfer, Direct Outward Dialing		Yes
3.11	- Hunt Group, Music on Hold		Yes
3.12	- Night Service, Off-hook Alarm, Redial		Yes
4.0	**Network Management System**		
4.1	Type/Name of configuration tool		

4.2	For fault / configuration management		Yes / yes
4.3	For local / remote operation		Yes / yes
4.4	Data communication network (DCN)		Ethernet / IP or Ethernet / OSI
5.0	**Ambient Conditions:**		
5.1	Storage: ETS 300 019-1-1, class 1.2	°C / % hum	-25 .. + 55 / class 1.2
5.2	Transport: ETS 300 019-1-2, class 2.2	°C / % hum	-25 .. + 70 / class 2.2
5.3	Operation: ETS 300 019-1-3, class 3.1E	°C / % hum	-5 .. +45 / class 3.1E

APPENDIX A10.1
SCHEDULE OF TECHNICAL REQUIREMENTS
DIGITAL FAULT AND DISTURBANCE RECORDER [DFDR]
FOR SHYAMPUR 230/132kV SUBSTATION

Sl.	ITEM	UNITS	
(A)	**GENERAL**		
1	Manufacturer's name & address		
2	Type		
3	Power Supply	VDC	110
	-Power supply for printer	VAC	230
(B)	**ANALOGUE INPUTS**		
1	Number of Channel		256
	-Expandability		Min. 336
2	Nominal Current	Amp	1A/5A
3	Nominal voltage	Vac/Vdc	
	- Current	mA/Amp	
4	Frequency response		
5	Cut-off frequency		
	(a) Bandwidth	dB	
	(b) Attenuation at	dB	
	(c) Auto adjusted anti-aliasing filters for chosen sampling rate	Yes/No	Yes
d	Simultaneously programmable sampling rate for all feeders/inputs		Min 2 for FAST and SLOW Recording
	-Locally Changeable	Yes/No	Yes
	-Remotely Changeable	Yes/No	Yes
e	Possible sampling rates		3 different sampling rates:
		Samples/sec	Slow. 1Hz-500Hz
		Samples/sec	fast: 0.5 kHz – 6kHz
		Samples/sec	continuous (variable rate)
6	DC coupled inputs	Yes/No	Yes
7	Resolution	bits	12 or better
8	Accuracy	%	Min 0.5
9	Burden		
	1. Current Circuit at IN	VA	
	2. Voltage Circuit	VA	
10	Over load		
	1. Current	% In	100% In continuously, Min 600 %
	2. Voltage circuit	% Vn	in for 1 Second 2Vn and max. 350 Vn
(C)	**DIGITAL INPUTS**		

1	Number of Channel		768
	-Expandability (Without and time skew)		min. 1008
2	Selectable input level	Vdc	N/O or N/C, 110 VDC
3	Type		Potential or potential free contact
4	Resolution	ms	
(D)	**MEMORY**		
1	Size	MB	64 MB or Higher
2	Type		Solid State
3	Pre-fault time (fast scanning rate)	sec	0.1-2 user programmable
4	Post-fault (fast scanning rate	sec	0.1-2 user programmable
5	Pre and Post-fault time (slow scanning rate)	sec	min. 180 user programmable
6	In-Built hard disk (auto-maintained	GB	min. 4 GB

Sl.	ITEM	UNITS	
(E)	**SENSORS/ TRIGERRING CRITERIA**		
	All sensors/trigerrs are preferable Programmable and Virtually recordable	Yes/No	Yes
1.	Logical combination sensor	Yes/No	Yes
2.	Three phase over or under Voltage / Current	Yes/No	Yes
3.	Mono phase over or under Voltage / Current	Yes/No	Yes
4.	***du/dt, dp/dt, dq/dt, [Single/3 Phases], df/dt. etc.	Yes/No	Yes
5.	RMS [Voltage / Current]	Yes/No	Yes
6.	Zero Sequence	Yes/No	Yes
7.	Negative, Positive Sequence	Yes/No	Yes
8.	Frequency	Yes/No	Yes
9.	DC Step	Yes/No	Yes
10.	Pendling / Swing	Yes/No	Yes
11.	Digital level and edge	Yes/No	Yes
12.	Sensor trigger	Yes/No	Yes
13.	Event Trigger	Yes/No	Yes
14.	Manual Trigger	Yes/No	Yes
15.	Remote Trigger	Yes/No	Yes
(F)	**CLOCK SYSTEM**		
1.	Internal Clock	Yes/No	Yes
2.	Accuracy		
3.	External Synchronization	Yes/No	Yes
4.	Time resolution between 2 synchronized pulses		
(G)	**OUTPUT ALARM RELAY CONTACT**		
1.	Max. operation Voltage DC/AC	Vac / Vdc	250 Vac or above, 60 Vdc or above
2.	Make and carry for 0.5 sec	A	Min 8A
3.	Carry Continuously	A	Min 5A
4.	Break (DC) – resistive	W	
(H)	**INTERFACE FOR DATA COMMUNICATION**		
1.	Full definition compression	Yes/No	Yes
2.	Maximum transmission rate	bits / Sec	
3.	Standard serial port (EIA-232-D)	Yes / No	Yes
4.	Printer Port	Yes/No	Yes
5.	Dedicated serial port for modem	Yes/No	Yes
(I)	**PRINTER DATA**		
1.	Printer amplitude (scaling peak to peak)		
2.	Time Scal (mm / s)		
3.	Printer resolution	mm	
4.	Auto printing	Yes/No	Yes
(J)	Fault Priority transmission	Yes/No	Yes
(K)	Fault location (distance calculation)	Yes/No	Yes

(L)	Test certificates from internationally recognized Laboratories	Yes/No	Yes
(M)	**COMMUNICATION AND REMOTE ANALYZING UNIT**		
	1. Processor Pentium	(MHz) Yes/No	Yes, at least 450 MHz Pentium
	2. Co-Processor pentium	Yes/No	Yes
	3. Main memory capacity	(Mb) Yes/No	Yes, at least 64 MB
	4. Color graphics board S-VGA	Yes/No	Yes
	5. Screen S-VGA	Yes/No	Yes
	6. Hard disk unit	Yes/No	Yes, at least 40 GB
	7. Printer	Yes/No	Yes
	8. Modem	Yes/No	Yes.

***Note:** du/dt=Change of voltage, dp/dt=Change of active power, dq/dt=change of reactive power, df/dt=Change of frequency.

APPENDIX A10.2
SCHEDULE OF TECHNICAL REQUIREMENTS
DIGITAL FAULT AND DISTURBANCE RECORDER [DFDR]
FOR EXISTING OLD AIRPORT 230/132kV SUBSTATION

Sl.	ITEM	UNITS	
(A)	**GENERAL**		
1	Manufacturer's name & address		
2	Type		
3	Power Supply	VDC	110
	-Power supply for printer	VAC	230
(B)	**ANALOGUE INPUTS**		
1	Number of Channel		232
	-Expandability		Min. 312
2	Nominal Current	Amp	1A/5A
3	Nominal voltage	Vac/Vdc	
	- Current	mA/Amp	
4	Frequency response		
5	Cut-off frequency		
	(a) Bandwidth	dB	
	(b) Attenuation at	dB	
	(c) Auto adjusted anti-aliasing filters for chosen sampling rate	Yes/No	Yes
d	Simultaneously programmable sampling rate for all feeders/inputs		Min 2 for FAST and SLOW Recording
	-Locally Changeable	Yes/No	Yes
	-Remotely Changeable	Yes/No	Yes
e	Possible sampling rates		3 different sampling rates:
		Samples/sec	Slow. 1Hz-500Hz
		Samples/sec	fast: 0.5 kHz – 6kHz
		Samples/sec	continuous (variable rate)
6	DC coupled inputs	Yes/No	Yes
7	Resolution	bits	12 or better
8	Accuracy	%	Min 0.5
9	Burden		
	1. Current Circuit at IN	VA	
	2. Voltage Circuit	VA	
10	Over load		
	1. Current	% In	100% In continuously, Min 600 %
	2. Voltage circuit	% Vn	in for 1 Second

			2Vn and max. 350 Vn
(C)	**DIGITAL INPUTS**		
1	Number of Channel		696
	-Expandability (Without and time skew)		min. 936
2	Selectable input level	Vdc	N/O or N/C, 110 VDC
3	Type		Potential or potential free contact
4	Resolution	ms	
(D)	**MEMORY**		
1	Size	MB	64 MB or Higher
2	Type		Solid State
3	Pre-fault time (fast scanning rate)	sec	0.1-2 user programmable
4	Post-fault (fast scanning rate	sec	0.1-2 user programmable
5	Pre and Post-fault time (slow scanning rate)	sec	min. 180 user programmable
6	In-Built hard disk (auto-maintained	GB	min. 4 GB

Sl.	**ITEM**	**UNITS**	
(E)	**SENSORS/ TRIGERRING CRITERIA**		
	All sensors/trigerrs are preferable Programmable and Virtually recordable	Yes/No	Yes
1.	Logical combination sensor	Yes/No	Yes
2.	Three phase over or under Voltage / Current	Yes/No	Yes
3.	Mono phase over or under Voltage / Current	Yes/No	Yes
4.	***du/dt, dp/dt, dq/dt, [Single/3 Phases], df/dt. etc.**	Yes/No	Yes
5.	RMS [Voltage / Current]	Yes/No	Yes
6.	Zero Sequence	Yes/No	Yes
7.	Negative, Positive Sequence	Yes/No	Yes
8.	Frequency	Yes/No	Yes
9.	DC Step	Yes/No	Yes
10.	Pendling / Swing	Yes/No	Yes
11.	Digital level and edge	Yes/No	Yes
12.	Sensor trigger	Yes/No	Yes
13.	Event Trigger	Yes/No	Yes
14.	Manual Trigger	Yes/No	Yes
15.	Remote Trigger	Yes/No	Yes
(F)	**CLOCK SYSTEM**		
1.	Internal Clock	Yes/No	Yes
2.	Accuracy		
3.	External Synchronization	Yes/No	Yes
4.	Time resolution between 2 synchronized pulses		
(G)	**OUTPUT ALARM RELAY CONTACT**		
1.	Max. operation Voltage DC/AC	Vac / Vdc	250 Vac or above, 60 Vdc or above
2.	Make and carry for 0.5 sec	A	Min 8A
3.	Carry Continuously	A	Min 5A
4.	Break (DC) – resistive	W	
(H)	**INTERFACE FOR DATA COMMUNICATION**		
1.	Full definition compression	Yes/No	Yes
2.	Maximum transmission rate	bits / Sec	
3.	Standard serial port (EIA-232-D)	Yes / No	Yes
4.	Printer Port	Yes/No	Yes
5.	Dedicated serial port for modem	Yes/No	Yes
(I)	**PRINTER DATA**		
1.	Printer amplitude (scaling peak to peak)		
2.	Time Scal (mm / s)		
3.	Printer resolution	mm	
4.	Auto printing	Yes/No	Yes

(J)	Fault Priority transmission	Yes/No	Yes
(K)	Fault location (distance calculation)	Yes/No	Yes
(L)	Test certificates from internationally recognized Laboratories	Yes/No	Yes
(M)	**COMMUNICATION AND REMOTE ANALYZING UNIT**		
	1. Processor Pentium	(MHz) Yes/No	Yes, at least 450 MHz Pentium
	2. Co-Processor pentium	Yes/No	Yes
	3. Main memory capacity	(Mb) Yes/No	Yes, at least 64 MB
	4. Color graphics board S-VGA	Yes/No	Yes
	5. Screen S-VGA	Yes/No	Yes
	6. Hard disk unit	Yes/No	Yes, at least 40 GB
	7. Printer	Yes/No	Yes
	8. Modem	Yes/No	Yes.

***Note:** du/dt=Change of voltage, dp/dt=Change of active power, dq/dt=change of reactive power, df/dt=Change of frequency.

APPENDIX A10.3
SCHEDULE OF TECHNICAL REQUIREMENTS
DIGITAL FAULT AND DISTURBANCE RECORDER [DFDR]
FOR EXISTING TONGI 230/132kV SUBSTATION

Sl.	ITEM	UNITS	
(A)	**GENERAL**		
1	Manufacturer's name & address		
2	Type		
3	Power Supply	VDC	110
	-Power supply for printer	VAC	230
(B)	**ANALOGUE INPUTS**		
1	Number of Channel		224
	-Expandability		Min. 304
2	Nominal Current	Amp	1A/5A
3	Nominal voltage	Vac/Vdc	
	- Current	mA/Amp	
4	Frequency response		
5	Cut-off frequency		
	(a) Bandwidth	dB	
	(b) Attenuation at	dB	
	(c) Auto adjusted anti-aliasing filters for chosen sampling rate	Yes/No	Yes
d	Simultaneously programmable sampling rate for all feeders/inputs		Min 2 for FAST and SLOW Recording
	-Locally Changeable	Yes/No	Yes
	-Remotely Changeable	Yes/No	Yes
e	Possible sampling rates		3 different sampling rates:
		Samples/sec	Slow. 1Hz-500Hz
		Samples/sec	fast: 0.5 kHz – 6kHz
		Samples/sec	continuous (variable rate)
6	DC coupled inputs	Yes/No	Yes
7	Resolution	bits	12 or better
8	Accuracy	%	Min 0.5
9	Burden		
	1. Current Circuit at IN	VA	
	2. Voltage Circuit	VA	
10	Over load		

	1. Current 2. Voltage circuit	% In % Vn	100% In continuously, Min 600 % in for 1 Second 2Vn and max. 350 Vn
(C)	**DIGITAL INPUTS**		
1	Number of Channel -Expandability (Without and time skew)		672 min. 912
2	Selectable input level	Vdc	N/O or N/C, 110 VDC
3	Type		Potential or potential free contact
4	Resolution	ms	
(D)	**MEMORY**		
1	Size	MB	64 MB or Higher
2	Type		Solid State
3	Pre-fault time (fast scanning rate)	sec	0.1-2 user programmable
4	Post-fault (fast scanning rate	sec	0.1-2 user programmable
5	Pre and Post-fault time (slow scanning rate)	sec	min. 180 user programmable
6	In-Built hard disk (auto-maintained	GB	min. 4 GB

Sl.	ITEM	UNITS	
(E)	**SENSORS/ TRIGERRING CRITERIA**		
	All sensors/trigerrs are preferable Programmable and Virtually recordable	Yes/No	Yes
1.	Logical combination sensor	Yes/No	Yes
2.	Three phase over or under Voltage / Current	Yes/No	Yes
3.	Mono phase over or under Voltage / Current	Yes/No	Yes
4.	***du/dt, dp/dt, dq/dt, [Single/3 Phases], df/dt. etc.	Yes/No	Yes
5.	RMS [Voltage / Current]	Yes/No	Yes
6.	Zero Sequence	Yes/No	Yes
7.	Negative, Positive Sequence	Yes/No	Yes
8.	Frequency	Yes/No	Yes
9.	DC Step	Yes/No	Yes
10.	Pendling / Swing	Yes/No	Yes
11.	Digital level and edge	Yes/No	Yes
12.	Sensor trigger	Yes/No	Yes
13.	Event Trigger	Yes/No	Yes
14.	Manual Trigger	Yes/No	Yes
15.	Remote Trigger	Yes/No	Yes
(F)	**CLOCK SYSTEM**		
1.	Internal Clock	Yes/No	Yes
2.	Accuracy		
3.	External Synchronization	Yes/No	Yes
4.	Time resolution between 2 synchronized pulses		
(G)	**OUTPUT ALARM RELAY CONTACT**		
1.	Max. operation Voltage DC/AC	Vac / Vdc	250 Vac or above, 60 Vdc or above
2.	Make and carry for 0.5 sec	A	Min 8A
3.	Carry Continuously	A	Min 5A
4.	Break (DC) – resistive	W	
(H)	**INTERFACE FOR DATA COMMUNICATION**		
1.	Full definition compression	Yes/No	Yes
2.	Maximum transmission rate	bits / Sec	
3.	Standard serial port (EIA-232-D)	Yes / No	Yes
4.	Printer Port	Yes/No	Yes
5.	Dedicated serial port for modem	Yes/No	Yes
(I)	**PRINTER DATA**		
1.	Printer amplitude (scaling peak to peak)		
2.	Time Scal (mm / s)		

3.	Printer resolution	mm	
4.	Auto printing	Yes/No	Yes
(J)	Fault Priority transmission	Yes/No	Yes
(K)	Fault location (distance calculation)	Yes/No	Yes
(L)	Test certificates from internationally recognized Laboratories	Yes/No	Yes
(M)	**COMMUNICATION AND REMOTE ANALYZING UNIT**		
	1. Processor Pentium	(MHz) Yes/No	Yes, at least 450 MHz Pentium
	2. Co-Processor pentium	Yes/No	Yes
	3. Main memory capacity	(Mb) Yes/No	Yes, at least 64 MB
	4. Color graphics board S-VGA	Yes/No	Yes
	5. Screen S-VGA	Yes/No	Yes
	6. Hard disk unit	Yes/No	Yes, at least 40 GB
	7. Printer	Yes/No	Yes
	8. Modem	Yes/No	Yes.

***Note:** du/dt=Change of voltage, dp/dt=Change of active power, dq/dt=change of reactive power, df/dt=Change of frequency.

POWER GRID COMPANY OF BANGLADESH LIMITED

BIDDING DOCUMENT

FOR

CONSTRUCTION AND COMPLETION OF 132/33KV GIS SUBSTATION AT DHAMRAI, 230/132KV GIS SUBSTATION AT SHYAMPUR AND ASSOCIATED TRANSMISSION LINES ON TURNKEY BASIS.

SCHEDULE B

BID PRICES & SCHEDULES

POWER GRID COMPANY OF BANGLADESH LIMITED

BIDDING DOCUMENT

CONSTRUCTION AND COMPLETION OF 132/33KV GIS SUBSTATION AT DHAMRAI, 230/132KV GIS SUBSTATION AT SHYAMPUR AND ASSOCIATED TRANSMISSION LINES ON TURNKEY BASIS.

SCHEDULE B (PRICE SCHEDULES)

PREAMBLE

General

1. The Price Schedules are divided into separate Schedules as follows:

Schedule No. B1:	Plant (including Mandatory Spare Parts) Supplied from Abroad .
Schedule No. B2:	Plant (including Mandatory Spare Parts) Supplied from within the Employer's Country.
Schedule No. B3:	Design Services
Schedule No. B4:	Installation & other services.
Schedule No. B5:	Grand Summery
Schedule No. B6:	Reccomended Spare Parts.

2. The Schedules do not generally give a full description of the plant to be supplied and the services to be performed under each item. Bidders shall be deemed to have read the Employer's Requirements and other sections of the Bidding Document and reviewed the Drawings to ascertain the full scope of the requirements included in each item prior to filling in the rates and prices. The entered rates and prices shall be deemed to cover the full scope as aforesaid, including overheads and profit.

3. If bidders are unclear or uncertain as to the scope of any item, they shall seek clarification in accordance with ITB 7 prior to submitting their bid.

Pricing

4. Prices shall be filled in indelible ink, and any alterations necessary due to errors, etc., shall be initialed by the Bidder.

   As specified in the Bid Data Sheet and Special Conditions of Contract, prices shall be fixed and firm for the duration of the Contract, or prices shall be subject to adjustment in accordance with the corresponding Appendix (Price Adjustment) to the Contract Agreement.

5. Bid prices shall be quoted in the manner indicated and in the currencies specified in the Instructions to Bidders in the Bidding Document.

   For each item, bidders shall complete each appropriate column in the respective Schedules, giving the price breakdown as indicated in the Schedules.

   Prices given in the Schedules against each item shall be for the scope covered by that item as detailed in Section 6 (Employer's Requirements) or elsewhere in the Bidding Document.

6. Payments will be made to the Contractor in the currency or currencies indicated under each respective item.

7. When requested by the Employer for the purposes of making payments or partial payments, valuing variations or evaluating claims, or for such other purposes as the Employer may reasonably require, the Contractor shall provide the Employer with a breakdown of any composite or lump sum items included in the Schedules.

Schedules of Rates and Prices

Schedule_B1 - Plant and Mandatory Spare Parts Supplied from Abroad

Schedule B1. 1: Dhamrai 132/33 kV GIS Substation

Item	Description	Code[1]	Qty (1)	Unit	Foreign Currency(in….) Unit Price[2] CIP (2)	Foreign Currency(in….) Total Price[2] CIP (1) x (2)
132kV Outdoor Type Gas Insulated Switchgear(GIS).						
1A1	132kV Overhead line circuit bay,1250A					
i)	_GIS for 132kV Overhead line circuit bay		2	Sets		
ii)	_GIS bus duct		2	Sets		
iii)	_Air Insulated bushing		2	Sets		
1A2	132kV Transformer circuit bay,1250A					
i)	_GIS for 132kV Transformer circuit bay		2	Sets		
ii)	_GIS bus duct		2	Sets		
iii)	_Air Insulated bushing		2	Sets		
1A3	132kV Bus tie circuit bay,3000A		1	Set		
1A4	132kV Main busbar(double busbar) ,3000A, with VT & ES		1	Lot		
1A5	HV GIS Test Bushing		1	Set		
33kV Air Insulated Switchgear(AIS) and Connection:						
1B1	Vacuum Circuit breaker(VCB), live tank, gang operating , 2000A		2	Sets		
1B2	Disconnector, single verticle break, 2000A, gantry mounted		7	Sets		
1B3	Single phase current transformer, post type,3-core		6	Nos.		
1B4	Single phase voltage transformer, post type, 2-core		12	Nos.		
1B5	Single phase, post type, metal oxide surge arrester, 30kV		12	Nos.		
1B6	Flexible Conductor, clamps & connectors for busbar, Jackbus,Jumper & equipment Connection					
i)	_Flexible Conductor for jackbus, jumper, equipment connections		1	Lot		
ii)	_Flexible Conductor for main bus		1	Lot		
iii)	_Clamps & Connectors		1	Lot		
1B.7	Insulator & Fittings					
i)	_Insulator		1	Lot		
ii)	_Fittings		1	Lot		
1B.8	Steel structures & cable tray					
i)	_Gantry Column including nut&bolts		1	Lot		
ii)	_Gantry beam including nut&bolts		1	Lot		
iii)	_Equipment support structures including nut&bolts		1	Lot		
iv)	_Cable tray including fitting, fixing accessories		1	Lot		
Power Transformer & Aux. Transformer						
1C1	132/33kV, 50/75(ONAN/ONAF) MVA,, three phase power transformer		2	Sets		
1C2	33/.415kV, 200kVA, three phase auxilliary transformer		2	Sets		
Control, Protection, SAS & Metering						
132kV Circuits						
1D1	Control, Protection, metering and SAS for 132kV overhead line bays		2	Sets		
1D2	Control, Protection, metering and SAS for 132kV Transformer bays		2	Sets		
1D3	Control, Protection, metering and SAS for 132kV Bus-tie bay		1	Set		
1D4	Busbar protection system for complete 132kV bus		1	Lot		
1D5	Tarrif metering for two line bays and two transformer bays		1	Lot		
33kV Circuit						
1D6	Control, Protection, metering and SAS for 33kV side of Transformer bays		2	sets		
1D7	Tariff metering for two Transformer bays		1	Lot		
Surge Arrester,Conductor,Steel Structure,Insulator & Hardware & Fittings:						
1E1	Single phase surge arrestor, 120kV, 10kA Discharge Current, Class III, gapless metaloxide		12	nos.		
1E2	Flexible Conductor, clamps & connectors for Jackbus,Jumper & equipment Connection					
i)	_Flexible Conductor for jackbus, jumper, equipment connections		1	Lot		
ii)	_Clamps & Connectors		1	Lot		
1E3	Insulator & Fittings					
i)	_Insulator		1	Lot		
ii)	_Fittings		1	Lot		
1E4	Steel structures & cable tray					
i)	_Gantry Column including nut&bolts		1	Lot		
ii)	_Gantry beam including nut&bolts		1	Lot		
iii)	_Equipment support structures including nut&bolts		1	Lot		
iv)	_Cable tray including fitting, fixing accessories		1	Lot		
Multicore Cables						
1F1	Multicore, XLPE, LV Power & Control Cable for control, protection, SAS, metering & power circuits					
i)	_LV Control Cable		1	Lot		
ii)	_LV Power Cable		1	Lot		
Earthing & Lightning Protection						
1G1	Earthing and Lightning Protection System					
i)	_Earthing system for complete substation		1	Lot		

Item	Description	Code[1]	Qty (1)	Unit	Unit Price[2] CIP (2)	Total Price[2] CIP (1) x (2)
ii)	_Lighting Protection System for complete substation		1	Lot		
Batteries, Chargers & DC Distribution						
1H1	Complete 110V Battery Bank with chargers and DC Distribution Board					
i)	_Battery Banks		2	Sets		
ii)	_Charger		2	Sets		
iii)	_110V DC Distribution panel		1	Set		
iv)	_110V/48V DC DC Converter,1kVA		2	Sets		
v)	_48V DC Disatribution Panel		1	Set		
iv)	_UPS system for SAS panels, 3kVA		2	sets		
LVAC Distribution						
1I1	Complete LVAC Distribution System with necessary DB, MCB, Meters etc		1	Lot		
1I2	Tariff metering for two station auxilliary Transformer		1	Lot		
1I3	Outdoor weatherproof 3-phase,4 wire, 125A Socket outlet and plugs.		1	Nos		
1K1	**Building Lighting, Small Power, Air Conditioning & Ventilation**					
i)	_BuildingSmall power		1	Lot		
ii)	_Building Lighting & emergency DC lighting		1	Lot		
iii)	_Building airconditioning & ventilation system		1	Lot		
1K2	**Outdoor switchyard Lighting, Small Power**					
i)	_OutdoorSmall power		1	Lot		
ii)	_Outdoor Lighting		1	Lot		
Fiber Optic Multiplexer Equipment for Teleprotection and Communication						
1L1.1	Fibre Optic Multipexer Equipment for communication & protection		1	Lot		
1L1.2	Hot line telephone system including phone sets, connection cords etc.		1	Lot		
Underground opticale fiber cable with Terminal box.						
1L.2.1	Underground Fibre Optic cable(24 cores)		1	Lot		
1L.2.2	Outdoor termination box, indoor MDF & pigtail cables		1	Lot		
Integration with existing SCADA, NLDC system						
1M1	Integration with existing SCADA/NLDC system.		1	Lot		
Mandatory Spares, tools & test equipment						
1N1	**132 kV GIS**					
i)	Arcing contact of CB		2	nos.		
ii)	Moving contact of CB		2	nos.		
iii)	Fixed contact of CB		2	nos.		
iv)	Moving contact of DS & ES		2	nos.		
v)	Fixed contact of DS & ES		2	nos.		
vi)	Blast nozzle		2	nos.		
vii)	CB Closing coil		6	nos.		
viii)	CB Tripping coil		6	nos.		
ix)	Motor for CB operating mechanism		1	nos.		
x)	Dashpot for CB operating mechanism		2	nos.		
xi)	Motor for DS & ES drive		2	nos.		
xii)	Supporting insulator		2	nos.		
xiii)	Supporting insulator with barrier		2	nos.		
xiv)	Indicating lamps (20% of total quantities installed)		1	nos.		
xv)	Indicating lamp covers (10% of total quantities installed)		1	nos.		
xvi)	Set of gaskets (10% of total quantities installed)		1	nos.		
xvii)	Heater		2	nos.		
xviii)	Humidity stat and thermostat		2	nos.		
xix)	Gas pressure monitor		2	nos.		
xx)	Gas pressure switch		2	nos.		
xxi)	Gas pressure gauge		2	nos.		
xxii)	Gas pressure relief device		2	nos.		
1N2	**132/33 kV Power Transformer**					
i)	Transformer 132 kV bushings (For 75MVA Transformer)		1	no.		
ii)	Ttransformer 33 kV bushings (For 75MVA Transformer)		2	nos.		
iii)	Neutral bushing		2	nos.		
iv)	Winding temperature indicating device		2	nos.		
v)	Spare transformer oil of 15% of total oil supplied		1	Lot		
vi)	Set of gaskets (10% of total quantities installed)		1	nos.		
vii)	Silica gel (100% of total quantities installed)		1	nos.		
viii)	Set of special tools, gauges and spanners		1	set		
ix)	Transformer oil treatment plant, 6000 Liters per hour		1	set		
x)	120 kV Surge Arrester		3	nos.		
1N.3	**33 kV SWITCHGEAR**					
i)	Current Transformer, single phase 3-core,		2	nos.		
ii)	Closing coils for CB		2	nos.		
iii)	Tripping coils for CB		2	nos.		
iv)	Motor for 33 kV circuit breaker operating mechanism		1	no.		
v)	Surge Arrester, single phase		2	nos.		
1N4	**Protection**					
i)	Line distance relay with complete protection elements		1	set		
ii)	Transformer differential relay with complete REF function		1	set		
iii)	overcurrent and earth fault relay		1	set		

Item	Description	Code[1]	Qty (1)	Unit	Unit Price[2] CIP (2)	Total Price[2] CIP (1) x (2)
iv)	Tripping relay (electrical reset)		3	nos.		
v)	Bay control unit		1	set		
vi)	Trip Circuit Supervision relay, 3phase		1	set		
vii)	RelayTest block & plug		1	set		
viii)	Bulbs for annunciator		10	nos.		
1N5	**Test Equipment**					
i)	SF6 Gas Handling Equipment		1	set		
ii)	SF6 Gas reservoir		1	set		
iv)	SF6 Gas leak Detector		1	set		
v)	Partial Discharge monitoring Device for GIS		1	set		
vi)	Contact resistance measurement test set (suitable for measurement down to 1 µ ohm at 200A d.c.)		1	set		
vii)	5 kV insulation resistance test set (range 0.5 –1.0 - 2.5 - 5 kV)		1	set		
viii)	Earth resistance test set (range 10-100-1000 ohm: min scale division 0.01 ohm)		1	set		
ix)	Clip-on mA meter (for spill current)		1	set		
x)	Portable Earthing lead including glass fiber stick		1	set		
xi)	AVO Meter, digital		1	set		
1N.5	**Test Equipment**					
i)	SF6 Gas Handling Equipment incld. Storage tank		1	set		
ii)	SF6 Gas leak Detector		1	set		
iii)	Partial Discharge monitoring Device for GIS		1	set		
iv)	Contact resistance measurement test set (suitable for measurement down to 1		1	set		
v)	5 kV insulation resistance test set (range 0.5 –1.0 - 2.5 - 5 kV)		1	set		
vi)	Earth resistance test set (range 10-100-1000 ohm: min scale division 0.01 ohm)		1	set		
vii)	Clip-on mA meter (for spill current)		1	set		
viii)	AVO Meter, digital		1	set		
Total Price for Dhamrai 132/33kV GIS Substation						
(carried to Schedule -B5: Grand Summary)						
Schedule B1. 2: Shyampur 230/132 kV GIS Substation						
230kV Indoor Type Gas Insulated Switchgear(GIS).						
2A1	230kV Overhead line circuit bay,1600A		4	Sets		
2A2	230kV Transformer circuit bay,1600A					
i)	GIS bay		2	Sets		
ii)	GIS bus duct		2	Sets		
iii)	Air Insulated Bushing		2	Sets		
2A3	230kV Bus tie circuit bay,2000A		1	Set		
2A4	230kV Main busbar(double busbar) ,2000A, with VT & ES		1	Lot		
2A5	HV GIS Test Bushing		1	set		
132kV Indoor Type Gas Insulated Switchgear(GIS).						
2B1	132kV Overhead line circuit bay,1250A		6	Sets		
2B2	132kV Transformer circuit bay,2000A		2	Sets		
2B3	132kV Bus tie circuit bay,3000A		1	Set		
2B4	132kV Main busbar(double busbar),3000A, with VT & ES		1	Lot		
33kV Air Insulated Switchgear(AIS) and Connection:						
2C1	Vacuum Circuit breaker(VCB), live tank, gang operating , 800A		2	Sets		
2C2	Disconnector, single verticle break, 800A, gantry mounted		2	Sets		
2C3	Single phase current transformer, post type,3-core		6	Nos.		
2C4	Single phase, post type, metal oxide surge arrester, 30kV		6	Nos.		
2C5	Flexible Conductor, clamps & connectors,Jumper & equipment Connection					
i)	_Flexible Conductor for jumper, equipment connections		1	Lot		
ii)	_Clamps & Connectors		1	Lot		
2C6	Post Insulator		6	Nos.		
2C7	Steel structures & cable tray					
i)	_Equipment support structures including nut&bolts		1	Lot		
ii)	_Cable tray including fitting, fixing accessories		1	Lot		
Power Transformer & Aux. Transformer						
2D1	230/138/33kV, 225/300(ONAN/ONAF) MVA, three phase Auto transformer		2	Sets		
2D2.1	33/0.415kV, 300kVA, three phase earthing transformer		2	Sets		
2D2.2	deleted					
2D2.3	Fire Prevention & Extinguishing System of two main transformer (Nitrogen Injection type)		1	Lot		
Control, Protection, SAS & Metering						
230kV Circuits						
2E1	Control, Protection, metering and SAS for 230kV overhead line bays		4	Sets		
2E2	Control, Protection, metering and SAS for 230kV side of Auto transformer bays		2	Sets		
2E3	Control, Protection, metering and SAS for 230kV Bus-tie bay		1	Set		
2E4	Busbar protection system for complete 230kV bus		1	Lot		
2E5	Tarrif metering for four line bays and two transformer bays		1	Lot		
132kV Circuits						
2F1	Control, Protection, metering and SAS for 132kV overhead line bays		6	Sets		

Item	Description	Code[1]	Qty (1)	Unit	Unit Price[2] CIP (2)	Total Price[2] CIP (1) x (2)
2F2	Control, Protection, metering and SAS for 132kV side of auto transformer bays		2	Sets		
2F3	Control, Protection, metering and SAS for 132kV Bus-tie bay		1	Set		
2F4	Busbar protection system for complete 132kV bus		1	Lot		
2F5	Tarrif metering for six line bays and two transformer bays		1	Lot		
33kV Circuit						
2G1	Control, Protection, metering for 33/0.4kV Auxilliary Transformers.		2	sets		
Power Cables & Cable Termination,Surge Arrester,Conductor,Steel Structure,Insulator & Hardware & Fittings:						
230kV Circuits						
2H1	230kV, XLPE 2000sqmm, Cu Power cable & termination					
i)	Power cable		720	meter		
ii)	Outdoor type Cable Sealing End per phase with required necessary accessories		12	Sets		
iii)	Indoor type Cable termination(GIS bay termination) per phase with required necessary accessories.		18	Sets		
2H2	Single phase surge arrestor, 186kV, 10kA Discharge Current, Class III, gapless metaloxide		18	nos.		
2H3	Flexible Conductor, clamps & connectors for Jackbus,Jumper & equipment Connection					
i)	_Flexible Conductor for jackbus, jumper, equipment connections		1	Lot		
ii)	_Clamps & Connectors		1	Lot		
2H4	Insulator & Fittings					
i)	_Insulator		1	Lot		
ii)	_Fittings		1	Lot		
2H5	Steel structures & cable tray					
i)	_Gantry Column including nut&bolts		1	Lot		
ii)	_Gantry beam including nut&bolts		1	Lot		
iii)	_Equipment support structures including nut&bolts		1	Lot		
iv)	_Cable tray including fitting, fixing accessories		1	Lot		
132kV Circuits						
2H6	132kV, XLPE 1000sqmm, Cu Power cable & termination					
i)	Power cable		1680	meter		
ii)	Outdoor type Cable Sealing End per phase with required necessary accessories for line bays		12	Sets		
iii)	Indoor type Cable termination(GIS bay termination) per phase with required necessary accessories for line bays		12	Sets		
iv)	Outdoor type Cable Sealing End with required necessary accessories for Tr bays (per each cable)		12	Sets		
v)	Indoor type Cable termination(GIS bay termination) per phase with required necessary accessories for Tr bays (per each cable)		12	Sets		
2H7	Single phase surge arrestor, 120kV, 10kA Discharge Current, Class III, gapless metaloxide		18	nos.		
2H8	Flexible Conductor, clamps & connectors for Jackbus,Jumper & equipment Connection					
i)	_Flexible Conductor for jackbus, jumper, equipment connections		1	Lot		
ii)	_Clamps & Connectors		1	Lot		
2H9	Insulator & Fittings					
i)	_Insulator		1	Lot		
ii)	_Fittings		1	Lot		
2H10	Steel structures & cable tray					
i)	_Gantry Column including nut&bolts		1	Lot		
ii)	_Gantry beam including nut&bolts		1	Lot		
iii)	_Equipment support structures including nut&bolts		1	Lot		
iv)	_Cable tray including fitting, fixing accessories		1	Lot		
33kV Circuits						
2H11.1	33kV, XLPE Cu Power cable, 185sqmm		150	meter		
2H11.2	33kV Cable termination with required necessary accessories.		12	Nos.		
Multicore Cables						
2I1	Multicore, XLPE, LV Power & Control Cable for control, protection, SAS, metering & power circuits					
i)	_LV Control Cable		1	Lot		
ii)	_LV Power Cable		1	Lot		
Earthing & Lightning Protection						
2J1	Earthing and Lightning Protection System					
i)	_Earthing system for complete substation incld. GIS building		1	Lot		
ii)	_Lightning Protection System for complete substation include. GIS building		1	Lot		
Batteries, Chargers & DC Distribution						
2K1	Complete 110V Battery Bank with chargers and DC Distribution Board					
i)	_Battery Banks		2	Sets		
ii)	_Charger		2	Sets		
iii)	_110V DC Distribution panel		1	Set		
iv)	_110V/48V DC DC Converter,1.5kVA		2	Sets		
v)	_48V DC Disatribution Panel		1	Set		
vi)	_UPS system for SAS panels, 3kVA		2	sets		
LVAC Distribution						

Item	Description	Code[1]	Qty (1)	Unit	Unit Price[2] CIP (2)	Total Price[2] CIP (1) x (2)
2L1	Complete LVAC Distribution System with necessary DB, MCB, Meters etc		1	Lot		
2L2	Tariff metering for two station auxilliary Transformer		1	Lot		
2L3	Outdoor weatherproof 3-phase,4 wire, 125A Socket outlet and plugs.		1	Nos		
Civil Works,Building and Foundation			1	Lot		
2M1	Complete Land development with carried earthfilling		24,300.00	Cubic Meter		
2M2	Complete outdoor civil works					
i)	_Outdoor gantry foundation 230kV switchyard		1	Lot		
ii)	_Outdoor gantry foundation 132kV switchyard		1	Lot		
iii)	_Outdoor gantry foundation 33kV switchyard		1	Lot		
iv)	_Outdoor equipment foundation 230kV switchyard		1	Lot		
v)	_Outdoor equipment foundation 132kV switchyard		1	Lot		
vi)	_Outdoor equipment foundation 33kV switchyard		1	Lot		
vii)	_Transformer foundation including oilpit & carrage way		1	Lot		
viii)	_Blast wall		1	Lot		
ix)	_Security Boundary Wall		1	Lot		
x)	_Substation Main gate		1	Lot		
xi)	_Barbed Wire Fencing		1	Lot		
xii)	_Approach raod		1	Lot		
xiii)	_Internal road		1	Lot		
xiv)	_Surface drain		1	Lot		
xv)	_Cable Trench		1	Lot		
xvi)	_Switchyard surface finishing		1	Lot		
xvii)	_Gravel laying		1	Lot		
xviii)	_Septic tank, sowak way		1	Lot		
xix)	_Pump house including deep tubewell, motor, pump, water reservaoir,		1	Lot		
xx)	_Gurd house, sentry post, car port		1	Lot		
2M3	Complete civil works for GIS & control room building					
i)	_Foundation works		1	Lot		
ii)	_Super structures		1	Lot		
iii)	_All finish works		1	Lot		
iv)	_EOT crane (5 Ton)		1	Lot		
2N1	**Building Lighting, Small Power, Air Conditioning & Ventilation**					
i)	_BuildingSmall power		1	Lot		
ii)	_Building Lighting & emergency DC lighting		1	Lot		
iii)	_Building airconditioning & ventilation system		1	Lot		
2N2	**Outdoor switchyard Lighting, Small Power**					
i)	_OutdoorSmall power		1	Lot		
ii)	_Outdoor Lighting		1	Lot		
Digital Fault & Disturbance Recorder(DFDR)						
2N3.1	DFDR complete for all 230kV & 132kV bays for Shyampur new		1	Lot		
2N3.2	DFDR complete for all 230kV & 132kV bays for existing Old Airport		1	Lot		
2N3.3	DFDR complete for all 230kV & 132kV bays for existing Tongi		1	Lot		
Fiber Optic Multiplexer Equipment for Teleprotection and Communication						
2O1	Fibre Optic Multipexer Equipment for communication & protection		1	Lot		
2O2	Hot line telephone system including phone sets, connection cords etc.		1	Lot		
Underground opticale fiber cable with Terminal box.						
2O3	Underground Fibre Optic cable(48 cores)		1	Lot		
2O4	Outdoor termination box, indoor MDF & pigtail cables		1	Lot		
Integration with existing SCADA, NLDC system						
2P1	Integration with existing SCADA/NLDC system.		1	Lot		
Mandatory Spares, tools & test equipment						
2Q1	**230 kV GIS**					
i)	Set of gas filling equipment and 3 bottles of 48kg of SF6	nos.	1	nos.		
ii)	Arcing contact of CB	nos.	2	nos.		
iii)	Moving contact of CB	nos.	2	nos.		
iv)	Fixed contact of CB	nos.	2	nos.		
v)	Moving contact of DS & ES	nos.	2	nos.		
vi)	Fixed contact of DS & ES	nos.	2	nos.		
vii)	Blast nozzle	nos.	2	nos.		
viii)	CB Closing coil	nos.	6	nos.		
ix)	CB Tripping coil	nos.	6	nos.		

Item	Description	Code[1]	Qty (1)	Unit	Unit Price[2] CIP (2)	Total Price[2] CIP (1) x (2)
x)	Motor for CB operating mechanism	nos.	1	nos.		
xi)	Dashpot for CB operating mechanism	nos.	2	nos.		
xii)	Motor for DS & ES drive	nos.	2	nos.		
xiii)	Supporting insulator	nos.	2	nos.		
xiv)	Supporting insulator with barrier	nos.	2	nos.		
xv)	Indicating lamps (20% of total quantities installed)	nos.	1	nos.		
xvi)	Indicating lamp covers (10% of total quantities installed)	nos.	1	nos.		
xvii)	Set of gaskets (10% of total quantities installed)	nos.	1	nos.		
xviii)	Heater	nos.	2	nos.		
xix)	Humidity stat and thermostat	nos.	2	nos.		
xx)	Gas pressure monitor	nos.	2	nos.		
xxi)	Gas pressure switch	nos.	2	nos.		
xxii)	Gas pressure gauge	nos.	2	nos.		
xxiii)	Gas pressure relief device	nos.	2	nos.		
xxiv)	Gas sniffer	nos.	1	nos.		
xxv)	Gas hygrometer	nos.	1	nos.		
2Q2	**132 kV GIS**					
i)	Arcing contact of CB	nos.	2	nos.		
ii)	Moving contact of CB	nos.	2	nos.		
iii)	Fixed contact of CB	nos.	2	nos.		
iv)	Moving contact of DS & ES	nos.	2	nos.		
v)	Fixed contact of DS & ES	nos.	2	nos.		
vi)	Blast nozzle	nos.	2	nos.		
vii)	CB Closing coil	nos.	6	nos.		
viii)	CB Tripping coil	nos.	6	nos.		
ix)	Motor for CB operating mechanism	nos.	1	nos.		
x)	Dashpot for CB operating mechanism	nos.	2	nos.		
xi)	Motor for DS & ES drive	nos.	2	nos.		
xii)	Supporting insulator	nos.	2	nos.		
xiii)	Supporting insulator with barrier	nos.	2	nos.		
xiv)	Indicating lamps (20% of total quantities installed)	nos.	1	nos.		
xv)	Indicating lamp covers (10% of total quantities installed)	nos.	1	nos.		
xvi)	Set of gaskets (10% of total quantities installed)	nos.	1	nos.		
xvii)	Heater	nos.	2	nos.		
xviii)	Humidity stat and thermostat	nos.	2	nos.		
xix)	Gas pressure monitor	nos.	2	nos.		
xx)	Gas pressure switch	nos.	2	nos.		
xxi)	Gas pressure gauge	nos.	2	nos.		
xxii)	Gas pressure relief device	nos.	2	nos.		
2Q3	**Auto Transformer & Switchgear**					
i)	Transformer 230 kV bushings (For 300MVA Transformer)		1	no.		
ii)	Ttransformer 138 kV bushings (For 300MVA Transformer)		2	nos.		
iii)	33 kV bushing	nos.	2	nos.		
iv)	Neutral bushing	nos.	2	nos.		
v)	Winding temperature indicating device	nos.	2	nos.		
vi)	Set of gaskets (10% of total quantities installed)	nos.	1	nos.		
vii)	Silica gel (100% of total quantities installed)	nos.	1	nos.		
viii)	Set of special tools, gauges and spanners		1	set		
ix)	Transformer oil treatment plant, 6000 Liters per hour		1	set		
x)	186kV Surge arrester		3	nos.		
xi)	120 kV Surge Arrester		3	nos.		
xii)	245kV, Cable Sealing End (for XLPE, 2000sqmm cu cable) incld. necessary all accessories		2	sets		
xii)	145kV, Cable Sealing End (for XLPE, 1000sqmm cu cable) incld. necessary all accessories		2	sets		
2Q4	**Protection**					
i)	Line distance relay with complete protection elements		1	set		
ii)	Transformer differential relay with complete REF function		1	set		
iii)	overcurrent and earth fault relay		1	set		
iv)	Tripping relay (electrical reset)		3	nos.		
v)	Bay control unit		1	set		

Item	Description	Code[1]	Qty (1)	Unit	Unit Price[2] CIP (2)	Total Price[2] CIP (1) x (2)
vi)	Trip Circuit Supervision relay, 3phase		1	set		
vii)	Relay test block & plug		3	sets		
viii)	Bulbs for annunciator	nos.	10	nos.		
2Q5	**Test Equipment**					
i)	SF6 Gas Handling Equipment including storage tank		1	set		
ii)	SF6 Gas leak Detector		1	set		
iv)	Partial Discharge monitoring Device for GIS		1	set		
v)	Contact resistance measurement test set (suitable for measurement down to 1 µ ohm at 200A d.c.)		1	set		
vi)	5 kV insulation resistance test set (range 0.5 –1.0 - 2.5 - 5 kV)		1	set		
vii)	Earth resistance test set (range 10-100-1000 ohm: min scale division 0.01 ohm)		1	set		
viii)	Clip-on mA meter (for spill current)		1	set		
ix)	Portable Earthing lead including glass fiber stick		1	set		
x)	AVO Meter, digital		1	set		
Total Price for Shyampur 230/132kV GIS Substation						

(carried to Schedule -B5: Grand Summary)

Total Schedule B1 (carried to Schedule B5 Grand Summary)						

Name of Bidder _____

Signature of Bidder _____

[1] Bidders shall enter a code representing the country of origin of all imported plant and equipment.

[2] Specifiy currency. Create and use as many column for Unit Price and total Price as there are currencies.

Country of Origin Declaration Form

Item	Description	Country

Schedules of Rates and Prices

Schedule_B2 - Plant and Mandatory Spare Parts Supplied from Employer's Country

Schedule B2. 1: Dhamrai 132/33 kV GIS Substation

Item	Description	Qty	Unit	Foreign Currency(in…..		Local Currency (in BDT)		
				EXW Unit Price[1]	EXW Total Price[1]	EXW Unit Price	EXW Total Price	VAT on EXW
		(1)		*(2)*	*(3)=(1) x (2)*	*(4)*	*(5)=(1) x (4)*	*(6)*
132kV Outdoor Type Gas Insulated Switchgear(GIS).								
1A1	132kV Overhead line circuit bay,1250A							
i)	_GIS for 132kV Overhead line circuit bay	2	Sets					
ii)	_GIS bus duct	2	Sets					
iii)	_Air Insulated bushing	2	Sets					
1A2	132kV Transformer circuit bay,1250A							
i)	_GIS for 132kV Transformer circuit bay	2	Sets					
ii)	_GIS bus duct	2	Sets					
iii)	_Air Insulated bushing	2	Sets					
1A3	132kV Bus tie circuit bay,3000A	1	Set					
1A4	132kV Main busbar(double busbar) ,3000A, with VT & ES	1	Lot					
1A5	HV GIS Test Bushing	1	Set					
33kV Air Insulated Switchgear(AIS) and Connection:								
1B1	Vacuum Circuit breaker(VCB), live tank, gang operating , 2000A	2	Sets					
1B2	Disconnector, single verticle break, 2000A, gantry mounted	7	Sets					
1B3	Single phase current transformer, post type,3-core	6	Nos.					
1B4	Single phase voltage transformer, post type, 2-core	12	Nos.					
1B5	Single phase, post type, metal oxide surge arrester, 30kV	12	Nos.					
1B6	Flexible Conductor, clamps & connectors for busbar, Jackbus,Jumper & equipment Connection							
i)	_Flexible Conductor for jackbus, jumper, equipment connections	1	Lot					
ii)	_Flexible Conductor for main bus	1	Lot					
iii)	_Clamps & Connectors	1	Lot					
1B.7	Insulator & Fittings							
i)	_Insulator	1	Lot					
ii)	_Fittings	1	Lot					
1B.8	Steel structures & cable tray							
i)	_Gantry Column including nut&bolts	1	Lot					
ii)	_Gantry beam including nut&bolts	1	Lot					
iii)	_Equipment support structures including nut&bolts	1	Lot					
iv)	_Cable tray including fitting, fixing accessories	1	Lot					
Power Transformer & Aux. Transformer								
1C1	132/33kV, 50/75(ONAN/ONAF) MVA,, three phase power transformer	2	Sets					
1C2	33/.415kV, 200kVA, three phase auxilliary transformer	2	Sets					
Control, Protection, SAS & Metering								
132kV Circuits								
1D1	Control, Protection, metering and SAS for 132kV overhead line bays	2	Sets					
1D2	Control, Protection, metering and SAS for 132kV Transformer bays	2	Sets					
1D3	Control, Protection, metering and SAS for 132kV Bus-tie bay	1	Set					
1D4	Busbar protection system for complete 132kV bus	1	Lot					
1D5	Tarrif metering for two line bays and two transformer bays	1	Lot					
33kV Circuit								
1D6	Control, Protection, metering and SAS for 33kV side of Transformer	2	sets					
1D7	Tariff metering for two Transformer bays	1	Lot					
Surge Arrester,Conductor,Steel Structure,Insulator & Hardware & Fittings:								
1E1	Single phase surge arrestor, 120kV, 10kA Discharge Current, Class III, gapless metaloxide	12	nos.					
1E2	Flexible Conductor, clamps & connectors for Jackbus,Jumper & equipment Connection							
i)	_Flexible Conductor for jackbus, jumper, equipment connections	1	Lot					
ii)	_Clamps & Connectors	1	Lot					
1E3	Insulator & Fittings							
i)	_Insulator	1	Lot					
ii)	_Fittings	1	Lot					
1E4	Steel structures & cable tray							
i)	_Gantry Column including nut&bolts	1	Lot					
ii)	_Gantry beam including nut&bolts	1	Lot					
iii)	_Equipment support structures including nut&bolts	1	Lot					

iv)	_Cable tray including fitting, fixing accessories	1	Lot					
Multicore Cables								
1F1	Multicore, XLPE, LV Power & Control Cable for control, protection, SAS, metering & power circuits							
i)	_LV Control Cable	1	Lot					
ii)	_LV Power Cable	1	Lot					
Earthing & Lightning Protection								
1G1	Earthing and Lightning Protection System							
i)	_Earthing system for complete substation	1	Lot					
ii)	_Lighting Protection System for complete substation	1	Lot					
Batteries, Chargers & DC Distribution								
1H1	Complete 110V Battery Bank with chargers and DC Distribution Board							
i)	_Battery Banks two sets	2	Sets					
ii)	_Charger two sets	2	Sets					
iii)	_110V DC Distribution panel	1	Set					
iv)	_110V/48V DC DC Converter,1kVA	2	Sets					
v)	_48V DC Disatribution Panel	1	Set					
iv)	_UPS system for SAS panels, 3kVA	2	sets					
LVAC Distribution								
1I1	Complete LVAC Distribution System with necessary DB, MCB, Meters	1	Lot					
1I2	Tariff metering for two station auxilliary Transformer	1	Lot					
1I3	Outdoor weatherproof 3-phase,4 wire, 125A Socket outlet and plugs.	1	Nos					
1K1	**Building Lighting, Small Power, Air Conditioning & Ventilation**							
i)	_BuildingSmall power	1	Lot					
ii)	_Building Lighting & emergency DC lighting	1	Lot					
iii)	_Building airconditioning & ventilation system	1	Lot					
1K2	**Outdoor switchyard Lighting, Small Power**							
i)	_OutdoorSmall power	1	Lot					
ii)	_Outdoor Lighting	1	Lot					
Fiber Optic Multiplexer Equipment for Teleprotection and Communication								
1L1.1	Fibre Optic Multipexer Equipment for communication & protection	1	Lot					
1L1.2	Hot line telephone system including phone sets, connection cords etc.	1	Lot					
Underground opticale fiber cable with Terminal box.								
1L.2.1	Underground Fibre Optic cable(24 cores)	1	Lot					
1L.2.2	Outdoor termination box, indoor MDF & pigtail cables	1	Lot					
Integration with existing SCADA, NLDC system								
1M1	Integration with existing SCADA/NLDC system.	1	Lot					
Mandatory Spares, tools & test equipment								
1N1	**132 kV GIS**							
i)	Arcing contact of CB	2	nos.					
ii)	Moving contact of CB	2	nos.					
iii)	Fixed contact of CB	2	nos.					
iv)	Moving contact of DS & ES	2	nos.					
v)	Fixed contact of DS & ES	2	nos.					
vi)	Blast nozzle	2	nos.					
vii)	CB Closing coil	6	nos.					
viii)	CB Tripping coil	6	nos.					
ix)	Motor for CB operating mechanism	1	nos.					
x)	Dashpot for CB operating mechanism	2	nos.					
xi)	Motor for DS & ES drive	2	nos.					
xii)	Supporting insulator	2	nos.					
xiii)	Supporting insulator with barrier	2	nos.					
xiv)	Indicating lamps (20% of total quantities installed)	1	nos.					
xv)	Indicating lamp covers (10% of total quantities installed)	1	nos.					
xvi)	Set of gaskets (10% of total quantities installed)	1	nos.					
xvii)	Heater	2	nos.					
xviii)	Humidity stat and thermostat	2	nos.					
xix)	Gas pressure monitor	2	nos.					
xx)	Gas pressure switch	2	nos.					
xxi)	Gas pressure gauge	2	nos.					
xxii)	Gas pressure relief device	2	nos.					
1N2	**132/33 kV Power Transformer**							
i)	Transformer 132 kV bushings (For 75MVA Transformer)	1	no.					
ii)	Ttransformer 33 kV bushings (For 75MVA Transformer)	2	nos.					
iii)	Neutral bushing	2	nos.					
iv)	Winding temperature indicating device	2	nos.					
v)	Spare transformer oil of 15% of total oil supplied	1	Lot					
vi)	Set of gaskets (10% of total quantities installed)	1	nos.					
vii)	Silica gel (100% of total quantities installed)	1	nos.					

viii)	Set of special tools, gauges and spanners	1	set					
ix)	Transformer oil treatment plant, 6000 Liters per hour	1	set					
x)	120 kV Surge Arrester	3	nos.					
1N.3	**33 kV SWITCHGEAR**							
i)	Current Transformer, single phase 3-core,	2	nos.					
ii)	Closing coils for CB	2	nos.					
iii)	Tripping coils for CB	2	nos.					
iv)	Motor for 33 kV circuit breaker operating mechanism	1	no.					
v)	Surge Arrester, single phase	2	nos.					
1N4	**Protection**							
i)	Line distance relay with complete protection elements	1	set					
ii)	Transformer differential relay with complete REF function	1	set					
iii)	overcurrent and earth fault relay	1	set					
iv)	Tripping relay (electrical reset)	3	nos.					
v)	Bay control unit	1	set					
vi)	Trip Circuit Supervision relay, 3phase	1	set					
vii)	RelayTest block & plug	1	set					
viii)	Bulbs for annunciator	10	nos.					
1N5	**Test Equipment**							
i)	SF6 Gas Handling Equipment	1	set					
ii)	SF6 Gas reservoir	1	set					
iv)	SF6 Gas leak Detector	1	set					
v)	Partial Discharge monitoring Device for GIS	1	set					
vi)	Contact resistance measurement test set (suitable for measurement down to 1 µ ohm at 200A d.c.)	1	set					
vii)	5 kV insulation resistance test set (range 0.5 –1.0 - 2.5 - 5 kV)	1	set					
viii)	Earth resistance test set (range 10-100-1000 ohm: min scale division 0.01 ohm)	1	set					
ix)	Clip-on mA meter (for spill current)	1	set					
x)	Portable Earthing lead including glass fiber stick	1	set					
xi)	AVO Meter, digital	1	set					
1N.5	**Test Equipment**							
i)	SF6 Gas Handling Equipment incld. Storage tank	1	set					
ii)	SF6 Gas leak Detector	1	set					
iii)	Partial Discharge monitoring Device for GIS	1	set					
iv)	Contact resistance measurement test set (suitable for measurement down to 1 µ ohm at 200A d.c.)	1	set					
v)	5 kV insulation resistance test set (range 0.5 –1.0 - 2.5 - 5 kV)	1	set					
vi)	Earth resistance test set (range 10-100-1000 ohm: min scale division 0.01 ohm)	1	set					
vii)	Clip-on mA meter (for spill current)	1	set					
viii)	AVO Meter, digital	1	set					
Total Price for Dhamrai 132/33kV GIS Substation								
(carried to Schedule -B5: Grand Summary)								
Schedule B1. 2: Shyampur 230/132 kV GIS Substation								
230kV Indoor Type Gas Insulated Switchgear(GIS).								
2A1	230kV Overhead line circuit bay,1600A	4	Sets					
2A2	230kV Transformer circuit bay,1600A							
i)	GIS bay	2	Sets					
ii)	GIS bus duct	2	Sets					
iii)	Air Insulated Bushing	2	Sets					
2A3	230kV Bus tie circuit bay,2000A	1	Set					
2A4	230kV Main busbar(double busbar) ,2000A, with VT & ES	1	Lot					
2A5	HV GIS Test Bushing	1	set					
132kV Indoor Type Gas Insulated Switchgear(GIS).								
2B1	132kV Overhead line circuit bay,1250A	6	Sets					
2B2	132kV Transformer circuit bay,2000A	2	Sets					
2B3	132kV Bus tie circuit bay,3000A	1	Set					
2B4	132kV Main busbar(double busbar),3000A, with VT & ES	1	Lot					
33kV Air Insulated Switchgear(AIS) and Connection:								
2C1	Vacuum Circuit breaker(VCB), live tank, gang operating , 800A	2	Sets					
2C2	Disconnector, single verticle break, 800A, gantry mounted	2	Sets					
2C3	Single phase current transformer, post type,3-core	6	Nos.					
2C4	Single phase, post type, metal oxide surge arrester, 30kV	6	Nos.					
2C5	Flexible Conductor, clamps & connectors,Jumper & equipment							
i)	_Flexible Conductor for jumper, equipment connections	1	Lot					
ii)	_Clamps & Connectors	1	Lot					
2C6	Post Insulator	6	Nos.					
2C7	Steel structures & cable tray							

i)	_Equipment support structures including nut&bolts	1	Lot					
ii)	_Cable tray including fitting, fixing accessories	1	Lot					
Power Transformer & Aux. Transformer								
2D1	230/138/33kV, 225/300(ONAN/ONAF) MVA, three phase Auto	2	Sets					
2D2.1	33/0.415kV, 300kVA, three phase earthing transformer	2	Sets					
2D2.2	deleted							
2D2.3	Fire Prevention & Extinguishing System of two main transformer (Nitrogen Injection type)	1	Lot					
Control, Protection, SAS & Metering								
230kV Circuits								
2E1	Control, Protection, metering and SAS for 230kV overhead line bays	4	Sets					
2E2	Control, Protection, metering and SAS for 230kV side of Auto	2	Sets					
2E3	Control, Protection, metering and SAS for 230kV Bus-tie bay	1	Set					
2E4	Busbar protection system for complete 230kV bus	1	Lot					
2E5	Tarrif metering for four line bays and two transformer bays	1	Lot					
132kV Circuits								
2F1	Control, Protection, metering and SAS for 132kV overhead line bays	6	Sets					
2F2	Control, Protection, metering and SAS for 132kV side of auto	2	Sets					
2F3	Control, Protection, metering and SAS for 132kV Bus-tie bay	1	Set					
2F4	Busbar protection system for complete 132kV bus	1	Lot					
2F5	Tarrif metering for six line bays and two transformer bays	1	Lot					
33kV Circuit								
2G1	Control, Protection, metering for 33/0.4kV Auxilliary Transformers.	2	sets					
Power Cables & Cable Termination,Surge Arrester,Conductor,Steel Structure,Insulator & Hardware & Fittings:								
230kV Circuits								
2H1	230kV, XLPE 2000sqmm, Cu Power cable & termination							
i)	Power cable	720	meter					
ii)	Outdoor type Cable Sealing End per phasewith required necessary accessories	12	Sets					
iii)	Indoor type Cable termination(GIS bay termination) per phasewith required necessary accessories.	18	Sets					
2H2	Single phase surge arrestor, 186kV, 10kA Discharge Current, Class III, gapless metaloxide	18	nos.					
2H3	Flexible Conductor, clamps & connectors for Jackbus,Jumper & equipment Connection							
i)	_Flexible Conductor for jackbus, jumper, equipment connections	1	Lot					
ii)	_Clamps & Connectors	1	Lot					
2H4	Insulator & Fittings							
i)	_Insulator	1	Lot					
ii)	_Fittings	1	Lot					
2H5	Steel structures & cable tray							
i)	_Gantry Column including nut&bolts	1	Lot					
ii)	_Gantry beam including nut&bolts	1	Lot					
iii)	_Equipment support structures including nut&bolts	1	Lot					
iv)	_Cable tray including fitting, fixing accessories	1	Lot					
132kV Circuits								
2H6	132kV, XLPE 1000sqmm, Cu Power cable & termination							
i)	Power cable	1680	meter					
ii)	Outdoor type Cable Sealing End per phasewith required necessary accessories for line bays	12	Sets					
iii)	Indoor type Cable termination(GIS bay termination) per phase with required necessary accessories for line bays	12	Sets					
iv)	Outdoor type Cable Sealing End with required necessary accessories for Tr bays (per each cable)	12	Sets					
v)	Indoor type Cable termination(GIS bay termination) per phase with required necessary accessories for Tr bays (per each cable)	12	Sets					
2H7	Single phase surge arrestor, 120kV, 10kA Discharge Current, Class III, gapless metaloxide	18	nos.					
2H8	Flexible Conductor, clamps & connectors for Jackbus,Jumper & equipment Connection							
i)	_Flexible Conductor for jackbus, jumper, equipment connections	1	Lot					
ii)	_Clamps & Connectors	1	Lot					
2H9	Insulator & Fittings							
i)	_Insulator	1	Lot					
ii)	_Fittings	1	Lot					
2H10	Steel structures & cable tray							
i)	_Gantry Column including nut&bolts	1	Lot					
ii)	_Gantry beam including nut&bolts	1	Lot					
iii)	_Equipment support structures including nut&bolts	1	Lot					
iv)	_Cable tray including fitting, fixing accessories	1	Lot					
33kV Circuits								

2H11.1	33kV, XLPE Cu Power cable, 185sqmm	150	meter					
2H11.2	33kV Cable termination with required necessary accessories.	12	Nos.					
Multicore Cables								
2I1	Multicore, XLPE, LV Power & Control Cable for control, protection, SAS, metering & power circuits							
i)	_LV Control Cable	1	Lot					
ii)	_LV Power Cable	1	Lot					
Earthing & Lightning Protection								
2J1	Earthing and Lightning Protection System							
i)	_Earthing system for complete substation incld. GIS building	1	Lot					
ii)	_Lightning Protection System for complete substation include. GIS	1	Lot					
Batteries, Chargers & DC Distribution								
2K1	Complete 110V Battery Bank with chargers and DC Distribution Board							
i)	_Battery Banks	2	Sets					
ii)	_Charger	2	Sets					
iii)	_110V DC Distribution panel	1	Set					
iv)	_110V/48V DC DC Converter,1.5kVA	2	Sets					
v)	_48V DC Disatribution Panel	1	Set					
vi)	_UPS system for SAS panels, 3kVA	2	sets					
LVAC Distribution								
2L1	Complete LVAC Distribution System with necessary DB, MCB, Meters	1	Lot					
2L2	Tariff metering for two station auxilliary Transformer	1	Lot					
2L3	Outdoor weatherproof 3-phase,4 wire, 125A Socket outlet and plugs.	1	Nos					
Civil Works,Building and Foundation		1	Lot					
2M1	Complete Land development with carried earthfilling	24300	Cubic Meter					
2M2	Complete outdoor civil works							
i)	_Outdoor gantry foundation 230kV switchyard	1	Lot					
ii)	_Outdoor gantry foundation 132kV switchyard	1	Lot					
iii)	_Outdoor gantry foundation 33kV switchyard	1	Lot					
iv)	_Outdoor equipment foundation 230kV switchyard	1	Lot					
v)	_Outdoor equipment foundation 132kV switchyard	1	Lot					
vi)	_Outdoor equipment foundation 33kV switchyard	1	Lot					
vii)	_Transformer foundation including oilpit & carrage way	1	Lot					
viii)	_Blast wall	1	Lot					
ix)	_Security Boundary Wall	1	Lot					
x)	_Substation Main gate	1	Lot					
xi)	_Barbed Wire Fencing	1	Lot					
xii)	_Approach raod	1	Lot					
xiii)	_Internal road	1	Lot					
xiv)	_Surface drain	1	Lot					
xv)	_Cable Trench	1	Lot					
xvi)	_Switchyard surface finishing	1	Lot					
xvii)	_Gravel laying	1	Lot					
xviii)	_Septic tank, sowak way	1	Lot					
xix)	_Pump house including deep tubewell, motor, pump, water reservaoir, water pipe line etc.	1	Lot					
xx)	_Gurd house, sentry post, car port	1	Lot					
2M3	Complete civil works for GIS & control room building							
i)	_Foundation works	1	Lot					
ii)	_Super structures	1	Lot					
iii)	_All finish works	1	Lot					
iv)	_EOT crane (5 Ton)	1	Lot					
2N1	**Building Lighting, Small Power, Air Conditioning & Ventilation**							
i)	_BuildingSmall power	1	Lot					
ii)	_Building Lighting & emergency DC lighting	1	Lot					
iii)	_Building airconditioning & ventilation system	1	Lot					
2N2	**Outdoor switchyard Lighting, Small Power**							
i)	_OutdoorSmall power	1	Lot					
ii)	_Outdoor Lighting	1	Lot					
Digital Fault & Disturbance Recorder(DFDR)								
2N3.1	DFDR complete for all 230kV & 132kV bays for Shyampur new	1	Lot					
2N3.2	DFDR complete for all 230kV & 132kV bays for existing Old Airport & Tongi Substation	1	Lot					
2N3.3	DFDR complete for all 230kV & 132kV bays for existing Tongi	1	Lot					
Fiber Optic Multiplexer Equipment for Teleprotection and Communication								
2O1	Fibre Optic Multipexer Equipment for communication & protection	1	Lot					
2O2	Hot line telephone system including phone sets, connection cords etc.	1	Lot					
Underground opticale fiber cable with Terminal box.								
2O3	Underground Fibre Optic cable(48 cores)	1	Lot					

2O4	Outdoor termination box, indoor MDF & pigtail cables	1	Lot					
Integration with existing SCADA, NLDC system								
2P1	Integration with existing SCADA/NLDC system.	1	Lot					
Mandatory Spares, tools & test equipment								
2Q1	**230 kV GIS**							
i)	Set of gas filling equipment and 3 bottles of 48kg of SF6	1	nos.					
ii)	Arcing contact of CB	2	nos.					
iii)	Moving contact of CB	2	nos.					
iv)	Fixed contact of CB	2	nos.					
v)	Moving contact of DS & ES	2	nos.					
vi)	Fixed contact of DS & ES	2	nos.					
vii)	Blast nozzle	2	nos.					
viii)	CB Closing coil	6	nos.					
ix)	CB Tripping coil	6	nos.					
x)	Motor for CB operating mechanism	1	nos.					
xi)	Dashpot for CB operating mechanism	2	nos.					
xii)	Motor for DS & ES drive	2	nos.					
xiii)	Supporting insulator	2	nos.					
xiv)	Supporting insulator with barrier	2	nos.					
xv)	Indicating lamps (20% of total quantities installed)	1	nos.					
xvi)	Indicating lamp covers (10% of total quantities installed)	1	nos.					
xvii)	Set of gaskets (10% of total quantities installed)	1	nos.					
xviii)	Heater	2	nos.					
xix)	Humidity stat and thermostat	2	nos.					
xx)	Gas pressure monitor	2	nos.					
xxi)	Gas pressure switch	2	nos.					
xxii)	Gas pressure gauge	2	nos.					
xxiii)	Gas pressure relief device	2	nos.					
xxiv)	Gas sniffer	1	nos.					
xxv)	Gas hygrometer	1	nos.					
2Q2	**132 kV GIS**							
i)	Arcing contact of CB	2	nos.					
ii)	Moving contact of CB	2	nos.					
iii)	Fixed contact of CB	2	nos.					
iv)	Moving contact of DS & ES	2	nos.					
v)	Fixed contact of DS & ES	2	nos.					
vi)	Blast nozzle	2	nos.					
vii)	CB Closing coil	6	nos.					
viii)	CB Tripping coil	6	nos.					
ix)	Motor for CB operating mechanism	1	nos.					
x)	Dashpot for CB operating mechanism	2	nos.					
xi)	Motor for DS & ES drive	2	nos.					
xii)	Supporting insulator	2	nos.					
xiii)	Supporting insulator with barrier	2	nos.					
xiv)	Indicating lamps (20% of total quantities installed)	1	nos.					
xv)	Indicating lamp covers (10% of total quantities installed)	1	nos.					
xvi)	Set of gaskets (10% of total quantities installed)	1	nos.					
xvii)	Heater	2	nos.					
xviii)	Humidity stat and thermostat	2	nos.					
xix)	Gas pressure monitor	2	nos.					
xx)	Gas pressure switch	2	nos.					
xxi)	Gas pressure gauge	2	nos.					
xxii)	Gas pressure relief device	2	nos.					
2Q3	**Auto Transformer & Switchgear**							
i)	Transformer 230 kV bushings (For 300MVA Transformer)	1	no.					
ii)	Ttransformer 138 kV bushings (For 300MVA Transformer)	2	nos.					
iii)	33 kV bushing	2	nos.					
iv)	Neutral bushing	2	nos.					
v)	Winding temperature indicating device	2	nos.					
vi)	Set of gaskets (10% of total quantities installed)	1	nos.					
vii)	Silica gel (100% of total quantities installed)	1	nos.					
viii)	Set of special tools, gauges and spanners	1	set					
ix)	Transformer oil treatment plant, 6000 Liters per hour	1	set					
x)	186kV Surge arrester	3	nos.					
xi)	120 kV Surge Arrester	3	nos.					
xii)	245kV, Cable Sealing End (for XLPE, 2000sqmm cu cable) incld. necessary all accessories	2	sets					
xii)	145kV, Cable Sealing End (for XLPE, 1000sqmm cu cable) incld. necessary all accessories	2	sets					

2Q4	**Protection**							
i)	Line distance relay with complete protection elements	1	set					
ii)	Transformer differential relay with complete REF function	1	set					
iii)	overcurrent and earth fault relay	1	set					
iv)	Tripping relay (electrical reset)	3	nos.					
v)	Bay control unit	1	set					
vi)	Trip Circuit Supervision relay, 3phase	1	set					
vii)	Relay test block & plug	3	sets					
viii)	Bulbs for annunciator	10	nos.					
2Q5	**Test Equipment**							
i)	SF6 Gas Handling Equipment including storage tank	1	set					
ii)	SF6 Gas leak Detector	1	set					
iv)	Partial Discharge monitoring Device for GIS	1	set					
v)	Contact resistance measurement test set (suitable for measurement down to 1 µ ohm at 200A d.c.)	1	set					
vi)	5 kV insulation resistance test set (range 0.5 –1.0 - 2.5 - 5 kV)	1	set					
vii)	Earth resistance test set (range 10-100-1000 ohm: min scale division 0.01 ohm)	1	set					
viii)	Clip-on mA meter (for spill current)	1	set					
ix)	Portable Earthing lead including glass fiber stick	1	set					
x)	AVO Meter, digital	1	set					
Total Price for Shyampur 230/132kV GIS Substation								
Total Schedule B2 (carried to Schedule B5 Grand Summary)								

[1] Specifiy currency. Create and use as many column for Unit Price and total Price as there are currencies.

Note: EXW price are required to be quoted excluding VAT, VAT on EXW shall be quoted in separate column in Bangladesh Taka. VAT on EXW is included in the Contract Price and shall be paid by the Contractor which shall be reimbursed by the Employer to the contractor at actual basis but not more than the quoted amount upon submission of relevant document.

Name of Bidder _____

Signature of Bidder _____

Schedules of Rates and Prices

Schedule_B3 - Design Service

Schedule B3. 1: Dhamrai 132/33 kV GIS Substation

Item	Description	Qty	Unit	Unit Price [1]		Total Price [1]	
				Foreign Curreny Portion	Local Curreny Portion	Foreign Curreny Portion	Local Curreny Portion
		(1)		(2)	(3)	(1) x (3)	(1) x (2)
132kV Outdoor Type Gas Insulated Switchgear(GIS).							
1A1	132kV Overhead line circuit bay,1250A						
i)	_GIS for 132kV Overhead line circuit bay	2	Sets				
ii)	_GIS bus duct	2	Sets				
iii)	_Air Insulated bushing	2	Sets				
1A2	132kV Transformer circuit bay,1250A						
i)	_GIS for 132kV Transformer circuit bay	2	Sets				
ii)	_GIS bus duct	2	Sets				
iii)	_Air Insulated bushing	2	Sets				
1A3	132kV Bus tie circuit bay,3000A	1	Set				
1A4	132kV Main busbar(double busbar) ,3000A, with VT & ES	1	Lot				
1A5	HV GIS Test Bushing	1	Set				
33kV Air Insulated Switchgear(AIS) and Connection:							
1B1	Vacuum Circuit breaker(VCB), live tank, gang operating , 2000A	2	Sets				
1B2	Disconnector, single verticle break, 2000A, gantry mounted	7	Sets				
1B3	Single phase current transformer, post type,3-core	6	Nos.				
1B4	Single phase voltage transformer, post type, 2-core	12	Nos.				
1B5	Single phase, post type, metal oxide surge arrester, 30kV	12	Nos.				
1B6	Flexible Conductor, clamps & connectors for busbar, Jackbus,Jumper & equipment Connection						
i)	_Flexible Conductor for jackbus, jumper, equipment connections	1	Lot				
ii)	_Flexible Conductor for main bus	1	Lot				
iii)	_Clamps & Connectors	1	Lot				
1B.7	Insulator & Fittings						
i)	_Insulator	1	Lot				
ii)	_Fittings	1	Lot				
1B.8	Steel structures & cable tray						
i)	_Gantry Column including nut&bolts	1	Lot				
ii)	_Gantry beam including nut&bolts	1	Lot				
iii)	_Equipment support structures including nut&bolts	1	Lot				
iv)	_Cable tray including fitting, fixing accessories	1	Lot				
Power Transformer & Aux. Transformer							
1C1	132/33kV, 50/75(ONAN/ONAF) MVA,, three phase power transformer	2	Sets				
1C2	33/.415kV, 200kVA, three phase auxilliary transformer	2	Sets				
Control, Protection, SAS & Metering							
132kV Circuits							
1D1	Control, Protection, metering and SAS for 132kV overhead line bays	2	Sets				
1D2	Control, Protection, metering and SAS for 132kV Transformer bays	2	Sets				
1D3	Control, Protection, metering and SAS for 132kV Bus-tie bay	1	Set				
1D4	Busbar protection system for complete 132kV bus	1	Lot				
1D5	Tarrif metering for two line bays and two transformer bays	1	Lot				
33kV Circuit							
1D6	Control, Protection, metering and SAS for 33kV side of Transformer bays	2	sets				
1D7	Tariff metering for two Transformer bays	1	Lot				
Surge Arrester,Conductor,Steel Structure,Insulator & Hardware & Fittings:							
1E1	Single phase surge arrestor, 120kV, 10kA Discharge Current, Class III, gapless metaloxide	12	nos.				
1E2	Flexible Conductor, clamps & connectors for Jackbus,Jumper & equipment Connection						
i)	_Flexible Conductor for jackbus, jumper, equipment connections	1	Lot				
ii)	_Clamps & Connectors	1	Lot				
1E3	Insulator & Fittings						
i)	_Insulator	1	Lot				
ii)	_Fittings	1	Lot				
1E4	Steel structures & cable tray						
i)	_Gantry Column including nut&bolts	1	Lot				
ii)	_Gantry beam including nut&bolts	1	Lot				
iii)	_Equipment support structures including nut&bolts	1	Lot				
iv)	_Cable tray including fitting, fixing accessories	1	Lot				
Multicore Cables							
1F1	Multicore, XLPE, LV Power & Control Cable for control, protection, SAS, metering & power circuits						
i)	_LV Control Cable	1	Lot				
ii)	_LV Power Cable	1	Lot				
Earthing & Lightning Protection							
1G1	Earthing and Lightning Protection System						
i)	_Earthing system for complete substation	1	Lot				
ii)	_Lighting Protection System for complete substation	1	Lot				

Item	Description	Qty	Unit	Unit Price [1]		Total Price [1]	
				Foreign Curreny Portion	Local Curreny Portion	Foreign Curreny Portion	Local Curreny Portion
		(1)		(2)	(3)	(1) x (3)	(1) x (2)
Batteries, Chargers & DC Distribution							
1H1	Complete 110V Battery Bank with chargers and DC Distribution Board						
i)	_Battery Banks two sets	2	Sets				
ii)	_Charger two sets	2	Sets				
iii)	_110V DC Distribution panel	1	Set				
iv)	_110V/48V DC DC Converter,1kVA	2	Sets				
v)	_48V DC Disatribution Panel	1	Set				
iv)	_UPS system for SAS panels, 3kVA	2	sets				
LVAC Distribution							
1I1	Complete LVAC Distribution System with necessary DB, MCB, Meters etc	1	Lot				
1I2	Tariff metering for two station auxilliary Transformer	1	Lot				
1I3	Outdoor weatherproof 3-phase,4 wire, 125A Socket outlet and plug	1	Nos				
Civil Works,Building and Foundation		1	Lot				
1J1	Complete Land development with carried earthfilling	40500	Cubic Meter				
1J2	Complete outdoor civil works						
i)	_Outdoor gantry foundation 132kV switchyard	1	Lot				
ii)	_Outdoor gantry foundation 33kV switchyard	1	Lot				
iii)	_Outdoor equipment foundation 132kV switchyard	1	Lot				
iv)	_Outdoor equipment foundation 33kV switchyard	1	Lot				
v)	_Transformer foundation including oilpit & carrage way	1	Lot				
vi)	_Blast wall	1	Lot				
vii)	_Security Boundary Wall	1	Lot				
viii)	_Substation Main gate	1	Lot				
ix)	_Barbed Wire Fencing	1	Lot				
x)	_Approach raod	1	Lot				
xi)	_Internal road	1	Lot				
xii)	_Surface drain	1	Lot				
xiii)	_Cable Trench	1	Lot				
xiv)	_Switchyard surface finishing	1	Lot				
xv)	_Gravel laying	1	Lot				
xvi)	_Septic tank, sowak way	1	Lot				
xvii)	_Pump house including deep tubewell, motor, pump, water reservaoir, water pipe line etc.	1	Lot				
xviii)	_Gurd house, sentry post, car port	1	Lot				
1J3	Complete civil works for two storied control building						
i)	_Foundation works	1	Lot				
ii)	_Super structures	1	Lot				
iii)	_All finish works	1	Lot				
1J4	Complete civil works for three storied dormitory building						
i)	_Foundation works(six storied)	1	Lot				
ii)	_Super structures	1	Lot				
iii)	_All finish works	1	Lot				
1K1	**Building Lighting, Small Power, Air Conditioning & Ventilation**						
i)	_BuildingSmall power	1	Lot				
ii)	_Building Lighting & emergency DC lighting	1	Lot				
iii)	_Building airconditioning & ventilation system	1	Lot				
1K2	**Outdoor switchyard Lighting, Small Power**						
i)	_OutdoorSmall power	1	Lot				
ii)	_Outdoor Lighting	1	Lot				
Fiber Optic Multiplexer Equipment for Teleprotection and Communication							
1L1.1	Fibre Optic Multipexer Equipment for communication & protection	1	Lot				
1L1.2	Hot line telephone system including phone sets, connection cords etc.	1	Lot				
Underground opticale fiber cable with Terminal box.							
1L.2.1	Underground Fibre Optic cable(24 cores)	1	Lot				
1L.2.2	Outdoor termination box, indoor MDF & pigtail cables	1	Lot				
Integration with existing SCADA, NLDC system							
1M1	Integration with existing SCADA/NLDC system.	1	Lot				
Mandatory Spares, tools & test equipment							
1N1	**132 kV GIS**						
i)	Arcing contact of CB	2	nos.				
ii)	Moving contact of CB	2	nos.				
iii)	Fixed contact of CB	2	nos.				
iv)	Moving contact of DS & ES	2	nos.				
v)	Fixed contact of DS & ES	2	nos.				
vi)	Blast nozzle	2	nos.				
vii)	CB Closing coil	6	nos.				
viii)	CB Tripping coil	6	nos.				
ix)	Motor for CB operating mechanism	1	nos.				

Item	Description	Qty	Unit	Unit Price [1]		Total Price [1]	
				Foreign Curreny Portion	Local Curreny Portion	Foreign Curreny Portion	Local Curreny Portion
		(1)		(2)	(3)	(1) x (3)	(1) x (2)
x)	Dashpot for CB operating mechanism	2	nos.				
xi)	Motor for DS & ES drive	2	nos.				
xii)	Supporting insulator	2	nos.				
xiii)	Supporting insulator with barrier	2	nos.				
xiv)	Indicating lamps (20% of total quantities installed)	1	nos.				
xv)	Indicating lamp covers (10% of total quantities installed)	1	nos.				
xvi)	Set of gaskets (10% of total quantities installed)	1	nos.				
xvii)	Heater	2	nos.				
xviii)	Humidity stat and thermostat	2	nos.				
xix)	Gas pressure monitor	2	nos.				
xx)	Gas pressure switch	2	nos.				
xxi)	Gas pressure gauge	2	nos.				
xxii)	Gas pressure relief device	2	nos.				
1N2	**132/33 kV Power Transformer**						
i)	Transformer 132 kV bushings (For 75MVA Transformer)	1	no.				
ii)	Ttransformer 33 kV bushings (For 75MVA Transformer)	2	nos.				
iii)	Neutral bushing	2	nos.				
iv)	Winding temperature indicating device	2	nos.				
v)	Spare transformer oil of 15% of total oil supplied	1	Lot				
vi)	Set of gaskets (10% of total quantities installed)	1	nos.				
vii)	Silica gel (100% of total quantities installed)	1	nos.				
viii)	Set of special tools, gauges and spanners	1	set				
ix)	Transformer oil treatment plant, 6000 Liters per hour	1	set				
x)	120 kV Surge Arrester	3	nos.				
1N.3	**33 kV SWITCHGEAR**						
i)	Current Transformer, single phase 3-core,	2	nos.				
ii)	Closing coils for CB	2	nos.				
iii)	Tripping coils for CB	2	nos.				
iv)	Motor for 33 kV circuit breaker operating mechanism	1	no.				
v)	Surge Arrester, single phase	2	nos.				
1N4	**Protection**						
i)	Line distance relay with complete protection elements	1	set				
ii)	Transformer differential relay with complete REF function	1	set				
iii)	overcurrent and earth fault relay	1	set				
iv)	Tripping relay (electrical reset)	3	nos.				
v)	Bay control unit	1	set				
vi)	Trip Circuit Supervision relay, 3phase	1	set				
vii)	RelayTest block & plug	1	set				
viii)	Bulbs for annunciator	10	nos.				
1N5	**Test Equipment**						
i)	SF6 Gas Handling Equipment	1	set				
ii)	SF6 Gas reservoir	1	set				
iv)	SF6 Gas leak Detector	1	set				
v)	Partial Discharge monitoring Device for GIS	1	set				
vi)	Contact resistance measurement test set (suitable for measurement down to 1 µ	1	set				
vii)	5 kV insulation resistance test set (range 0.5 –1.0 - 2.5 - 5 kV)	1	set				
viii)	Earth resistance test set (range 10-100-1000 ohm: min scale division 0.01 ohm)	1	set				
ix)	Clip-on mA meter (for spill current)	1	set				
x)	Portable Earthing lead including glass fiber stick	1	set				
xi)	AVO Meter, digital	1	set				
1N.5	**Test Equipment**						
i)	SF6 Gas Handling Equipment incld. Storage tank	1	set				
ii)	SF6 Gas leak Detector	1	set				
iii)	Partial Discharge monitoring Device for GIS	1	set				
iv)	Contact resistance measurement test set (suitable for measurement down to 1 µ	1	set				
v)	5 kV insulation resistance test set (range 0.5 –1.0 - 2.5 - 5 kV)	1	set				
vi)	Earth resistance test set (range 10-100-1000 ohm: min scale division 0.01 ohm)	1	set				
vii)	Clip-on mA meter (for spill current)	1	set				
viii)	AVO Meter, digital	1	set				
Total Price for Dhamrai 132/33kV GIS Substation							
(carried to Schedule -B5: Grand Summary)							
Schedule B1. 2: Shyampur 230/132 kV GIS Substation							
230kV Indoor Type Gas Insulated Switchgear(GIS).							

Item	Description	Qty	Unit	Unit Price [1]		Total Price [1]	
				Foreign Curreny Portion	Local Curreny Portion	Foreign Curreny Portion	Local Curreny Portion
		(1)		(2)	(3)	(1) x (3)	(1) x (2)
2A1	230kV Overhead line circuit bay,1600A	4	Sets				
2A2	230kV Transformer circuit bay,1600A						
i)	GIS bay	2	Sets				
ii)	GIS bus duct	2	Sets				
iii)	Air Insulated Bushing	2	Sets				
2A3	230kV Bus tie circuit bay,2000A	1	Set				
2A4	230kV Main busbar(double busbar) ,2000A, with VT & ES	1	Lot				
2A4	230kV Main busbar(double busbar) ,2000A, with VT & ES	1	Lot				
132kV Indoor Type Gas Insulated Switchgear(GIS).							
2B1	132kV Overhead line circuit bay,1250A	6	Sets				
2B2	132kV Transformer circuit bay,2000A	2	Sets				
2B3	132kV Bus tie circuit bay,3000A	1	Set				
2B4	132kV Main busbar(double busbar),3000A, with VT & ES	1	Lot				
33kV Air Insulated Switchgear(AIS) and Connection:							
2C1	Vacuum Circuit breaker(VCB), live tank, gang operating , 800A	2	Sets				
2C2	Disconnector, single verticle break, 800A, gantry mounted	2	Sets				
2C3	Single phase current transformer, post type,3-core	6	Nos.				
2C4	Single phase, post type, metal oxide surge arrester, 30kV	6	Nos.				
2C5	Flexible Conductor, clamps & connectors,Jumper & equipment						
i)	_Flexible Conductor for jumper, equipment connections	1	Lot				
ii)	_Clamps & Connectors	1	Lot				
2C6	Post Insulator	6	Nos.				
2C7	Steel structures & cable tray						
i)	_Equipment support structures including nut&bolts	1	Lot				
ii)	_Cable tray including fitting, fixing accessories	1	Lot				
Power Transformer & Aux. Transformer							
2D1	230/138/33kV, 225/300(ONAN/ONAF) MVA, three phase Auto	2	Sets				
2D2.1	33/0.415kV, 300kVA, three phase earthing transformer	2	Sets				
2D2.2	deleted						
2D2.3	Fire Prevention & Extinguishing System of two main transformer(Nitrogen Injection type)	1	Lot				
Control, Protection, SAS & Metering							
230kV Circuits							
2E1	Control, Protection, metering and SAS for 230kV overhead line bays	4	Sets				
2E2	Control, Protection, metering and SAS for 230kV side of Auto	2	Sets				
2E3	Control, Protection, metering and SAS for 230kV Bus-tie bay	1	Set				
2E4	Busbar protection system for complete 230kV bus	1	Lot				
2E5	Tarrif metering for four line bays and two transformer bays	1	Lot				
132kV Circuits							
2F1	Control, Protection, metering and SAS for 132kV overhead line bays	6	Sets				
2F2	Control, Protection, metering and SAS for 132kV side of auto transformer	2	Sets				
2F3	Control, Protection, metering and SAS for 132kV Bus-tie bay	1	Set				
2F4	Busbar protection system for complete 132kV bus	1	Lot				
2F5	Tarrif metering for six line bays and two transformer bays	1	Lot				
33kV Circuit							
2G1	Control, Protection, metering for 33/0.4kV Auxilliary Transformers.	2	sets				
Power Cables & Cable Termination,Surge Arrester,Conductor,Steel Structure,Insulator & Hardware & Fittings:							
230kV Circuits							
2H1	230kV, XLPE 2000sqmm, Cu Power cable & termination						
i)	Power cable	720	meter				
ii)	Outdoor type Cable Sealing End per phasewith required necessary accessories	12	Sets				
iii)	Indoor type Cable termination(GIS bay termination) per phasewith required necessary accessories.	18	Sets				
2H2	Single phase surge arrestor, 186kV, 10kA Discharge Current, Class III, gapless metaloxide	18	nos.				
2H3	Flexible Conductor, clamps & connectors for Jackbus,Jumper & equipment Connection						
i)	_Flexible Conductor for jackbus, jumper, equipment connections	1	Lot				
ii)	_Clamps & Connectors	1	Lot				
2H4	Insulator & Fittings						
i)	_Insulator	1	Lot				
ii)	_Fittings	1	Lot				
2H5	Steel structures & cable tray						
i)	_Gantry Column including nut&bolts	1	Lot				
ii)	_Gantry beam including nut&bolts	1	Lot				
iii)	_Equipment support structures including nut&bolts	1	Lot				
iv)	_Cable tray including fitting, fixing accessories	1	Lot				
132kV Circuits							
2H6	132kV, XLPE 1000sqmm, Cu Power cable & termination						
i)	Power cable	1680	meter				
ii)	Outdoor type Cable Sealing End per phasewith required necessary accessories for line bays	12	Sets				
iii)	Indoor type Cable termination(GIS bay termination) per phase with required necessary accessories for line bays	12	Sets				

Item	Description	Qty	Unit	Unit Price [1]		Total Price [1]	
				Foreign Curreny Portion (2)	Local Curreny Portion (3)	Foreign Curreny Portion (1) x (3)	Local Curreny Portion (1) x (2)
iv)	Outdoor type Cable Sealing End with required necessary accessories for Tr bays (per each cable)	12	Sets				
v)	Indoor type Cable termination(GIS bay termination) per phase with required necessary accessories for Tr bays (per each cable)	12	Sets				
2H7	Single phase surge arrestor, 120kV, 10kA Discharge Current, Class III, gapless metaloxide	18	nos.				
2H8	Flexible Conductor, clamps & connectors for Jackbus,Jumper & equipment Connection						
i)	_Flexible Conductor for jackbus, jumper, equipment connections	1	Lot				
ii)	_Clamps & Connectors	1	Lot				
2H9	Insulator & Fittings						
i)	_Insulator	1	Lot				
ii)	_Fittings	1	Lot				
2H10	Steel structures & cable tray						
i)	_Gantry Column including nut&bolts	1	Lot				
ii)	_Gantry beam including nut&bolts	1	Lot				
iii)	_Equipment support structures including nut&bolts	1	Lot				
iv)	_Cable tray including fitting, fixing accessories	1	Lot				
33kV Circuits							
2H11.1	33kV, XLPE Cu Power cable, 185sqmm	150	meter				
2H11.2	33kV Cable termination with required necessary accessories.	12	Nos.				
Multicore Cables							
2I1	Multicore, XLPE, LV Power & Control Cable for control, protection, SAS, metering & power circuits						
i)	_LV Control Cable	1	Lot				
ii)	_LV Power Cable	1	Lot				
Earthing & Lightning Protection							
2J1	Earthing and Lightning Protection System						
i)	_Earthing system for complete substation incld. GIS building	1	Lot				
ii)	_Lightning Protection System for complete substation include. GIS	1	Lot				
Batteries, Chargers & DC Distribution							
2K1	Complete 110V Battery Bank with chargers and DC Distribution Board						
i)	_Battery Banks	2	Sets				
ii)	_Charger	2	Sets				
iii)	_110V DC Distribution panel	1	Set				
iv)	_110V/48V DC DC Converter,1.5kVA	2	Sets				
v)	_48V DC Disatribution Panel	1	Set				
vi)	_UPS system for SAS panels, 3kVA	2	sets				
LVAC Distribution							
2L1	Complete LVAC Distribution System with necessary DB, MCB, Meters	1	Lot				
2L2	Tariff metering for two station auxilliary Transformer	1	Lot				
2L3	Outdoor weatherproof 3-phase,4 wire, 125A Socket outlet and plugs.	1	Nos				
Civil Works,Building and Foundation		1	Lot				
2M1	Complete Land development with carried earthfilling	24300	Cubic Meter				
2M2	Complete outdoor civil works						
i)	_Outdoor gantry foundation 230kV switchyard	1	Lot				
ii)	_Outdoor gantry foundation 132kV switchyard	1	Lot				
iii)	_Outdoor gantry foundation 33kV switchyard	1	Lot				
iv)	_Outdoor equipment foundation 230kV switchyard	1	Lot				
v)	_Outdoor equipment foundation 132kV switchyard	1	Lot				
vi)	_Outdoor equipment foundation 33kV switchyard	1	Lot				
vii)	_Transformer foundation including oilpit & carrage way	1	Lot				
viii)	_Blast wall	1	Lot				
ix)	_Security Boundary Wall	1	Lot				
x)	_Substation Main gate	1	Lot				
xi)	_Barbed Wire Fencing	1	Lot				
xii)	_Approach raod	1	Lot				
xiii)	_Internal road	1	Lot				
xiv)	_Surface drain	1	Lot				
xv)	_Cable Trench	1	Lot				
xvi)	_Switchyard surface finishing	1	Lot				
xvii)	_Gravel laying	1	Lot				
xviii)	_Septic tank, sowak way	1	Lot				
xix)	_Pump house including deep tubewell, motor, pump, water reservaoir, water pipe line etc.	1	Lot				
xx)	_Gurd house, sentry post, car port	1	Lot				
2M3	Complete civil works for GIS & control room building						
i)	_Foundation works	1	Lot				
ii)	_Super structures	1	Lot				
iii)	_All finish works	1	Lot				

Item	Description	Qty	Unit	Unit Price [1]		Total Price [1]	
				Foreign Curreny Portion	Local Curreny Portion	Foreign Curreny Portion	Local Curreny Portion
		(1)		(2)	(3)	(1) x (3)	(1) x (2)
iv)	_EOT crane (5 Ton)	1	Lot				
2N1	**Building Lighting, Small Power, Air Conditioning & Ventilation**						
i)	_BuildingSmall power	1	Lot				
ii)	_Building Lighting & emergency DC lighting	1	Lot				
iii)	_Building airconditioning & ventilation system	1	Lot				
2N2	**Outdoor switchyard Lighting, Small Power**						
i)	_OutdoorSmall power	1	Lot				
ii)	_Outdoor Lighting	1	Lot				
Digital Fault & Disturbance Recorder(DFDR)							
2N3.1	DFDR complete for all 230kV & 132kV bays for Shyampur new	1	Lot				
2N3.2	DFDR complete for all 230kV & 132kV bays for existing Old Airport & Tongi Substation	1	Lot				
2N3.3	DFDR complete for all 230kV & 132kV bays for existing Tongi Substation	1	Lot				
Fiber Optic Multiplexer Equipment for Teleprotection and Communication							
2O1	Fibre Optic Multipexer Equipment for communication & protection	1	Lot				
2O2	Hot line telephone system including phone sets, connection cords etc.	1	Lot				
Underground opticale fiber cable with Terminal box.							
2O3	Underground Fibre Optic cable(48 cores)	1	Lot				
2O4	Outdoor termination box, indoor MDF & pigtail cables	1	Lot				
Integration with existing SCADA, NLDC system							
2P1	Integration with existing SCADA/NLDC system.	1	Lot				
Mandatory Spares, tools & test equipment							
2Q1	**230 kV GIS**						
i)	Set of gas filling equipment and 3 bottles of 48kg of SF6	1	nos.				
ii)	Arcing contact of CB	2	nos.				
iii)	Moving contact of CB	2	nos.				
iv)	Fixed contact of CB	2	nos.				
v)	Moving contact of DS & ES	2	nos.				
vi)	Fixed contact of DS & ES	2	nos.				
vii)	Blast nozzle	2	nos.				
viii)	CB Closing coil	6	nos.				
ix)	CB Tripping coil	6	nos.				
x)	Motor for CB operating mechanism	1	nos.				
xi)	Dashpot for CB operating mechanism	2	nos.				
xii)	Motor for DS & ES drive	2	nos.				
xiii)	Supporting insulator	2	nos.				
xiv)	Supporting insulator with barrier	2	nos.				
xv)	Indicating lamps (20% of total quantities installed)	1	nos.				
xvi)	Indicating lamp covers (10% of total quantities installed)	1	nos.				
xvii)	Set of gaskets (10% of total quantities installed)	1	nos.				
xviii)	Heater	2	nos.				
xix)	Humidity stat and thermostat	2	nos.				
xx)	Gas pressure monitor	2	nos.				
xxi)	Gas pressure switch	2	nos.				
xxii)	Gas pressure gauge	2	nos.				
xxiii)	Gas pressure relief device	2	nos.				
xxiv)	Gas sniffer	1	nos.				
xxv)	Gas hygrometer	1	nos.				
2Q2	**132 kV GIS**						
i)	Arcing contact of CB	2	nos.				
ii)	Moving contact of CB	2	nos.				
iii)	Fixed contact of CB	2	nos.				
iv)	Moving contact of DS & ES	2	nos.				
v)	Fixed contact of DS & ES	2	nos.				
vi)	Blast nozzle	2	nos.				
vii)	CB Closing coil	6	nos.				
viii)	CB Tripping coil	6	nos.				
ix)	Motor for CB operating mechanism	1	nos.				
x)	Dashpot for CB operating mechanism	2	nos.				
xi)	Motor for DS & ES drive	2	nos.				
xii)	Supporting insulator	2	nos.				
xiii)	Supporting insulator with barrier	2	nos.				
xiv)	Indicating lamps (20% of total quantities installed)	1	nos.				
xv)	Indicating lamp covers (10% of total quantities installed)	1	nos.				
xvi)	Set of gaskets (10% of total quantities installed)	1	nos.				
xvii)	Heater	2	nos.				
xviii)	Humidity stat and thermostat	2	nos.				
xix)	Gas pressure monitor	2	nos.				
xx)	Gas pressure switch	2	nos.				
xxi)	Gas pressure gauge	2	nos.				

Item	Description	Qty	Unit	Unit Price [1]		Total Price [1]	
				Foreign Curreny Portion	Local Curreny Portion	Foreign Curreny Portion	Local Curreny Portion
		(1)		*(2)*	*(3)*	*(1) x (3)*	*(1) x (2)*
xxii)	Gas pressure relief device	2	nos.				
2Q3	**Auto Transformer & Switchgear**						
i)	Transformer 230 kV bushings (For 300MVA Transformer)	1	no.				
ii)	Ttransformer 138 kV bushings (For 300MVA Transformer)	2	nos.				
iii)	33 kV bushing	2	nos.				
iv)	Neutral bushing	2	nos.				
v)	Winding temperature indicating device	2	nos.				
vi)	Set of gaskets (10% of total quantities installed)	1	nos.				
vii)	Silica gel (100% of total quantities installed)	1	nos.				
viii)	Set of special tools, gauges and spanners	1	set				
ix)	Transformer oil treatment plant, 6000 Liters per hour	1	set				
x)	186kV Surge arrester	3	nos.				
xi)	120 kV Surge Arrester	3	nos.				
xii)	245kV, Cable Sealing End (for XLPE, 2000sqmm cu cable) incld. necessary all accessories	2	sets				
xii)	145kV, Cable Sealing End (for XLPE, 1000sqmm cu cable) incld. necessary all accessories	2	sets				
2Q4	**Protection**						
i)	Line distance relay with complete protection elements	1	set				
ii)	Transformer differential relay with complete REF function	1	set				
iii)	overcurrent and earth fault relay	1	set				
iv)	Tripping relay (electrical reset)	3	nos.				
v)	Bay control unit	1	set				
vi)	Trip Circuit Supervision relay, 3phase	1	set				
vii)	Relay test block & plug	3	sets				
viii)	Bulbs for annunciator	10	nos.				
2Q5	**Test Equipment**						
i)	SF6 Gas Handling Equipment including storage tank	1	set				
ii)	SF6 Gas leak Detector	1	set				
iv)	Partial Discharge monitoring Device for GIS	1	set				
v)	Contact resistance measurement test set (suitable for measurement down to 1 µ ohm at 200A d.c.)	1	set				
vi)	5 kV insulation resistance test set (range 0.5 –1.0 - 2.5 - 5 kV)	1	set				
vii)	Earth resistance test set (range 10-100-1000 ohm: min scale division 0.01 ohm)	1	set				
viii)	Clip-on mA meter (for spill current)	1	set				
ix)	Portable Earthing lead including glass fiber stick	1	set				
x)	AVO Meter, digital	1	set				
Total Price for Shyampur 230/132kV GIS Substation							
(carried to Schedule -B5: Grand Summary)							
Total Schedule B3 (carried to Schedule B5 Grand Summary)							

Name of Bidder _____

[1] Specify currency in accordance with specifications in Bid Data Sheet under ITB 18.1.

Signature of Bidder _____

Schedules of Rates and Prices

Schedule_B4 -Installation & Other Services

Schedule B4. 1: Dhamrai 132/33 kV GIS Substation

Item	Description	Qty (1)	Unit	Unit Price [1] Foreign Curreny Portion (2)	Unit Price [1] Local Curreny Portion (3)	Total Price [1] Foreign Curreny Portion (1) x(2)	Total Price [1] Local Curreny Portion (1) x (3)
132kV Outdoor Type Gas Insulated Switchgear(GIS).							
1A1	132kV Overhead line circuit bay,1250A						
i)	_GIS for 132kV Overhead line circuit bay	2	Sets				
ii)	_GIS bus duct	2	Sets				
iii)	_Air Insulated bushing	2	Sets				
1A2	132kV Transformer circuit bay,1250A						
i)	_GIS for 132kV Transformer circuit bay	2	Sets				
ii)	_GIS bus duct	2	Sets				
iii)	_Air Insulated bushing	2	Sets				
1A3	132kV Bus tie circuit bay,3000A	1	Set				
1A4	132kV Main busbar(double busbar) ,3000A, with VT & ES	1	Lot				
1A5	HV GIS Test Bushing	1	Set				
33kV Air Insulated Switchgear(AIS) and Connection:							
1B1	Vacuum Circuit breaker(VCB), live tank, gang operating , 2000A	2	Sets				
1B2	Disconnector, single verticle break, 2000A, gantry mounted	7	Sets				
1B3	Single phase current transformer, post type,3-core	6	Nos.				
1B4	Single phase voltage transformer, post type, 2-core	12	Nos.				
1B5	Single phase, post type, metal oxide surge arrester, 30kV	12	Nos.				
1B6	Flexible Conductor, clamps & connectors for busbar, Jackbus,Jumper & equipment Connection						
i)	_Flexible Conductor for jackbus, jumper, equipment connections	1	Lot				
ii)	_Flexible Conductor for main bus	1	Lot				
iii)	_Clamps & Connectors	1	Lot				
1B.7	Insulator & Fittings						
i)	_Insulator	1	Lot				
ii)	_Fittings	1	Lot				
1B.8	Steel structures & cable tray						
i)	_Gantry Column including nut&bolts	1	Lot				
ii)	_Gantry beam including nut&bolts	1	Lot				
iii)	_Equipment support structures including nut&bolts	1	Lot				
iv)	_Cable tray including fitting, fixing accessories	1	Lot				
Power Transformer & Aux. Transformer							
1C1	132/33kV, 50/75(ONAN/ONAF) MVA,, three phase power transformer	2	Sets				
1C2	33/.415kV, 200kVA, three phase auxilliary transformer	2	Sets				
Control, Protection, SAS & Metering							
132kV Circuits							
1D1	Control, Protection, metering and SAS for 132kV overhead line bays	2	Sets				
1D2	Control, Protection, metering and SAS for 132kV Transformer bays	2	Sets				
1D3	Control, Protection, metering and SAS for 132kV Bus-tie bay	1	Set				
1D4	Busbar protection system for complete 132kV bus	1	Lot				
1D5	Tarrif metering for two line bays and two transformer bays	1	Lot				
33kV Circuit							
1D6	Control, Protection, metering and SAS for 33kV side of Transformer bays	2	sets				
1D7	Tariff metering for two Transformer bays	1	Lot				
Surge Arrester,Conductor,Steel Structure,Insulator & Hardware & Fittings:							
1E1	Single phase surge arrestor, 120kV, 10kA Discharge Current, Class III, gapless metaloxide	12	nos.				
1E2	Flexible Conductor, clamps & connectors for Jackbus,Jumper & equipment Connection						
i)	_Flexible Conductor for jackbus, jumper, equipment connections	1	Lot				
ii)	_Clamps & Connectors	1	Lot				
1E3	Insulator & Fittings						
i)	_Insulator	1	Lot				
ii)	_Fittings	1	Lot				
1E4	Steel structures & cable tray						
i)	_Gantry Column including nut&bolts	1	Lot				
ii)	_Gantry beam including nut&bolts	1	Lot				
iii)	_Equipment support structures including nut&bolts	1	Lot				
iv)	_Cable tray including fitting, fixing accessories	1	Lot				
Multicore Cables							
1F1	Multicore, XLPE, LV Power & Control Cable for control, protection, SAS, metering & power circuits						
i)	_LV Control Cable	1	Lot				
ii)	_LV Power Cable	1	Lot				
Earthing & Lightning Protection							

Item	Description	Qty (1)	Unit	Unit Price [1] Foreign Curreny Portion (2)	Unit Price [1] Local Curreny Portion (3)	Total Price [1] Foreign Curreny Portion (1) x(2)	Total Price [1] Local Curreny Portion (1) x (3)
1G1	Earthing and Lightning Protection System						
i)	_Earthing system for complete substation	1	Lot				
ii)	_Lighting Protection System for complete substation	1	Lot				
Batteries, Chargers & DC Distribution							
1H1	Complete 110V Battery Bank with chargers and DC Distribution Board						
i)	_Battery Banks two sets	2	Sets				
ii)	_Charger two sets	2	Sets				
iii)	_110V DC Distribution panel	1	Set				
iv)	_110V/48V DC DC Converter,1kVA	2	Sets				
v)	_48V DC Disatribution Panel	1	Set				
iv)	_UPS system for SAS panels, 3kVA	2	sets				
LVAC Distribution							
1I1	Complete LVAC Distribution System with necessary DB, MCB, Meters etc	1	Lot				
1I2	Tariff metering for two station auxilliary Transformer	1	Lot				
1I3	Outdoor weatherproof 3-phase,4 wire, 125A Socket outlet and plug	1	Nos				
Civil Works,Building and Foundation		1	Lot				
1J1	Complete Land development with carried earthfilling	40500	Cubic Meter				
1J2	Complete outdoor civil works						
i)	_Outdoor gantry foundation 132kV switchyard	1	Lot				
ii)	_Outdoor gantry foundation 33kV switchyard	1	Lot				
iii)	_Outdoor equipment foundation 132kV switchyard	1	Lot				
iv)	_Outdoor equipment foundation 33kV switchyard	1	Lot				
v)	_Transformer foundation including oilpit & carrage way	1	Lot				
vi)	_Blast wall	1	Lot				
vii)	_Security Boundary Wall	1	Lot				
viii)	_Substation Main gate	1	Lot				
ix)	_Barbed Wire Fencing	1	Lot				
x)	_Approach raod	1	Lot				
xi)	_Internal road	1	Lot				
xii)	_Surface drain	1	Lot				
xiii)	_Cable Trench	1	Lot				
xiv)	_Switchyard surface finishing	1	Lot				
xv)	_Gravel laying	1	Lot				
xvi)	_Septic tank, sowak way	1	Lot				
xvii)	_Pump house including deep tubewell, motor, pump, water reservaoir, water pipe line etc.	1	Lot				
xviii)	_Gurd house, sentry post, car port	1	Lot				
1J3	Complete civil works for two storied control building						
i)	_Foundation works	1	Lot				
ii)	_Super structures	1	Lot				
iii)	_All finish works	1	Lot				
1J4	Complete civil works for three storied dormitory building						
i)	_Foundation works(six storied)	1	Lot				
ii)	_Super structures	1	Lot				
iii)	_All finish works	1	Lot				
1K1	**Building Lighting, Small Power, Air Conditioning & Ventilation**						
i)	_BuildingSmall power	1	Lot				
ii)	_Building Lighting & emergency DC lighting	1	Lot				
iii)	_Building airconditioning & ventilation system	1	Lot				
1K2	**Outdoor switchyard Lighting, Small Power**						
i)	_OutdoorSmall power	1	Lot				
ii)	_Outdoor Lighting	1	Lot				
Fiber Optic Multiplexer Equipment for Teleprotection and Communication							
1L1.1	Fibre Optic Multipexer Equipment for communication & protection	1	Lot				
1L1.2	Hot line telephone system including phone sets, connection cords etc.	1	Lot				
Underground opticale fiber cable with Terminal box.							
1L.2.1	Underground Fibre Optic cable(24 cores)	1	Lot				
1L.2.2	Outdoor termination box, indoor MDF & pigtail cables	1	Lot				
Integration with existing SCADA, NLDC system							
1M1	Integration with existing SCADA/NLDC system.	1	Lot				
Mandatory Spares, tools & test equipment							
1N1	**132 kV GIS**						
i)	Arcing contact of CB	2	nos.				
ii)	Moving contact of CB	2	nos.				
iii)	Fixed contact of CB	2	nos.				
iv)	Moving contact of DS & ES	2	nos.				
v)	Fixed contact of DS & ES	2	nos.				
vi)	Blast nozzle	2	nos.				

Item	Description	Qty (1)	Unit	Unit Price [1] Foreign Curreny Portion (2)	Unit Price [1] Local Curreny Portion (3)	Total Price [1] Foreign Curreny Portion (1) x(2)	Total Price [1] Local Curreny Portion (1) x (3)
vii)	CB Closing coil	6	nos.				
viii)	CB Tripping coil	6	nos.				
ix)	Motor for CB operating mechanism	1	nos.				
x)	Dashpot for CB operating mechanism	2	nos.				
xi)	Motor for DS & ES drive	2	nos.				
xii)	Supporting insulator	2	nos.				
xiii)	Supporting insulator with barrier	2	nos.				
xiv)	Indicating lamps (20% of total quantities installed)	1	nos.				
xv)	Indicating lamp covers (10% of total quantities installed)	1	nos.				
xvi)	Set of gaskets (10% of total quantities installed)	1	nos.				
xvii)	Heater	2	nos.				
xviii)	Humidity stat and thermostat	2	nos.				
xix)	Gas pressure monitor	2	nos.				
xx)	Gas pressure switch	2	nos.				
xxi)	Gas pressure gauge	2	nos.				
xxii)	Gas pressure relief device	2	nos.				
1N2	**132/33 kV Power Transformer**						
i)	Transformer 132 kV bushings (For 75MVA Transformer)	1	no.				
ii)	Ttransformer 33 kV bushings (For 75MVA Transformer)	2	nos.				
iii)	Neutral bushing	2	nos.				
iv)	Winding temperature indicating device	2	nos.				
v)	Spare transformer oil of 15% of total oil supplied	1	Lot				
vi)	Set of gaskets (10% of total quantities installed)	1	nos.				
vii)	Silica gel (100% of total quantities installed)	1	nos.				
viii)	Set of special tools, gauges and spanners	1	set				
ix)	Transformer oil treatment plant, 6000 Liters per hour	1	set				
x)	120 kV Surge Arrester	3	nos.				
1N.3	**33 kV SWITCHGEAR**						
i)	Current Transformer, single phase 3-core,	2	nos.				
ii)	Closing coils for CB	2	nos.				
iii)	Tripping coils for CB	2	nos.				
iv)	Motor for 33 kV circuit breaker operating mechanism	1	no.				
v)	Surge Arrester, single phase	2	nos.				
1N4	**Protection**						
i)	Line distance relay with complete protection elements	1	set				
ii)	Transformer differential relay with complete REF function	1	set				
iii)	overcurrent and earth fault relay	1	set				
iv)	Tripping relay (electrical reset)	3	nos.				
v)	Bay control unit	1	set				
vi)	Trip Circuit Supervision relay, 3phase	1	set				
vii)	RelayTest block & plug	1	set				
viii)	Bulbs for annunciator	10	nos.				
1N5	**Test Equipment**						
i)	SF6 Gas Handling Equipment	1	set				
ii)	SF6 Gas reservoir	1	set				
iv)	SF6 Gas leak Detector	1	set				
v)	Partial Discharge monitoring Device for GIS	1	set				
vi)	Contact resistance measurement test set (suitable for measurement down to 1 µ	1	set				
vii)	5 kV insulation resistance test set (range 0.5 –1.0 - 2.5 - 5 kV)	1	set				
viii)	Earth resistance test set (range 10-100-1000 ohm: min scale division 0.01 ohm)	1	set				
ix)	Clip-on mA meter (for spill current)	1	set				
x)	Portable Earthing lead including glass fiber stick	1	set				
xi)	AVO Meter, digital	1	set				
1N.5	**Test Equipment**						
i)	SF6 Gas Handling Equipment incld. Storage tank	1	set				
ii)	SF6 Gas leak Detector	1	set				
iii)	Partial Discharge monitoring Device for GIS	1	set				
iv)	Contact resistance measurement test set (suitable for measurement down to 1 µ ohm at 200A d.c.)	1	set				
v)	5 kV insulation resistance test set (range 0.5 –1.0 - 2.5 - 5 kV)	1	set				
vi)	Earth resistance test set (range 10-100-1000 ohm: min scale division 0.01 ohm)	1	set				
vii)	Clip-on mA meter (for spill current)	1	set				
viii)	AVO Meter, digital	1	set				
Total Price for Dhamrai 132/33kV GIS Substation							
(carried to Schedule -B5: Grand Summary)							
Schedule B1. 2: Shyampur 230/132 kV GIS Substation							
230kV Indoor Type Gas Insulated Switchgear(GIS).							
2A1	230kV Overhead line circuit bay,1600A	4	Sets				
2A2	230kV Transformer circuit bay,1600A						

Item	Description	Qty (1)	Unit	Unit Price [1] Foreign Curreny Portion (2)	Unit Price [1] Local Curreny Portion (3)	Total Price [1] Foreign Curreny Portion (1) x(2)	Total Price [1] Local Curreny Portion (1) x (3)
i)	GIS bay	2	Sets				
ii)	GIS bus duct	2	Sets				
iii)	Air Insulated Bushing	2	Sets				
2A3	230kV Bus tie circuit bay,2000A	1	Set				
2A4	230kV Main busbar(double busbar) ,2000A, with VT & ES	1	Lot				
2A5	HV GIS Test Bushing	1	set				
132kV Indoor Type Gas Insulated Switchgear(GIS).							
2B1	132kV Overhead line circuit bay,1250A	6	Sets				
2B2	132kV Transformer circuit bay,2000A	2	Sets				
2B3	132kV Bus tie circuit bay,3000A	1	Set				
2B4	132kV Main busbar(double busbar),3000A, with VT & ES	1	Lot				
33kV Air Insulated Switchgear(AIS) and Connection:							
2C1	Vacuum Circuit breaker(VCB), live tank, gang operating , 800A	2	Sets				
2C2	Disconnector, single verticle break, 800A, gantry mounted	2	Sets				
2C3	Single phase current transformer, post type,3-core	6	Nos.				
2C4	Single phase, post type, metal oxide surge arrester, 30kV	6	Nos.				
2C5	Flexible Conductor, clamps & connectors,Jumper & equipment Connection						
i)	_Flexible Conductor for jumper, equipment connections	1	Lot				
ii)	_Clamps & Connectors	1	Lot				
2C6	Post Insulator	6	Nos.				
2C7	Steel structures & cable tray						
i)	_Equipment support structures including nut&bolts	1	Lot				
ii)	_Cable tray including fitting, fixing accessories	1	Lot				
Power Transformer & Aux. Transformer							
2D1	230/138/33kV, 225/300(ONAN/ONAF) MVA, three phase Auto transformer	2	Sets				
2D2.1	33/0.415kV, 300kVA, three phase earthing transformer	2	Sets				
2D2.2	deleted						
2D2.3	Fire Prevention & Extinguishing System of two main transformer(Nitrogen Injection type)	1	Lot				
Control, Protection, SAS & Metering							
230kV Circuits							
2E1	Control, Protection, metering and SAS for 230kV overhead line bays	4	Sets				
2E2	Control, Protection, metering and SAS for 230kV side of Auto transformer bays	2	Sets				
2E3	Control, Protection, metering and SAS for 230kV Bus-tie bay	1	Set				
2E4	Busbar protection system for complete 230kV bus	1	Lot				
2E5	Tarrif metering for four line bays and two transformer bays	1	Lot				
132kV Circuits							
2F1	Control, Protection, metering and SAS for 132kV overhead line bays	6	Sets				
2F2	Control, Protection, metering and SAS for 132kV side of auto transformer bays	2	Sets				
2F3	Control, Protection, metering and SAS for 132kV Bus-tie bay	1	Set				
2F4	Busbar protection system for complete 132kV bus	1	Lot				
2F5	Tarrif metering for six line bays and two transformer bays	1	Lot				
33kV Circuit							
2G1	Control, Protection, metering for 33/0.4kV Auxilliary Transformers.	2	sets				
Power Cables & Cable Termination,Surge Arrester,Conductor,Steel Structure,Insulator & Hardware & Fittings:							
230kV Circuits							
2H1	230kV, XLPE 2000sqmm, Cu Power cable & termination						
i)	Power cable	720	meter				
ii)	Outdoor type Cable Sealing End per phasewith required necessary accessories	12	Sets				
iii)	Indoor type Cable termination(GIS bay termination) per phasewith required necessary accessories.	18	Sets				
2H2	Single phase surge arrestor, 186kV, 10kA Discharge Current, Class III, gapless metaloxide	18	nos.				
2H3	Flexible Conductor, clamps & connectors for Jackbus,Jumper & equipment Connection						
i)	_Flexible Conductor for jackbus, jumper, equipment connections	1	Lot				
ii)	_Clamps & Connectors	1	Lot				
2H4	Insulator & Fittings						
i)	_Insulator	1	Lot				
ii)	_Fittings	1	Lot				
2H5	Steel structures & cable tray						
i)	_Gantry Column including nut&bolts	1	Lot				
ii)	_Gantry beam including nut&bolts	1	Lot				
iii)	_Equipment support structures including nut&bolts	1	Lot				
iv)	_Cable tray including fitting, fixing accessories	1	Lot				
132kV Circuits							
2H6	132kV, XLPE 1000sqmm, Cu Power cable & termination						
i)	Power cable	1680	meter				

Item	Description	Qty (1)	Unit	Unit Price [1] Foreign Curreny Portion (2)	Unit Price [1] Local Curreny Portion (3)	Total Price [1] Foreign Curreny Portion (1) x(2)	Total Price [1] Local Curreny Portion (1) x (3)
ii)	Outdoor type Cable Sealing End per phasewith required necessary	12	Sets				
iii)	Indoor type Cable termination(GIS bay termination) per phase with	12	Sets				
iv)	Outdoor type Cable Sealing End with required necessary accessories	12	Sets				
v)	Indoor type Cable termination(GIS bay termination) per phase with	12	Sets				
2H7	Single phase surge arrestor, 120kV, 10kA Discharge Current, Class III,	18	nos.				
2H8	Flexible Conductor, clamps & connectors for Jackbus,Jumper &						
i)	_Flexible Conductor for jackbus, jumper, equipment connections	1	Lot				
ii)	_Clamps & Connectors	1	Lot				
2H9	Insulator & Fittings						
i)	_Insulator	1	Lot				
ii)	_Fittings	1	Lot				
2H10	Steel structures & cable tray						
i)	_Gantry Column including nut&bolts	1	Lot				
ii)	_Gantry beam including nut&bolts	1	Lot				
iii)	_Equipment support structures including nut&bolts	1	Lot				
iv)	_Cable tray including fitting, fixing accessories	1	Lot				
33kV Circuits							
2H11.1	33kV, XLPE Cu Power cable, 185sqmm	150	meter				
2H11.2	33kV Cable termination with required necessary accessories.	12	Nos.				
Multicore Cables							
2I1	Multicore, XLPE, LV Power & Control Cable for control, protection, SAS, metering & power circuits						
i)	_LV Control Cable	1	Lot				
ii)	_LV Power Cable	1	Lot				
Earthing & Lightning Protection							
2J1	Earthing and Lightning Protection System						
i)	_Earthing system for complete substation incld. GIS building	1	Lot				
ii)	_Lightning Protection System for complete substation include. GIS building	1	Lot				
Batteries, Chargers & DC Distribution							
2K1	Complete 110V Battery Bank with chargers and DC Distribution Board						
i)	_Battery Banks	2	Sets				
ii)	_Charger	2	Sets				
iii)	_110V DC Distribution panel	1	Set				
iv)	_110V/48V DC DC Converter,1.5kVA	2	Sets				
v)	_48V DC Disatribution Panel	1	Set				
vi)	_UPS system for SAS panels, 3kVA	2	sets				
LVAC Distribution							
2L1	Complete LVAC Distribution System with necessary DB, MCB, Meters etc	1	Lot				
2L2	Tariff metering for two station auxilliary Transformer	1	Lot				
2L3	Outdoor weatherproof 3-phase,4 wire, 125A Socket outlet and plugs.	1	Nos				
Civil Works,Building and Foundation		1	Lot				
2M1	Complete Land development with carried earthfilling	24300	Cubic Meter				
2M2	Complete outdoor civil works						
i)	_Outdoor gantry foundation 230kV switchyard	1	Lot				
ii)	_Outdoor gantry foundation 132kV switchyard	1	Lot				
iii)	_Outdoor gantry foundation 33kV switchyard	1	Lot				
iv)	_Outdoor equipment foundation 230kV switchyard	1	Lot				
v)	_Outdoor equipment foundation 132kV switchyard	1	Lot				
vi)	_Outdoor equipment foundation 33kV switchyard	1	Lot				
vii)	_Transformer foundation including oilpit & carrage way	1	Lot				
viii)	_Blast wall	1	Lot				
ix)	_Security Boundary Wall	1	Lot				
x)	_Substation Main gate	1	Lot				
xi)	_Barbed Wire Fencing	1	Lot				
xii)	_Approach raod	1	Lot				
xiii)	_Internal road	1	Lot				
xiv)	_Surface drain	1	Lot				
xv)	_Cable Trench	1	Lot				
xvi)	_Switchyard surface finishing	1	Lot				
xvii)	_Gravel laying	1	Lot				
xviii)	_Septic tank, sowak way	1	Lot				
xix)	_Pump house including deep tubewell, motor, pump, water reservaoir, water pipe line etc.	1	Lot				
xx)	_Gurd house, sentry post, car port	1	Lot				
2M3	Complete civil works for GIS & control room building						
i)	_Foundation works	1	Lot				
ii)	_Super structures	1	Lot				
iii)	_All finish works	1	Lot				
iv)	_EOT crane (5 Ton)	1	Lot				

Item	Description	Qty (1)	Unit	Unit Price [1] Foreign Curreny Portion (2)	Unit Price [1] Local Curreny Portion (3)	Total Price [1] Foreign Curreny Portion (1) x(2)	Total Price [1] Local Curreny Portion (1) x (3)
2N1	**Building Lighting, Small Power, Air Conditioning & Ventilation**						
i)	_BuildingSmall power	1	Lot				
ii)	_Building Lighting & emergency DC lighting	1	Lot				
iii)	_Building airconditioning & ventilation system	1	Lot				
2N2	**Outdoor switchyard Lighting, Small Power**						
i)	_OutdoorSmall power	1	Lot				
ii)	_Outdoor Lighting	1	Lot				
Digital Fault & Disturbance Recorder(DFDR)							
2N3.1	DFDR complete for all 230kV & 132kV bays for Shyampur new Substation	1	Lot				
2N3.2	DFDR complete for all 230kV & 132kV bays for existing Old Airport & Tongi Substation	1	Lot				
2N3.3	DFDR complete for all 230kV & 132kV bays for existing Tongi Substation	1	Lot				
Fiber Optic Multiplexer Equipment for Teleprotection and Communication							
2O1	Fibre Optic Multipexer Equipment for communication & protection	1	Lot				
2O2	Hot line telephone system including phone sets, connection cords etc.	1	Lot				
Underground opticale fiber cable with Terminal box.							
2O3	Underground Fibre Optic cable(48 cores)	1	Lot				
2O4	Outdoor termination box, indoor MDF & pigtail cables	1	Lot				
Integration with existing SCADA, NLDC system							
2P1	Integration with existing SCADA/NLDC system.	1	Lot				
Mandatory Spares, tools & test equipment							
2Q1	**230 kV GIS**						
i)	Set of gas filling equipment and 3 bottles of 48kg of SF6	1	nos.				
ii)	Arcing contact of CB	2	nos.				
iii)	Moving contact of CB	2	nos.				
iv)	Fixed contact of CB	2	nos.				
v)	Moving contact of DS & ES	2	nos.				
vi)	Fixed contact of DS & ES	2	nos.				
vii)	Blast nozzle	2	nos.				
viii)	CB Closing coil	6	nos.				
ix)	CB Tripping coil	6	nos.				
x)	Motor for CB operating mechanism	1	nos.				
xi)	Dashpot for CB operating mechanism	2	nos.				
xii)	Motor for DS & ES drive	2	nos.				
xiii)	Supporting insulator	2	nos.				
xiv)	Supporting insulator with barrier	2	nos.				
xv)	Indicating lamps (20% of total quantities installed)	1	nos.				
xvi)	Indicating lamp covers (10% of total quantities installed)	1	nos.				
xvii)	Set of gaskets (10% of total quantities installed)	1	nos.				
xviii)	Heater	2	nos.				
xix)	Humidity stat and thermostat	2	nos.				
xx)	Gas pressure monitor	2	nos.				
xxi)	Gas pressure switch	2	nos.				
xxii)	Gas pressure gauge	2	nos.				
xxiii)	Gas pressure relief device	2	nos.				
xxiv)	Gas sniffer	1	nos.				
xxv)	Gas hygrometer	1	nos.				
2Q2	**132 kV GIS**						
i)	Arcing contact of CB	2	nos.				
ii)	Moving contact of CB	2	nos.				
iii)	Fixed contact of CB	2	nos.				
iv)	Moving contact of DS & ES	2	nos.				
v)	Fixed contact of DS & ES	2	nos.				
vi)	Blast nozzle	2	nos.				
vii)	CB Closing coil	6	nos.				
viii)	CB Tripping coil	6	nos.				
ix)	Motor for CB operating mechanism	1	nos.				
x)	Dashpot for CB operating mechanism	2	nos.				
xi)	Motor for DS & ES drive	2	nos.				
xii)	Supporting insulator	2	nos.				
xiii)	Supporting insulator with barrier	2	nos.				
xiv)	Indicating lamps (20% of total quantities installed)	1	nos.				
xv)	Indicating lamp covers (10% of total quantities installed)	1	nos.				
xvi)	Set of gaskets (10% of total quantities installed)	1	nos.				
xvii)	Heater	2	nos.				
xviii)	Humidity stat and thermostat	2	nos.				
xix)	Gas pressure monitor	2	nos.				
xx)	Gas pressure switch	2	nos.				
xxi)	Gas pressure gauge	2	nos.				

Item	Description	Qty (1)	Unit	Unit Price [1] Foreign Curreny Portion (2)	Unit Price [1] Local Curreny Portion (3)	Total Price [1] Foreign Curreny Portion (1) x(2)	Total Price [1] Local Curreny Portion (1) x (3)
xxii)	Gas pressure relief device	2	nos.				
2Q3	**Auto Transformer & Switchgear**						
i)	Transformer 230 kV bushings (For 300MVA Transformer)	1	no.				
ii)	Ttransformer 138 kV bushings (For 300MVA Transformer)	2	nos.				
iii)	33 kV bushing	2	nos.				
iv)	Neutral bushing	2	nos.				
v)	Winding temperature indicating device	2	nos.				
vi)	Set of gaskets (10% of total quantities installed)	1	nos.				
vii)	Silica gel (100% of total quantities installed)	1	nos.				
viii)	Set of special tools, gauges and spanners	1	set				
ix)	Transformer oil treatment plant, 6000 Liters per hour	1	set				
x)	186kV Surge arrester	3	nos.				
xi)	120 kV Surge Arrester	3	nos.				
xii)	245kV, Cable Sealing End (for XLPE, 2000sqmm cu cable) incld. necessary all	2	sets				
xii)	145kV, Cable Sealing End (for XLPE, 1000sqmm cu cable) incld. necessary all	2	sets				
2Q4	**Protection**						
i)	Line distance relay with complete protection elements	1	set				
ii)	Transformer differential relay with complete REF function	1	set				
iii)	overcurrent and earth fault relay	1	set				
iv)	Tripping relay (electrical reset)	3	nos.				
v)	Bay control unit	1	set				
vi)	Trip Circuit Supervision relay, 3phase	1	set				
vii)	Relay test block & plug	3	sets				
viii)	Bulbs for annunciator	10	nos.				
2Q5	**Test Equipment**						
i)	SF6 Gas Handling Equipment including storage tank	1	set				
ii)	SF6 Gas leak Detector	1	set				
iv)	Partial Discharge monitoring Device for GIS	1	set				
v)	Contact resistance measurement test set (suitable for measurement down to 1 µ ohm at 200A d.c.)	1	set				
vi)	5 kV insulation resistance test set (range 0.5 –1.0 - 2.5 - 5 kV)	1	set				
vii)	Earth resistance test set (range 10-100-1000 ohm: min scale division 0.01 ohm)	1	set				
viii)	Clip-on mA meter (for spill current)	1	set				
ix)	Portable Earthing lead including glass fiber stick	1	set				
x)	AVO Meter, digital	1	set				
Total Price for Shyampur 230/132kV GIS Substation							

(carried to Schedule -B5: Grand Summary)

Total Schedule B4 (carried to Schedule B5 Grand Summary)						

Name of Bidder _____

Signature of Bidder _____

[1] Specify currency in accordance with specifications in Bid Data Sheet under ITB 18.1.

(TRANSMISSION LINE PART)

PRICES SCHEDULES FOR SCOPE 3.1 & 3.2

Schedules of Rates and Prices
Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

TRANSMISSION LINE

Schedule No.B1 - Plant and Mandatory Spare Parts Supplied from Abroad

Schedule B1. 3.1 : 230kV Meghnaghat-Hasnabad D/C Transmission Line In-Out)

					Foreign Currency in ---	
Item	**Description**	**Code[1]**	**Unit**	**Qty**	**Unit Price[2] CIF**	**Total Price CIF**
				(1)	***(2)***	***(1) x (2)***
A1	**Towers**					
A1.1	Fabrication, galvanising and supply of various types of towers, & its body / leg (equal & unequal) extensions (complete) excluding stubs and bolts & nuts but including hangers, D-shackles, pack washer, earthing (2 Nos. power tower), step bolt, anti-theft nuts & bolts, anti-climbing device, danger plate, number plate etc. as per specification (payment shall be released for identified MT for complete tower)					
A1.1.1	High tensile steel and mild steel		MT	414.5		
	Sub-total for Item A1					

Schedules of Rates and Prices
Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

TRANSMISSION LINE

Schedule No.B1 - Plant and Mandatory Spare Parts Supplied from Abroad

Schedule B1. 3.1 : 230kV Meghnaghat-Hasnabad D/C Transmission Line In-Out)

					Foreign Currency in ---	
Item	**Description**	**Code[1]**	**Unit**	**Qty**	**Unit Price[2] CIF**	**Total Price CIF**
				(1)	*(2)*	*(1) x (2)*
A2	**Supply of insulator and fittings:** Insulator sets complete with insulators and all hardware fittings including suspension clamps, tension dead ends, armour rods as per requirement,arcing					
A2.1	230kV, 120kN Suspension Insulator String for twin ACSR Mallar, complete		each	36		
A2.2	230kV, 210kN Heavy Suspension Insulator String for twin ACSR Mallard, complete assembly		each	12		
A2.3	230kV, twin 210kN tension Insulator String for twin ACSR Mallar, complete		each	96		
A2.4	230kV, 120kN Single upright low duty Tension Insulator String for twin ACSR Mallard, complete assembly		each	12		
A2.5	230kV, 120kN Single inverted low duty Tension Insulator String for twin ACSR Mallard, complete assembly		each	12		
A2.6	Weighted spacers complete with 35kg weight to be used with the jumper of 2Q30 tower		each	6		
A2.7	Spacer damper and or vibration damper for twin ACSR Mallard for all 12 phases		Nos	850		
A2.8	Spacer for twin ACSR Mallard for all 12 phases		Nos	96		
A3	**Supply of Phase Conductor and OPGW**					
A3.1	Phase conductor ACSR Mallard including the necessary midspan joint and repair sleeves. Twelve nos. twin conductors on the line. Payment for extra length for sag, jumper, joint etc. shall deem to be included in the quoted		route-km	1		
A3.2	a) 7x4.00mm S earthwire equivalent OPGW Fibre Optic Cable - 48 Fibre inclusive of joint boxes, fixing clamp, fusion splices, connections to to the joint boxes and earth bond as required as per actual site condition. Two nos. OPGW for the line. Payment for extra length due to sag, joint etc. shall deem to be		route-km	1		
	b) OPGW tension set complete assembly for above OPGW		each	8		
	c) OPGW suspension set complete assembly for above OPGW		each	2		
	d) Vibration damper for above OPGW.		Nos	4		
A4	**Aircraft obstruction lights solar powered complete with lamps, solar panels, batteries, control equipment cables, support framework, tower work platform etc**		tower	3		
	Sub-total for Item A2, A3 & A4					

Schedules of Rates and Prices
Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

TRANSMISSION LINE

Schedule No.B1 - Plant and Mandatory Spare Parts Supplied from Abroad

Schedule B1. 3.1 : 230kV Meghnaghat-Hasnabad D/C Transmission Line In-Out)

					Foreign Currency in ---	
Item	**Description**	**Code[1]**	**Unit**	**Qty**	**Unit Price[2] CIF**	**Total Price CIF**
				(1)	*(2)*	*(1) x (2)*
	SPARES S					
S2	**Phase Conductor and OPGW**					
S2.1	ACSR Mallard		km	3		
S2.2	OPGW (7/4.00mm Steel earthwire equivalent)		km	2		
S3	**Insulator**					
S3.1	120kN insulator unit		each	204		
S3.2	210kN insulator unit		each	672		
S4	**Fittings & Accessories**					
S4.1	Mid-span joint for phase condutor ACSR Mallard		each	25		
S4.2	Repair sleeve for phase conductor ACSR Mallard		each	25		
S4.3	120kN single suspension set without disc for twin ACSR Mallard		each	12		
S4.4	210kN twinTension set without disc for twin ACSR Mallard		each	24		
S4.5	OPGW (7x4.00 mm S earthwire equivalent) suspension set, complete		each	2		
S4.6	OPGW (7x4.00 mm S earthwire equivalent) tension set, complete assembly		each	2		
S4.7	Vibration damper for 7x4.00 mm S earthwire equivalent OPGW		each	4		
	Sub-total for Item S					

Schedules of Rates and Prices
Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

TRANSMISSION LINE

Schedule No.B1 - Plant and Mandatory Spare Parts Supplied from Abroad

Schedule B1. 3.1 : 230kV Meghnaghat-Hasnabad D/C Transmission Line In-Out)

					Foreign Currency in ---	
Item	**Description**	**Code[1]**	**Unit**	**Qty**	**Unit Price[2] CIF**	**Total Price CIF**
				(1)	***(2)***	***(1) x (2)***
E	**ERECTION & OTHER EQUIPMENT**					
E1	Temporary earthing equipment		each	2		
E2	Elcometer		each	1		
E3	Motorised jointing compressor for conductor complete with disc suitable for ACSR Mallard conductors & 7x4.00 mm		each	1		
	Sub-total for Item E					
Total price for schedule B1(Item A1+Item A2, A3, A4 & A5 +Item S + Item E) forwarded to Schedule No. 5- Grand Summary						

Name of Bidder

Signature of Bidder

[1] Bidders shall enter a code representing the country of origin of all imported plant and equipment.

[2] Specifiy currency. Create and use as many column for Unit Price and total Price as there are ecurrencies.

Country of Origin Declaration Form

Item	**Descritpion**				**Country**	

Schedules of Rates and Prices
Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

TRANSMISSION LINE

Schedule No.B1 - Plant and Mandatory Spare Parts Supplied from Abroad

Schedule B1. 3.2 : 132kV Shyampur-Hasnabad-Haripur D/C Transmission Line In-Out)

					Foreign Currency in ---	
Item	**Description**	**Code[1]**	**Unit**	**Qty**	**Unit Price[2] CIF**	**Total Price CIF**
				(1)	*(2)*	*(1) x (2)*
Part A: 132kV Double Circuit Line						
A1	**Towers**					
A1.1	Fabrication, galvanising and supply of various types of towers, & its body / leg (equal & unequal) extensions (complete) excluding stubs and bolts & nuts but including hangers, D-shackles, pack washer, earthing (2 Nos. power tower), step bolt, anti-theft nuts & bolts, anti-climbing device, danger plate, number plate etc. as per specification (payment shall be released for identified MT for					
A1.1.1	High tensile steel and mild steel		MT	176		
A2	**Supply of insulator and fittings:**					
	Insulator sets complete with insulators and all hardware fittings including suspension clamps, tension dead ends, armour rods as per requirement,arcing horn etc.					
A2.1	132kV 70kN Suspension Insulator String for ACSR Grosbeak		Sets	6		
A2.2	132kV 120kN Heavy Suspension Insulator String for ACSR Grosbeak		Sets	162		
A2.3	132kV 120kN tension Insulator String for ACSR Grosbeak		Sets	96		
A2.4	132kV 70kN inverted low duty Tension Insulator String for ACSR Grosbeak		Sets	12		
A2.5	132kV 70kN upright low duty tension Insulator String for ACSR Grosbeak		Sets	12		
A2.6	Weighted spacers complete with 35kg weight to be used with the jumper of 1Q30 tower		Sets	12		
A2.7	Vibration Damper for ACSR Grosbeak		Nos	72		
A4	**Supply of Conductor and OPGW**					
A4.1	ACSR Grosbeak single conductor per phase. Total six nos. single conductors for double circuit line. Payment for extra length for sag, jumper, joint etc. shall deem to be included in the quoted price.		route-km	1		
A4.2	a) OPGW Fibre Optic Cable - 12 Fibre including joint box and earth bond as required as per actual site condition. One no. OPGW for the line. Payment for extra length due to sag, joint etc. shall deem to be included in the quoted price.		route-km	1		

Schedules of Rates and Prices
Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

TRANSMISSION LINE

	b) OPGW tension set complete assembly for above OPGW		Set	8		
	c) OPGW suspension set complete assembly for above OPGW		Set	2		
	d) OPGW vibration damper		nos.	8		
	Sub-total for Item A1, A2, A3 & A4					

	SPARES S					
S1	**Phase Conductor and OPGW**					
S1.1	ACSR Grosbeak		km	2		
S1.2	OPGW (7/3.25 Steel earthwire equivalent)		km	2		
S2	**Insulator**					
S2.1	70kN insulator unit		each	120		
S2.2	120kN insulator unit		each	240		
S3	**Fittings & Accessories**					
S3.1	Mid-span joint for phase ACSR Grosbeak		each	10		
S3.2	Repair sleeve for phase ACSR Grosbeak		each	10		
S3.3	70kN Suspension fittings without disc for ACSR Grosbeak		set	12		
S3.4	120kN Tension fittings without disc for ACSR Grosbeak		set	24		
S3.5	OPGW (7x3.25 mm S earthwire equivalent) suspension set, complete assembly		set	2		
S3.6	OPGW (7x3.25 mm S earthwire equivalent) tension set, complete assembly		set	2		
S3.7	Vibration damper for 7x3.25 mm S earthwire equivalent OPGW		each	4		
	Sub-total for Item S					
E	**ERECTION & OTHER EQUIPMENT**					
E1	Linesmen Harness (complete)		each	10		
	Sub-total for Item E					
Total price for schedule B1(Item A1+Item A2, A3 & A4+Item B1+Item B2, B3 & B4+Item S + Item E) forwarded to Schedule No. 5- Grand Summary						

Name of Bidder

Signature of Bidder

[1] Bidders shall enter a code representing the country of origin of all imported plant and equipment.

[2] Specifiy currency. Create and use as many column for Unit Price and total Price as there are ecurrencies.

Country of Origin Declaration Form

Item	**Descritpion**				**Country**	

Schedules of Rates and Prices
Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

TRANSMISSION LINE

Schedule No.B2 - Plant and Mandatory Spare Parts Supplied from within the Employer's country

Schedule B2. 3.1 : 230kV Meghnaghat-Hasnabad D/C Transmission Line In-Out)

					Foreign Currency in ---		Local currency in Bangladesh taka		
Item	**Description**	**Code[1]**	**Unit**	**Qty**	**EXW Unit Price[2]**	**EXW Total Price**	**EXW Unit Price[1]**	**EXW Total Price[1]**	**VAT on EXW**
				(1)	*(2)*	*(3)=(1) x (2)*	*(4)*	*(5)=(1)x(4)*	*(6)*
A1	**Towers**								
A1.1	Fabrication, galvanising and supply of various types of towers, & its body / leg (equal & unequal) extensions (complete) excluding stubs and bolts & nuts but including hangers, D-shackles, pack washer, earthing (2 Nos. power tower), step bolt, anti-theft nuts & bolts, anti-climbing device, danger plate, number plate etc. as per specification (payment shall be released for identified MT for complete tower)								
A1.1.1	High tensile steel and mild steel		MT	414.5					
	Sub-total for Item A1								

Schedules of Rates and Prices
Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

TRANSMISSION LINE

Schedule No.B2 - Plant and Mandatory Spare Parts Supplied from within the Employer's country

Schedule B2. 3.1 : 230kV Meghnaghat-Hasnabad D/C Transmission Line In-Out)

					Foreign Currency in ---		Local currency in Bangladesh taka		
Item	**Description**	**Code[1]**	**Unit**	**Qty**	**EXW Unit Price[2]**	**EXW Total Price**	**EXW Unit Price[1]**	**EXW Total Price[1]**	**VAT on EXW**
				(1)	*(2)*	*(3)=(1) x (2)*	*(4)*	*(5)=(1)x(4)*	*(6)*
A2	**Supply of insulator and fittings:** Insulator sets complete with insulators and all hardware fittings including suspension clamps, tension dead ends, armour rods as per requirement,arcing horn etc.								
A2.1	230kV, 120kN Suspension Insulator String for twin ACSR Mallar, complete assembly		each	36					
A2.2	230kV, 210kN Heavy Suspension Insulator String for twin ACSR Mallard, complete assembly		each	12					
A2.3	230kV, twin 210kN tension Insulator String for twin ACSR Mallar, complete assembly		each	96					
A2.4	230kV, 120kN Single upright low duty Tension Insulator String for twin ACSR Mallard, complete assembly		each	12					
A2.5	230kV, 120kN Single inverted low duty Tension Insulator String for twin ACSR Mallard, complete assembly		each	12					
A2.6	Weighted spacers complete with 35kg weight to be used with the jumper of 2Q30 tower		each	6					
A2.7	Spacer damper and or vibration damper for twin ACSR Mallard for all 12 phases		Nos	850					
A2.8	Spacer for twin ACSR Mallard for all 12 phases		Nos	96					
A3	**Supply of Phase Conductor and OPGW**								
A3.1	Phase conductor ACSR Mallard including the necessary midspan joint and repair sleeves. Twelve nos. twin conductors on the line. Payment for extra length for sag, jumper, joint etc. shall deem to be included in the quoted price.		route-km	1					
A3.2	a) 7x4.00mm S earthwire equivalent OPGW Fibre Optic Cable - 48 Fibre inclusive of joint boxes, fixing clamp, fusion splices, connections to to the joint boxes and earth bond as required as per actual site condition. Two nos. OPGW for the line. Payment for extra length due to sag, joint etc. shall deem to be included in the quoted price.		route-km	1					
	b) OPGW tension set complete assembly for above OPGW		each	8					
	c) OPGW suspension set complete assembly for above OPGW		each	2					
	d) Vibration damper for above OPGW.		Nos	4					
A4	**Aircraft obstruction lights solar powered complete with lamps, solar panels, batteries, control equipment cables, support framework, tower work platform etc.**		tower	3					
	Sub-total for Item A2, A3 & A4								

Schedules of Rates and Prices
Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

TRANSMISSION LINE

Schedule No.B2 - Plant and Mandatory Spare Parts Supplied from within the Employer's country

Schedule B2. 3.1 : 230kV Meghnaghat-Hasnabad D/C Transmission Line In-Out)

					Foreign Currency in ---		Local currency in Bangladesh taka		
Item	**Description**	**Code[1]**	**Unit**	**Qty**	**EXW Unit Price[2]**	**EXW Total Price**	**EXW Unit Price[1]**	**EXW Total Price[1]**	**VAT on EXW**
				(1)	*(2)*	*(3)=(1) x (2)*	*(4)*	*(5)=(1)x(4)*	*(6)*
	SPARES S								
S2	**Phase Conductor and OPGW**								
S2.1	ACSR Mallard		km	3					
S2.2	OPGW (7/4.00mm Steel earthwire equivalent)		km	2					
S3	**Insulator**								
S3.1	120kN insulator unit		each	204					
S3.2	210kN insulator unit		each	672					
S4	**Fittings & Accessories**								
S4.1	Mid-span joint for phase condutor ACSR Mallard		each	25					
S4.2	Repair sleeve for phase conductor ACSR Mallard		each	25					
S4.3	120kN single suspension set without disc for twin ACSR Mallard		each	12					
S4.4	210kN twinTension set without disc for twin ACSR Mallard		each	24					
S4.5	OPGW (7x4.00 mm S earthwire equivalent) suspension set, complete assembly		each	2					
S4.6	OPGW (7x4.00 mm S earthwire equivalent) tension set, complete assembly		each	2					
S4.7	Vibration damper for 7x4.00 mm S earthwire equivalent OPGW		each	4					
	Sub-total for Item S								

Schedules of Rates and Prices
Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

TRANSMISSION LINE

Schedule No.B2 - Plant and Mandatory Spare Parts Supplied from within the Employer's country

Schedule B2. 3.1 : 230kV Meghnaghat-Hasnabad D/C Transmission Line In-Out)

					Foreign Currency in ---		Local currency in Bangladesh taka		
Item	**Description**	**Code[1]**	**Unit**	**Qty**	**EXW Unit Price[2]**	**EXW Total Price**	**EXW Unit Price[1]**	**EXW Total Price[1]**	**VAT on EXW**
				(1)	*(2)*	*(3)=(1) x (2)*	*(4)*	*(5)=(1)x(4)*	*(6)*
E	**ERECTION & OTHER EQUIPMENT**								
E1	Temporary earthing equipment		each	2					
E2	Elcometer		each	1					
E3	Motorised jointing compressor for conductor complete with disc suitable for ACSR Mallard conductors & 7x4.00 mm S earthwire to be used for this contract		each	1					
	Sub-total for Item E								
Total price for schedule B1(Item A1+Item A2, A3, & A4 +Item S + Item E) forwarded to Schedule No. 5- Grand Summary									

Name of Bidder

Signature of Bidder

[1] Bidders shall enter a code representing the country of origin of all imported plant and equipment.

[2] Specifiy currency. Create and use as many column for Unit Price and total Price as there are ecurrencies.

Country of Origin Declaration Form

Item	**Descritpion**				**Country**	

Schedules of Rates and Prices
Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

TRANSMISSION LINE

Schedule No.B2 - Plant and Mandatory Spare Parts Supplied from within the Employer's country									
Schedule B2. 3.2 : 132kV Shyampur-Hasnabad-Haripur D/C Transmission Line In-Out)									
					Foreign Currency in ---		**Local currency in Bangladesh**		
Item	**Description**	**Code[1]**	**Unit**	**Qty**	**EXW Unit Price[2]**	**EXW Total Price**	**EXW Unit Price[1]**	**EXW Total Price[1]**	**VAT on EXW**
				(1)	*(2)*	*(3)=(1) x (2)*	*(4)*	*(5)=(1)x(4)*	*(6)*
Part A: 132kV Double Circuit Line									
A1	**Towers**								
A1.1	Fabrication, galvanising and supply of various types of towers, & its body / leg (equal & unequal) extensions (complete) excluding stubs and bolts & nuts but including hangers, D-shackles, pack washer, earthing (2 Nos. power tower), step bolt, anti-theft nuts & bolts, anti-climbing device, danger plate, number plate etc. as per specification (payment shall be released for identified MT for complete tower)								
A1.1.1	High tensile steel and mild steel		MT	176					
A2	**Supply of insulator and fittings:**								
	Insulator sets complete with insulators and all hardware fittings including suspension clamps, tension dead ends, armour rods as per requirement,arcing horn etc.								
A2.1	132kV 70kN Suspension Insulator String for ACSR Grosbeak		Sets	6					
A2.2	132kV 120kN Heavy Suspension Insulator String for ACSR Grosbeak		Sets	162					
A2.3	132kV 120kN tension Insulator String for ACSR Grosbeak		Sets	96					

Schedules of Rates and Prices
Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

TRANSMISSION LINE

A2.4	132kV 70kN inverted low duty Tension Insulator String for ACSR Grosbeak		Sets	12					
A2.5	132kV 70kN upright low duty tension Insulator String for ACSR Grosbeak		Sets	12					
A2.6	Weighted spacers complete with 35kg weight to be used with the jumper of 1Q30 tower		Sets	12					
A2.7	Vibration Damper for ACSR Grosbeak		Nos	72					
A4	**Supply of Conductor and OPGW**								
A4.1	ACSR Grosbeak single conductor per phase. Total six nos. single conductors for double circuit line. Payment for extra length for sag, jumper, joint etc. shall deem to be included in		route-km	1					
A4.2	a) OPGW Fibre Optic Cable - 12 Fibre including joint box and earth bond as required as per actual site condition. One no. OPGW for the line. Payment for extra length due to sag, joint etc. shall deem to be included in the quoted		route-km	1					
	b) OPGW tension set complete assembly for above OPGW		Set	8					
	c) OPGW suspension set complete assembly for above OPGW		Set	2					
	d) OPGW vibration damper		nos.	8					
	Sub-total for Item A1, A2, A3 & A4								

	SPARES S								
S1	**Phase Conductor and OPGW**								
S1.1	ACSR Grosbeak		km	2					
S1.2	OPGW (7/3.25 Steel earthwire equivalent)		km	2					
S2	**Insulator**								
S2.1	70kN insulator unit		each	120					
S2.2	120kN insulator unit		each	240					
S3	**Fittings & Accessories**								

Schedules of Rates and Prices
Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

TRANSMISSION LINE

S3.1	Mid-span joint for phase ACSR Grosbeak		each	10					
S3.2	Repair sleeve for phase ACSR Grosbeak		each	10					
S3.3	70kN Suspension fittings without disc for ACSR Grosbeak		set	12					
S3.4	120kN Tension fittings without disc for ACSR Grosbeak		set	24					
S3.5	OPGW (7x3.25 mm S earthwire equivalent) suspension set, complete assembly		set	2					
S3.6	OPGW (7x3.25 mm S earthwire equivalent) tension set, complete assembly		set	2					
S3.7	Vibration damper for 7x3.25 mm S earthwire equivalent OPGW		each	4					
	Sub-total for Item S								
E	**ERECTION & OTHER EQUIPMENT**								
E1	Linesmen Harness (complete)		each	10					
	Sub-total for Item E								
Total price for schedule B1(Item A1+Item A2, A3 & A4+Item B1+Item B2, B3 & B4+Item S + Item E) forwarded to Schedule No. 5- Grand Summary									

Country Name of Bidder

Item	**Descritpion**				**Country**	

Signature of Bidder

1 Bidders shall enter a code representing the country of origin of all imported plant and equipment.

2 Specifiy currency. Create and use as many column for Unit Price and total Price as there are ecurrencies.

Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

TRANSMISSION LINE

Schedule No. B3 - Design Service

Schedule B3. 3.1 : 230kV Meghnaghat-Hasnabad D/C Transmission Line In-Out)

Item	Description	Qty	Unit Price [1]		Total Price [1]	
			Local Currency Portion	Foreign Currency Portion	Foreign Curreny Portion	Local Curreny Portion
		(1)	*(2)*	*(optional)*		*(1) x (2)*
	All design cost as per requirement					
Total (to Schedule No. 5- Grand Summary)						

Name of Bidder _____

Signature of Bidder _____

[1] specifiy currency in accordance with specifications in Bid Data Sheet under ITB 18.1.

Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

TRANSMISSION LINE

Schedule No. B4: Installation and Other Services

Schedule B4. 3.1 : 230kV Meghnaghat-Hasnabad D/C Transmission Line In-Out)

				Foreign Currency (F/C) Price (in ….)			
Item	Description	Unit	Qty	Unit Price[1]		Total Price[1]	
				Foreign Currency Portion	Local Currency Portion	Foreign Currency	Local Currency
			1	*2*	*3*	*4=1x2*	*5=1x3*
A1	**Route Survey and clearance**						
A1.1	Profile survey in accordance with the requirements of the technical specification,including full ground survey with change of tower location, if any, tower plotting and preparation and submission of route maps, profile drawings, SIMM documents, etc.	km	1				
A1.2	Route clearance in accordance with requirements of the technical specification including payment of compensation for crops, trees, houses, etc. and all kind of damage compensation.	km	1				
A2	**Geotechnical Investigation**						
A2.1	Geotechnical Investigation in accordance with the requirements of the Technical Specification						
(a)	Level 2	borehole	5				
(b)	Level 3	borehole	NIL				
(c)	Level 4	borehole	NIL				
A3	**Foundations**						
	Foundations for towers including all setting out, Concrete, Reinforcement, Excavation, Pumping, Stub-cutting, Shuttering, Leveling, Timbering, supply & Installation of foundation steelwork, Earthing materials,Backfilling,foundation protection (cutting/ filling/ retaining wall etc.), approved Protective Coating & site						
A3.1	**Tower Type 2DT6**	per tower	2				
A3.2	**Tower Type 2Q30**	per tower	1				
A3.3	**Tower Type 2QT6**	per tower	2				
A4	**Testing of Foundations**						
A4.1	Supply (incl. Foundation, steel works), install and test foundation to prove compliance with Technical specification, payment for successful test only: Uplift test for pad & chimney type foundation for tower type 2DT6.	per test	1				
A4.2	Individual Pile test including supply,install and test to prove compliance with technical specification, payment for successful test only (applicable for all tower types selected by the Employer's						
(a)	Compression Type test	per test	1				
(b)	Uplift Type test	per test	1				
(c)	Pile Integrity Test	per test	20				
	Sub-Total for Item A1, A2, A3 & A4						

Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

TRANSMISSION LINE

Schedule No. B4: Installation and Other Services

Schedule B4. 3.1 : 230kV Meghnaghat-Hasnabad D/C Transmission Line In-Out)

				Foreign Currency (F/C) Price (in ….)			
Item	Description	Unit	Qty	Unit Price[1]		Total Price[1]	
				Foreign Currency Portion	Local Currency Portion	Foreign Currency	Local Currency
			1	*2*	*3*	*4=1x2*	*5=1x3*
A5	Erection of various types of towers, & its body / leg (equal & unequal) extensions (complete) excluding stubs and bolts & nuts but including hangers, D-shackles, pack washer, spring washer, plain washer, welding, painting (Anti-corrosive painting uptp highest flood level of every tower), rest platform installation (if required), ladder installation (if required), aircraft warning sphere installation (if required), aircraft warning light installation (if required) etc. as per specification (payment shall be released for identified complete tower). The item also include installation of tower earthing, number plate, danger plate, bird guard, step bolt,	MT	414.5				
A6	Installation of insulator strings complete with arcing horns & necessary hardware, installing & stringing of conductor including fixing of conductor accessories ,installing & stringing of two nos. OPGW including fixing of OPGW accessories.	km	1				
A7	All works associated with making connection of existing 230kV double circuit line to new 230kV four circuit line tower including construction of temporary by-pass line (if required).For constructing temporary by-pass line, single circuit poles may be available at PGCB store. The contractor shall have to transport the poles from PGCB store to site. Other materials required for temporary by-pass line shall be used from the materials of this	Lumpsum	1				
A8	Supply of paint & painting of 60M and over tower in according with the requirements of the Technical Specification.	per tower	NIL				
A9	Aircraft obstruction lights solar powered complete with lamps, solar panels, batteries, control equipment cables, support framework, tower work platform etc.	tower	4				
	Sub-Total for Item A5, A6, A7, A8, A9 & A10						
Section M: Miscellaneous							
M1	Erection of twin downleads including downdrops from terminal tower to substation gantry	per set of three	4				
M2	Erection of OPGW connection from terminal tower to substation gantry/mast including installation of OPGW termination boxes at the base of sub-station gantry structures.	Per wire	2				
	Sub-Total for Item M						
Total Price for schedule B4; carried forward to Summary of Price Schedule (Schedule No.5- Grand Summary)							

Note: (1) in the Item A5, the unit 'Tower' means all the materials such as conductor, earthwire/OPGW, insulators,fittings etc. are included.
(2) in item A3, unit rate of foundation for soil category 4 shall be higher than soil category 3 and unit rate of foundation for soil category 3 shall be higher than soil category 2.

Total Price (in words) ……..

Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

TRANSMISSION LINE

Schedule No. B4: Installation and Other Services

Schedule B4. 3.2 : 132kV Shyampur-Hasnabad-Haripur D/C Transmission Line In-Out)

				Foreign Currency (F/C) Price (in ....)			
Item	Description	Unit	Qty	Unit Price[1]		Total Price[1]	
				Foreign Currency Portion	Local Currency Portion	Foreign Currency	Local Currency
			1	*2*	*3*	*4=1x2*	*5=1x3*
Part A: 132kV Double Circuit Line							
A1	Route Survey and clearance						
A1.1	Profile survey in accordance with the requirements of the technical specification, including full ground survey with change of tower location, if any, tower plotting and preparation and submission of route maps, profile drawings, SIMM documents, etc.	km	1				
A1.2	Route clearance in accordance with requirements of the technical specification including payment of compensation for crops, trees, houses, etc. and all kind of damage compensation.	km	1				
A2	Geotechnical Investigation						
A2.1	Geotechnical Investigation in accordance with the requirements of the Technical Specification						
(a)	Level 2	borehole	5				
(b)	Level 3	borehole	NIL				
(c)	Level 4	borehole	NIL				
A3	Foundations						
	Foundations for towers including all setting out, Concrete, Reinforcement, Excavation, Pumping, Stub-cutting, Shuttering, Leveling, Timbering, supply & Installation of foundation steelwork, Earthing Materials,Backfilling,foundation protection (cutting/ filling/ retaining wall etc.), approved Protective Coating & site clearing etc.						
A3.1	Tower Type 1DT6	per tower	2				

Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

TRANSMISSION LINE

Schedule No. B4: Installation and Other Services

Schedule B4. 3.2 : 132kV Shyampur-Hasnabad-Haripur D/C Transmission Line In-Out)

				Foreign Currency (F/C) Price (in ....)			
Item	Description	Unit	Qty	Unit Price[1]		Total Price[1]	
				Foreign Currency Portion	Local Currency Portion	Foreign Currency	Local Currency
			1	*2*	*3*	*4=1x2*	*5=1x3*
A3.2	Tower Type 1QL	per tower	1				
A3.3	Tower Type 1Q30	per tower	1				
A3.4	Tower Type 1QT6	per tower	2				
A4	Testing of Foundations						
A4.1	Supply (incl. Foundation, steel works), install and test foundation to prove compliance with Technical specification, payment for successful test only: Uplift test for pad & chimney type foundation for tower type 1DT6.	per test	1				
A4.2	Individual Pile test including supply,install and test to prove compliance with technical specification, payment for successful test only (applicable for all tower types selected by the Employer's Engineer):						
(a)	Compression Type test	per test	1				
(b)	Uplift Type test	per test	1				
(c)	Pile Integrity Test	per test	24				
A5	Erection of various types of towers, & its body / leg (equal & unequal) extensions (complete) excluding stubs and bolts & nuts but including hangers, D-shackles, pack washer, spring washer, plain washer, welding, painting (Anti-corrosive painting upto highest flood level of every tower), rest platform installation (if required), ladder installation (if required), aircraft warning sphere installation (if required), aircraft warning light installation (if required) etc. as per specification (payment shall be released for identified complete tower). The item also include installation of tower earthing, number plate, danger plate, bird guard, step bolt, anti-climbing device etc.	MT	175.99				
A6	Installation of insulator strings complete with arcing horns & necessary hardware, installing & stringing of conductor including fixing of conductor accessories & installing & stringing of OPGW including fixing of OPGW accessories.	km	16				

Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

TRANSMISSION LINE

Schedule No. B4: Installation and Other Services

Schedule B4. 3.2 : 132kV Shyampur-Hasnabad-Haripur D/C Transmission Line In-Out)

				Foreign Currency (F/C) Price (in ....)			
Item	Description	Unit	Qty	Unit Price[1]		Total Price[1]	
				Foreign Currency Portion	Local Currency Portion	Foreign Currency	Local Currency
			1	*2*	*3*	*4=1x2*	*5=1x3*
A7	All works associated with making connection of existing 230kV double circuit line to new 230kV four circuit line tower including construction of temporary by-pass line (if required).For constructing temporary by-pass line, single circuit poles may be available at PGCB store. The contractor shall have to transport the poles from PGCB store to site. Other materials required for temporary by-pass line shall be used from the materials of this contract.	Lumpsum	1				
	Sub-Total for Item A1, A2, A3, A4, A5 & A6						
Section M: Miscellaneous							
M1	Erection of downleads from terminal tower to substation gantry	Set of three	4				
M2	Erection of OPGW connection from terminal tower to substation gantry	Per wire	2				
	Sub-Total for Item M						
Total Price for schedule B4; carried forward to Summary of Price Schedule (Schedule No.5- Grand Summary)							

Note: (1) in the Item A5 & B5, the unit 'Tower' means all the materials such as conductor, earthwire/OPGW, insulators,fittings etc. are included.

Total Price (in words) ……..

Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

Schedule B5 - Grand Summary

Item	Description	Total Price [1]	
		Foreign in ….	Local in BDT
Scope- 1: Dhamrai 132/33 kV GIS Substation			
1	Total Schedule B1. Plant, and Mandatory Spare Parts Supplied from Abroad		
2	Total Schedule B2. Plant, and Mandatory Spare Parts Supplied from Within the Employer's Country		
3	Total Schedule B3. Design Service		
4	Total Schedule B4. Installation and Other Services		
Total of Scope-1			
Scope- 2: Shyampur 230/132 kV GIS Substation			
1	Total Schedule B1. Plant, and Mandatory Spare Parts Supplied from Abroad		
2	Total Schedule B2. Plant, and Mandatory Spare Parts Supplied from Within the Employer's Country		
3	Total Schedule B3. Design Service		
4	Total Schedule B4. Installation and Other Services		
Total of Scope-2			
Scope- 3.1 : 230kV Meghnaghat-Hasnabad D/C Transmission Line In-Out)			
1	Total Schedule B1. Plant, and Mandatory Spare Parts Supplied from Abroad		
2	Total Schedule B2. Plant, and Mandatory Spare Parts Supplied from Within the Employer's Country		
3	Total Schedule B3. Design Service		
4	Total Schedule B4. Installation and Other Services		
Total of Scope-3.1			
Scope- 3.2 : 132kV Shyampur-Hasnabad-Haripur D/C Transmission Line In-Out)			
1	Total Schedule B1. Plant, and Mandatory Spare Parts Supplied from Abroad		
2	Total Schedule B2. Plant, and Mandatory Spare Parts Supplied from Within the Employer's Country		
3	Total Schedule B3. Design Service		
4	Total Schedule B4. Installation and Other Services		
Total of Scope-3.2			
Grand Total excluding VAT on EXW(to Bid Form)			

Note: VAT on EXW is included in the contract price and shall be paid by the contractor which shall be re-imbursed by the employer to the contractor at actual basis but not more than the quoted amount upon submission of relevent document.

Name of Bidder _____

Signature of Bidder _____

[1] specifiy currency in accordance with specifications in Bid Data Sheet under ITB 18.1. Create and use as many as columns for Foregin Currency requirement as there are foreign currencies.

Schedule B6 - Recommended Spare Parts

Item	Description	Qty	Unit Price [1]		Total Price
			CIF or CIP	EXW	
		(1)	*(2)*	*(optional)*	*(1) x (2) or (3)*

Name of Bidder _____

Signature of Bidder _____

POWER GRID COMPANY OF BANGLADESH LIMITED

BIDDING DOCUMENT

FOR

CONSTRUCTION AND COMPLETION OF 132/33KV GIS SUBSTATION AT DHAMRAI, 230/132KV GIS SUBSTATION AT SHYAMPUR AND ASSOCIATED TRANSMISSION LINES ON TURNKEY BASIS.

SCHEDULE C

COMPLETION TIME SCHEDULES

POWER GRID COMPANY OF BANGLADESH LIMITED

BIDDING DOCUMENT

Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

SCHEDULE C

TIMES FOR DELIVERY AND COMPLETION

The individual dates are all contractually binding.

The times given under Column D are the commissioning target dates at present planned to be achieved and may be the subject of mutual adjustment.

Column A details the earliest dates by which access to site can be given for storage purposes. The times entered under column B are to be the dates guaranteed for arrival at Site of the first shipment of parts for the circuits in question being also the dates when the contract requires access to the Site for plant erection, to the extent necessary to enable him to proceed with work to meet the dates under column C guaranteed for complete delivery, erection and commissioning of the shipment.

The times include all necessary control, relay, metering, auxiliary power ancillary equipment to enable the respective circuit or item of plant to be completely commissioned and put into commercial operation, together with such other associated equipment, e.g. busbars, etc as will ensure that subsequent shutdown are unnecessary or at least only of a temporary or short time nature.

The dates assume an order is placed by . . . . . .
(to be advised or stated by Bidder)

Site	**A*** **Latest Access Permitted**	**B*** **Guaranteed Arrival of first shipment**	**C*** **Guaranteed Completion**	**D*** **Target Completion**
Dhamrai,Manikganj & Shyampur,Dhaka, Narayanganj	7 days from the date of signing of the Contract		730(Seven Hundred Thirty) Days.	

* Time in days, from contract effective date.

Preliminary SLD, overall layout and control building drawings of the Technical Specifications shall be provided within 2.0 months of the contract commencing date.

Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

SCHEDULE C-1(Substation Part)

BAR CHART PROGRAMME OF KEY ACTIVITIES

	Time Period in month																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Equipment Design																								
Drawings of single line diagram																								
Drawings of 230kV,132kV and 33kV Switchgear Layout																								
Drawings of 230kV Switchgear Equipment																								
Drawings of 225/300MVA Power Transformer																								
Drawings of 50/75MVA Power Transformer																								
Manufacture of 230kV,132kV &33kV Switchgear																								
Manufacture of 225/300MVA Power Transformer																								
Manufacture of 50/75MVA Power Transformer																								
Manufacture of Control, Protection, and Metering System																								
Factory Acceptance Test																								
Delivery of equpment to site																								
Building & Foundation Design																								
Calculation/Drawings of gantry structures and equipment supports																								
Calculaiton /Drawings of control building																								
Calculaiton /Drawings of earthing System																								
Construction and Installation Works																								
Site Survey																								
Geo-technical survey																								
Switchyard																								
- Piling																								
- Foundation works incl. earthing																								
- Cable trenches																								
- Gantry and equpment support installation																								
switchgear equipment installation																								
Transformer installation																								
- Busbars, Jumper condcutors and OH earthwire installation																								
Construction of Control Building/GIS Bulding																								
Cable laying & Termination																								
Installation of LVAC & DC system																								
Installation of Indoor equipment (Control, protection, metering,SAS,DFDR etc.)																								
Testing & Commissioning																								

Note: Time to complete the plant and services from the effective date is 730(Seven Hundred Thirty) days.

SCHEDULE C-2(Transmission Line Part)

BAR CHART PROGRAMME OF KEY ACTIVITIES

	Month																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Check Survey																								
Approval of Plan & Profile Drawings																								
Tower Design																								
Foundation Design																								
Soil test & foundation																								
Tower Testing																								
Manufacture of Tower																								
Approval of Specification of conductor, earthwire, OPGE, Insulator & fittings																								
Manufacture of Conductor, Insulator, Earthwire, OPGW & accessories																								
Tower Erection																								
Manufacture of Fiber optic cable & Fittings																								
Stringing																								
Testing & Commissioning																								

The Works under this turnkey contract shall be completed within [24(Twenty) months-(minus) {Total time of delay made by the Bidder to submit the Performance Security as per ITB 45.1, Vol. 1 of 3 of the bidding document}] from the date of signing of the contract.

Schedule C: Bar Chart Programme of Key Activities

POWER GRID COMPANY OF BANGLADESH LIMITED

BIDDING DOCUMENT

FOR

CONSTRUCTION AND COMPLETION OF 132/33KV GIS SUBSTATION AT DHAMRAI, 230/132KV GIS SUBSTATION AT SHYAMPUR AND ASSOCIATED TRANSMISSION LINES ON TURNKEY BASIS.

SCHEDULE D

MANUFACTURERS, PLACES OF MANUFACTURE AND TESTING

POWER GRID COMPANY OF BANGLADESH LIMITED

BIDDING DOCUMENT

DESIGN, SUPPLY, ERECTION, TESTING & COMMISSIONING OF 132/33KV GIS SUBSTATION AT DAMRAI, 230/132KV GIS SUBSTATION AT SHYAMPUR AND A SSOCIATED TRANSMISSION LINES ON TURNKEY BASIS.

SCHEDULE D (Substation Part)

MANUFACTURERS, PLACES OF MANUFACTURE AND TESTING

The following Subcontractors and/or manufacturers are proposed for carrying out the item of the facilities indicated.

Bidders are free to propose more than one for each item.

Item	Description	Proposed Subcontractors/ Manufacturers	Place of Manufacture	Place of Testing and Inspection
1	230kV INDOOR GIS			
2	132kV INDOOR GIS			
3	132kV OUTDOOR GIS			
4	230 kV SWITCHGEAR Lightning Arrester Flexible conductors EarthWire Connectors Insulator -Post -Disc Fittings Steel Structures			
5	132 kV SWITCHGEAR Lightning Arrester Flexible conductors EarthWire Connectors Insulator -Post -Disc Fittings Steel Structures			

Item	Description	Proposed Subcontractors/ Manufacturers	Place of Manufacture	Place of Testing and Inspection
6	33 kV SWITCHGEAR Circuit-breakers CB Operating Mechanism Disconnectors Current transformers Voltage Transformers Lightning Arrester Busbar conductor Flexible conductors EarthWire Connectors Insulator -Post -Disc Fittings Steel Structures			
7	**230/138/33 kV POWER TRANSFORMERS** Complete HV bushings LV bushings TV bushings Porcelain for insulators Tap changers Copper Core plates Tanks Radiators			

Item	Description	Proposed Subcontractors/ Manufacturers	Place of Manufacture	Place of Testing and Inspection
	Fan motors Temperature indicators Oil valves Pressure relief device Motor control equip. Gas/Oil actuated relay Transformer oil Remote control panel Automatic voltage control equipment Indicating instruments			
8	**132/33 kV POWER TRANSFORMERS** Complete On load Tap Changer HV bushings LV bushings Porcelain for insulators Tap changers Copper Core plates Tanks Radiators Fan motors Temperature indicators Oil valves Pressure relief device Motor control equip. Gas/Oil actuated relay Transformer oil			

Item	Description	Proposed Subcontractors/ Manufacturers	Place of Manufacture	Place of Testing and Inspection
	Remote control panel AutomaticVoltageRegulator Indicating instruments			
9	**33/0.4 kV EARTHING TRANSFORMERS**			
10	**33/0.4 kV AUXILIARY TRANSFORMERS**			
11	**Deleted**			
12	**PROTECTION METERING AND CONTROL** Control & Relay Panels Protective relays Substation automation System DFDR Meters Transducers Energy meter			
13	**DC EQUIPMENT** Batteries Chargers Distribution Boards			
14	**415 V SWITCH BOARD**			
15	**MULTICORE CABLES** XLPE Insulated Cables Cable trays			
16	**POWER CABLES** 230 kV XLPE Cables 132 kV XLPE Cables			

Item	Description	Proposed Subcontractors/ Manufacturers	Place of Manufacture	Place of Testing and Inspection
	33 kV XLPE Cables 230 & 132 kV Cable sealing ends and 33kV Cable termination kits			
17	**EARTHING** Copper flatbar/ Copper conductor Insulated copper Conductor Earthing Rod			
18	**FIBRE OPTIC MULTIPLEXER EQUIPMENT**			
19	**PABX System**			
20	**SITE ERECTION AND COMMISSIONING BY** **CIVIL WORKS** Design to be performed by:- Constructed by:-			

SCHEDULE D (Transmission Line Part)

Proposed Subcontractors/Manufacturers for Major Items of Plant and Services

The following Subcontractors and/or manufacturers are proposed for carrying out the item of the facilities indicated:

Bidders are free to propose more than one for each item.

If the bidder proposes equipment from the following manufacturers, then only authorization letter from those manufacturers will require to be submitted, no need to provide any other documents as mentioned above:

Tower: Kalpataru, India or KEC, India, or Bosung, Korea or L& T, India or MAN Structure, India or Jyoti Structures Ltd, India.
Conductor: Sterlite, India or Apar India or Hang Zhou Cable China or ZTT China.
Insulator: NGK Insulator, Japan.
Fittings for Conductor, Earthwire & Insulator: Sefag, Switzerland or Mozdorfer Austria or Sicamax, France or EMI, India.
OPGW: Prysmian, Spain or NKT, Germany or Draka Germany or LS cable, Korea or ZTT, China.
OPGW Fittings: Prysmian, Spain or Sefag, Switzerland or Mozdorfer, Austria or Sicamax, France or ZTT, China.

Item	Description	Manufacturer	Place of Manufacture	Place of Testing and Inspection
1.	**TOWER**			
	Tower			
	Nuts, Bolts, washer etc.			
2.	**CONDUCTOR & FITTINGS**			
	Conductor			
	Conductor fittings			
3.	**EARTHWIRE & FITTINGS**			
	Earthwire			
	Earthwire fittings			
4.	**OPGW & FITTINGS**			
	OPGW			
	OPGW fittings			
	Joint/Splice Boxes			
5.	**INSULATOR & FITTINGS**			
	Insulator units			
	Insulator fittings			

POWER GRID COMPANY OF BANGLADESH LIMITED

BIDDING DOCUMENT

FOR

CONSTRUCTION AND COMPLETION OF 132/33KV GIS SUBSTATION AT DHAMRAI, 230/132KV GIS SUBSTATION AT SHYAMPUR AND ASSOCIATED TRANSMISSION LINES ON TURNKEY BASIS.

SCHEDULE E

TECHNICAL PARTICULARS AND GUARANTEES

POWER GRID COMPANY OF BANGLADESH LIMITED

BIDDING DOCUMENT

CONSTRUCTION AND COMPLETION OF 132/33KV GIS SUBSTATION AT DHAMRAI, 230/132KV GIS SUBSTATION AT SHYAMPUR AND ASSOCIATED TRANSMISSION LINES ON TURNKEY BASIS

SCHEDULE E

TECHNICAL PARTICULARS AND GUARANTEES

PART 1 - 230 kV & 132 kV GIS

1.1A SHYAMPUR 230/132kV INDOOR TYPE GIS SUBSTATION:

Sl. No.	Description	Unit	Bidder's Data	
			230 kV	132 kV
1	**Site Condition**			
	Max. Altitude above sea level	m		
	Max. Ambient temperature outdoor	^{0}C		
	Min. Ambient temperature outdoor	^{0}C		
	Max. Ambient relative humidity	%		
	Max. Seismic acceleration at floor level:			
	- horizontal	g		
	- vertical	g		
2	**Type Designation**			
	Enclosure:			
	- busbar			
	- bay			
	Enclosure Material			
	Standards			
3	**Electrical Data**			
	Rated Voltage	kV		
	Rated Frequency	Hz		
	Insulation Level:			
	- lightning impulse withstand	kV		
	- 50 Hz withstand 1 minute	kV		
	Rated continuous current at 40^{0}C ambient temperature:			
	- main busbar and bus coupler	A		
	- transformer bay	A		
	- line bay	A		
	Rated short time withstand:			

Sl. No.	Description	Unit	Bidder's Data	
			230 kV	132 kV
	- current	kA		
	- duration	sec		
	Rated peak withstand current	kA		
4	**Secondary Circuit**			
	Auxiliary voltage:			
	- for control and signal	V dc		
	- for remote control	V dc		
	- for heating	V ac		
	- tolerances	%		
5	**Solid Insulators**			
	Type of solid insulators			
	Material of solid insulators			
	Discharge level at 110% of the Rated voltage	pC		
	Gas tight disc type insulator:			
	- bursting pressure	Bar		
	- routine test pressure	Bar		
6	**Insulation Medium**			
	Insulation medium			
	Max. permissible moisture content	ppmv		
	Max. permissible air content	vol%		
7	**Gas Compartments**			
	No. of gas compartment per feeder			
	Max. gas losses per gas compartment and year	%		
	Material of filter employed for Moisture absorption			
	Gas filling pressure at 20^0C ambient temperature	Bar		
	Max. gas-service pressure at 40^0C ambient temperature	Bar		
	Min. gas-service pressure at 25^0C ambient temperature	Bar		
	Type of gas monitoring			
	Signal: "Loss of SF6-Gas" at 20^0C ambient temperature	Bar		
	Signal: "Min. of SF6-Gas" at 20^0C	Bar		

Sl. No.	Description	Unit	Bidder's Data	
			230 kV	132 kV
	ambient temperature			
	Type of pressure relief device			
	Material of pressure relied device			
	Setting of pressure relief device	Bar		
8	**Enclosures**			
	Mechanical strength of enclosures:			
	- design pressure	Bar		
	- min. bursting pressure	Bar		
	Temperature rise of enclosures at Rated current:			
	- which have to be touched during normal operation	K		
	- which need not to be touched during normal operation	K		
	- which are not accessible to the operation	K		
9	**Circuit Breaker**			
	Enclosure			
	Enclosure material			
	Material of contacts			
	No. of breaks per phase			
	Rated continuous current at 40^0C ambient temperature	A		
	Rated short time breaking current	kA		
	Rated peak withstand current	kA		
	Percentage D.C component	%		
	First-pole-to-clear-factor			
	Rated breaking current, small capacitive currents	A		
	Rated breaking current, small inductive currents	A		
	Switching overvoltage	p.u.		
	Operating mechanism:			
	- for closing			
	- for opening			
	Making coil:			
	- no. per operating mechanism	pcs		
	- rated power each	W		

Sl. No.	Description	Unit	Bidder's Data	
			230 kV	132 kV
	Tripping coil:			
	- no. per operating mechanism	pcs		
	- rated power each	W		
	- voltage tolerances	%		
	Rated motor voltage	V dc		
	Rated motor power	W		
	No. of auxiliary contacts (NC/NO/wiping)	pcs		
	Rated operating sequence:			
	- t	sec		
	- t'	min		
	Max. closing time	ms		
	Max. dead time	ms		
	Max. break time	ms		
	Max. arcing time	ms		
10	**Disconnector**			
	Enclosure			
	Enclosure material			
	Rated continuous current at 40^0C ambient temperature	A		
	Rated breaking current	A		
	Operating mechanism:			
	- for closing			
	- for opening			
	Max. operating time:			
	- for closing	s		
	- for opening	s		
	No. of auxiliary contacts (NC/NO/wiping)	pcs		
	Rated motor voltage	V dc		
	Rated motor power	W		
	Hand operating facilities			
11	**Maintenance Earthing Switch**			
	Enclosure			
	Enclosure material			
	Operating mechanism:			
	- for closing			

Sl. No.	Description	Unit	Bidder's Data	
			230 kV	132 kV
	- for opening			
	Max. operating time:			
	- for closing	s		
	- for opening	s		
	No. of auxiliary contacts (NC/NO/wiping)	pcs		
	Rated motor voltage	V dc		
	Rated motor power	W		
	Hand operating facilities			
12	**High Speed Earthing Switch**			
	Enclosure			
	Enclosure material			
	Rated current	A		
	Rated capacitive breaking current	A		
	Rated inductive breaking current	A		
	Operating mechanism:			
	- for closing			
	- for opening			
	Max. operating time:			
	- for closing	s		
	- for opening	s		
	No. of auxiliary contacts (NC/NO/wiping)	pcs		
	Rated motor voltage	V dc		
	Rated motor power	W		
	Hand operating facilities			
13	**Surge Arrester**			
	Rated voltage	kV		
	Nominal discharge current	kA		
	Steep current impulse residual voltage	kV pk		
	Lightning impulse residual voltage	kV pk		
	Duty class			
	Discharge class			
14	**CT ratio, class and output**			
	(a) Line bay	A		
	(b) 230 kV Transformer bay	A		

Sl. No.	Description	Unit	Bidder's Data	
			230 kV	132 kV
	(c) 132 kV Transformer bay	A		
	(d) Bus coupler bay	A		
15	**VT ratio, class and out**			
	Ratio	kV		
	Burden	VA		
	Accuracy class			
16	**Circuit Breaker Control Cubicle**			
	Material			
	Material thickness	mm		
	Dimensions (depth/width/height)	mm		
	Total net weight	mm		
17	**Separate Local Control Cubicle**			
	Material			
	Material thickness	mm		
	Dimensions (depth/width/height)	mm		
	Total net weight	mm		

1.1B DHAMRAI 132/33kV OUTDOOR TYPE GIS SUBSTATION:

Sl. No.	Description	Unit	Bidder's Data	
				132 kV
1	**Site Condition**			
	Max. Altitude above sea level	m		
	Max. Ambient temperature outdoor	^{0}C		
	Min. Ambient temperature outdoor	^{0}C		
	Max. Ambient relative humidity	%		
	Max. Seismic acceleration at floor level:			
	- horizontal	g		
	- vertical	g		
2	**Type Designation**			
	Enclosure:			
	- busbar			
	- bay			
	Enclosure Material			
	Standards			
3	**Electrical Data**			
	Rated Voltage	kV		
	Rated Frequency	Hz		

Sl. No.	Description	Unit	Bidder's Data	
				132 kV
	Insulation Level:			
	- lightning impulse withstand	kV		
	- 50 Hz withstand 1 minute	kV		
	Rated continuous current at 40^0C ambient temperature:			
	- main busbar and bus coupler	A		
	- transformer bay	A		
	- line bay	A		
	Rated short time withstand:			
	- current	kA		
	- duration	sec		
	Rated peak withstand current	kA		
4	**Secondary Circuit**			
	Auxiliary voltage:			
	- for control and signal	V dc		
	- for remote control	V dc		
	- for heating	V ac		
	- tolerances	%		
5	**Solid Insulators**			
	Type of solid insulators			
	Material of solid insulators			
	Discharge level at 110% of the Rated voltage	pC		
	Gas tight disc type insulator:			
	- bursting pressure	Bar		
	- routine test pressure	Bar		
6	**Insulation Medium**			
	Insulation medium			
	Max. permissible moisture content	ppmv		
	Max. permissible air content	vol%		
7	**Gas Compartments**			
	No. of gas compartment per feeder			
	Max. gas losses per gas compartment and year	%		
	Material of filter employed for Moisture absorption			
	Gas filling pressure at 20^0C ambient temperature	Bar		

Sl. No.	Description	Unit	Bidder's Data	
				132 kV
	Max. gas-service pressure at 40^0C ambient temperature	Bar		
	Min. gas-service pressure at 25^0C ambient temperature	Bar		
	Type of gas monitoring			
	Signal: "Loss of SF6-Gas" at 20^0C ambient temperature	Bar		
	Signal: "Min. of SF6-Gas" at 20^0C ambient temperature	Bar		
	Type of pressure relief device			
	Material of pressure relied device			
	Setting of pressure relief device	Bar		
8	**Enclosures**			
	Mechanical strength of enclosures:			
	- design pressure	Bar		
	- min. bursting pressure	Bar		
	Temperature rise of enclosures at Rated current:			
	- which have to be touched during normal operation	K		
	- which need not to be touched during normal operation	K		
	- which are not accessible to the operation	K		
9	**Circuit Breaker**			
	Enclosure			
	Enclosure material			
	Material of contacts			
	No. of breaks per phase			
	Rated continuous current at 40^0C ambient temperature	A		
	Rated short time breaking current	kA		
	Rated peak withstand current	kA		
	Percentage D.C component	%		
	First-pole-to-clear-factor			
	Rated breaking current, small capacitive currents	A		

Sl. No.	Description	Unit	Bidder's Data	
				132 kV
	Rated breaking current, small inductive currents	A		
	Switching overvoltage	p.u.		
	Operating mechanism:			
	- for closing			
	- for opening			
	Making coil:			
	- no. per operating mechanism	pcs		
	- rated power each	W		
	Tripping coil:			
	- no. per operating mechanism	pcs		
	- rated power each	W		
	- voltage tolerances	%		
	Rated motor voltage	V dc		
	Rated motor power	W		
	No. of auxiliary contacts (NC/NO/wiping)	pcs		
	Rated operating sequence:			
	- t	sec		
	- t'	min		
	Max. closing time	ms		
	Max. dead time	ms		
	Max. break time	ms		
	Max. arcing time	ms		
10	**Disconnector**			
	Enclosure			
	Enclosure material			
	Rated continuous current at 40^0C ambient temperature	A		
	Rated breaking current	A		
	Operating mechanism:			
	- for closing			
	- for opening			
	Max. operating time:			
	- for closing	s		
	- for opening	s		
	No. of auxiliary contacts	pcs		

Sl. No.	Description	Unit	Bidder's Data	
				132 kV
	(NC/NO/wiping)			
	Rated motor voltage	V dc		
	Rated motor power	W		
	Hand operating facilities			
11	**Maintenance Earthing Switch**			
	Enclosure			
	Enclosure material			
	Operating mechanism:			
	- for closing			
	- for opening			
	Max. operating time:			
	- for closing	s		
	- for opening	s		
	No. of auxiliary contacts (NC/NO/wiping)	pcs		
	Rated motor voltage	V dc		
	Rated motor power	W		
	Hand operating facilities			
12	**High Speed Earthing Switch**			
	Enclosure			
	Enclosure material			
	Rated current	A		
	Rated capacitive breaking current	A		
	Rated inductive breaking current	A		
	Operating mechanism:			
	- for closing			
	- for opening			
	Max. operating time:			
	- for closing	s		
	- for opening	s		
	No. of auxiliary contacts (NC/NO/wiping)	pcs		
	Rated motor voltage	V dc		
	Rated motor power	W		
	Hand operating facilities			
13	**Surge Arrester**			
	Rated voltage	kV		

Sl. No.	Description	Unit	Bidder's Data	
				132 kV
	Nominal discharge current	kA		
	Steep current impulse residual voltage	kV pk		
	Lightning impulse residual voltage	kV pk		
	Duty class			
	Discharge class			
14	**CT ratio, class and output**			
	(a) Line bay	A		
	(b) Deleted			
	(c) 132 kV Transformer bay	A		
	(d) Bus coupler bay	A		
15	**VT ratio, class and out**			
	Ratio	kV		
	Burden	VA		
	Accuracy class			
16	**Circuit Breaker Control Cubicle**			
	Material			
	Material thickness	mm		
	Dimensions (depth/width/height)	mm		
	Total net weight	mm		
17	**Separate Local Control Cubicle**			
	Material			
	Material thickness	mm		
	Dimensions (depth/width/height)	mm		
	Total net weight	mm		

PART 2 – Outdoor Type Switchgear(AIS)

2.1A VACUUM CIRCUIT BREAKERS(VCB) for Dhamrai SS:

Sl. No.	Nominal System Voltage			33 kV
1	Manufacturer			
2	Type Reference (Manufacturer's designation)			

Sl. No.	Nominal System Voltage			33 kV
3	Number of Poles			
4	Rated Voltage			
5	Rated frequency			
6	Rated normal current-	A		
7	Rated breaking currents: Line charging Cable charging Small inductive	kA rms		
8	Rated short-circuit breaking current	kA,rms		
9	First pole to clear factor			
10	Rated transient recovery voltage for terminal faults if other than standard	kV		
11	Rated characteristics for short-line faults			
12	Rated short-circuit making current	kA		
13	Rated operating sequence			
14	Rated duration of short-circuit	s		
15	Rated out of phase breaking current	kA		
16	Rated opening time	ms		
17	Rated break time	ms		
18	Rated closing time	ms		
19	Maximum arcing time of any duty cycle to IEC 56	ms		
20	Is circuit-breaker re-strike free	Yes/No		
21	Test Authority			
22	Test Certificate ref.			
23	Rated short time withstand current	kA		
24	Rated duration of short-circuit	s		
25	Rated peak withstand current	kA		
26	Rated insulation levels:-			
26.1	Lightning impulse withstand to earth	kV pk		
	(waveshape 1.2/50μs)			

Sl. No.	Nominal System Voltage			33 kV
26.2	Lightning impulse withstand across open	kV pk		
	contacts (waveshape 1.2/50μs)			
26.3	Power frequency voltage withstand to earth	kV rms		
26.4	Power frequency voltage withstand across open contacts	kV rms		
27	Frequency of operation	yr^{-1}		
28	Operating mechanism Manufacturer			
29	Mechanism Type:			
30	Trip free/or fixed trip			
31	Is lockout facility fitted?			
32	Closing supply Volts max/min Amps	 V A		
33	Rated supply voltage of shunt opening release	V		
34	Current required at rated supply voltage to open circuit-breaker Spring charging motor - Current - Voltage AC/DC	A A V		
35	Number of auxiliary switch contacts - normally open - normally closed - adjustable			
36 37	Other auxiliary loads: Voltage: Current:			
38	Degree of Protection for (a) auxiliary circuits (b) moving parts			
39	Minimum clearances in air: (a) between phases (b) phases to earth (c) across interrupters (d) live parts to ground level	 mm mm mm mm		
40	Minimum creepage (a) to earth (b) across interrupter terminals	 mm mm		

Sl. No.	Nominal System Voltage			33 kV
41	Radio interference voltage	μV		
42	Number of interrupters per pole			
43	Material of interrupter chamber			
44	Wall thickness of interrupter chamber	mm		
45	Material of contact surfaces primary arcing			
46	Length of each break	mm		
47	Length of stroke	mm		
48	Operating rod for moving contact(s) material			
49	DIMENSIONS, ETC.			
50	Weight of circuit-breaker unit complete	kg		
51	Maximum shock load imposed on floor or foundations when opening under fault conditions (state whether tension or compression)	kg		
52	Period of time equipment has been in commercial operation			
53	Number of the same type of circuit breakers supplied to date			

2.1B VACUUM CIRCUIT BREAKERS (VCB) for Shyampur SS:

Sl. No.	Nominal System Voltage			33 kV
1	Manufacturer			
2	Type Reference (Manufacturer's designation)			
3	Number of Poles			
4	Rated Voltage			
5	Rated frequency			
6	Rated normal current-	A		
7	Rated breaking currents: Line charging Cable charging	kA rms		

Sl. No.	Nominal System Voltage			33 kV
	Small inductive			
8	Rated short-circuit breaking current	kA,rms		
9	First pole to clear factor			
10	Rated transient recovery voltage for terminal faults if other than standard	kV		
11	Rated characteristics for short-line faults			
12	Rated short-circuit making current	kA		
13	Rated operating sequence			
14	Rated duration of short-circuit	s		
15	Rated out of phase breaking current	kA		
16	Rated opening time	ms		
17	Rated break time	ms		
18	Rated closing time	ms		
19	Maximum arcing time of any duty cycle to IEC 56	ms		
20	Is circuit-breaker re-strike free	Yes/No		
21	Test Authority			
22	Test Certificate ref.			
23	Rated short time withstand current	kA		
24	Rated duration of short-circuit	s		
25	Rated peak withstand current	kA		
26	Rated insulation levels:-			
26.1	Lightning impulse withstand to earth	kV pk		
	(waveshape 1.2/50μs)			
26.2	Lightning impulse withstand across open	kV pk		
	contacts (waveshape 1.2/50μs)			
26.3	Power frequency voltage withstand to earth	kV rms		
26.4	Power frequency voltage withstand across open contacts	kV rms		
27	Frequency of operation	yr^{-1}		

Sl. No.	Nominal System Voltage			33 kV
28	Operating mechanism Manufacturer			
29	Mechanism Type:			
30	Trip free/or fixed trip			
31	Is lockout facility fitted?			
32	Closing supply Volts max/min Amps	 V A		
33	Rated supply voltage of shunt opening release	V		
34	Current required at rated supply voltage to open circuit-breaker Spring charging motor - Current - Voltage AC/DC	A A V		
35	Number of auxiliary switch contacts - normally open - normally closed - adjustable			
36 37	Other auxiliary loads: Voltage: Current:			
38	Degree of Protection for (a) auxiliary circuits (b) moving parts			
39	Minimum clearances in air: (a) between phases (b) phases to earth (c) across interrupters (d) live parts to ground level	 mm mm mm mm		
40	Minimum creepage (a) to earth (b) across interrupter terminals	 mm mm		
41	Radio interference voltage	μV		
42	Number of interrupters per pole			
43	Material of interrupter chamber			
44	Wall thickness of interrupter chamber	mm		
45	Material of contact surfaces primary arcing			

Sl. No.	Nominal System Voltage			33 kV
46	Length of each break	mm		
47	Length of stroke	mm		
48	Operating rod for moving contact(s) material			
49	DIMENSIONS, ETC.			
50	Weight of circuit-breaker unit complete	kg		
51	Maximum shock load imposed on floor or foundations when opening under fault conditions (state whether tension or compression)	kg		
52	Period of time equipment has been in commercial operation			
53	Number of the same type of circuit breakers supplied to date			

2.2 DISCONNECTORS AND EARTHING SWITCHES

Sl. No.	Nominal System Voltage			33 kV
1	Manufacturer			
2	Type Number			
3	Operating type			
	(a) horizontal/vertical break			
	(b) Series/parallel			
	(c) Number of support insulator for pole			
	(d) Number of breaks per pole (SingleBreak/CenterBreak/DoubleBreak)			
	(e) Material of contact surfaces			
	(f) Type of Contacts			
4	Rated normal current	A		
5	Rated short time withstand current	kA, rms		
6	Rated duration of short time current	s		

Sl. No.	Nominal System Voltage			33 kV
7	Rated peak withstand current	kA pk		
8	Rated insulation levels:			
8.1	Lightning impulse withstand to earth (waveshape: 1.2/50µs)	kV pk		
8.2	Lightning impulse withstand across open contacts (waveshape: 1.2/50µs)	kV pk		
8.3	Power frequency voltage withstand to earth	kV rms		
8.4	Power frequency voltage withstand across open contacts	kV rms		
9	Method of operation			
10	Type of operating mechanism manual/power			
11	Operating power			
12	Voltage/pressure rated max min	V/MPa(g) V/MPa(g) V/MPa(g)		
13	Consumption electric	A		
14	Operating time: open max min	ms ms		
15	Operating time: close max min	ms ms		
16	Manual operating torque	kNm		
17	Load switching capability	A		
18	Mechanical Terminal Load	N		
19	Insulator Creepage	mm		
20	Radio interference voltage	mV		
21	Number of auxiliary switches - normally open - normally closed - adjustable			
22	Other auxiliary loads - voltage - current			
23	Mechanical endurance:			
	Number of operations carried out for			

Sl. No.	Nominal System Voltage			33 kV
	mechanical operation test			
24	Degree of protection for 1) auxiliary circuits 2) moving parts			
25	Total weight of three pole disconnector complete	kg		
26	Type test certificate date/reference			
27	Period of time equipment has been in commercial operation			
28	Number of the same type of disconnectors supplied to date			

2.3 CURRENT TRANSFORMERS (for Dhamrai SS)

Sl. No.	Nominal System Voltage			33 kV
1	Manufacturer/type			
2	Rated primary current	A rms		
3	Rated secondary current	A rms		
4	Rated frequency	Hz		
5	Highest voltage for equipment	kV		
6	Rated insulation level - primary winding	kV		
7	Lightning impulse withstand	kV pk		
8	(a) Power frequency withstand (dry) (b) Power frequency withstand (wet)	kV rms kV rms		
9	Insulator creepage (phase to earth)	mm		
10	Electrical dissipation factor at power frequency test voltage			
11	Radio influence voltage measured at U/√3 1 MHz	µV		
12 13	Rated short term thermal current for 1s Rated short term thermal current for 3s	A rms A rms		
14	Rated dynamic current	kA pk		
15	Insulation class			
16	Number of secondary windings			

Sl. No.	Nominal System Voltage			33 kV
	Location of core			
	Core 1 Rated output Accuracy class Accuracy limit factor			
	Core 2 Rated output Accuracy class Accuracy limit factor			
	Core 3 Rated output Accuracy class Accuracy limit factor			
	Core 4 Rated output Accuracy class Accuracy limit factor			
17	Is earth screen fitted between primary and secondary windings			
18	Type test certificate ref/date			

2.4 Inductive Voltage Transformer

Sl. No.	Nominal System Voltage			33 kV
1	Manufacturer	-		
2	Type No.	-		
3	Transformer type	-		
4	Rated primary voltage	kV rms		
5	Rated secondary voltage for each secondary winding	kV rms		
6	Accuracy class for each winding Rated output for each winding Rated volt-ampere rating for each winding	VA VA		
7	Rated voltage factor			
8	Type of Insulation			
9	Maximum temperature rise	^{O}C		
10	Short-circuit withstand capability	kA rms		
11	Primary insulation			
11.1	Lightning impulse withstand dry	kV pk		
11.2	(a) Power frequency withstand wet (b) Power frequency withstand dry	kV rms kV rms		
12	Partial discharge magnitude	pC		
13	Total external creepage distance	mm		
14	Radio influence voltage measured at 11 Um/√3 at 1 MHz	µV		
15	Total installed weight	kg		
17	Open circuit intermediate voltage	kV		

Sl. No.	Nominal System Voltage			33 kV
18	Rated open-circuit intermediate voltage	kV		
19 20	Reference range of frequency Reference range of temperature	+/- Hz oC		
21	Protective device to limit overvoltage			

2.5 SURGE ARRESTERS

Sl. No.	**Nominal System Voltage**		**230kV**	**132kV**	**33 kV**
1	Manufacturer				
2	Model Number				
3	Type:				
4	Continuous operating voltage	kV rms			
5	Rated voltage	kV rms			
6	Standard nominal discharge current	kA			
7	Reference current at ambient temperature	mA			
8	Reference voltage for above	kV rms			
9	Steep current impulse residual voltage	kV pk			
10	Lightning impulse residual voltage at 5kA 10kA 20kA	 kV pk kV pk kV pk			
11	Duty Class				
12	Discharge class				
13	Pressure relief class				
14	Nominal diameter of resistor blocks	mm			
15	Number of resistor blocks connected electrically in parallel				
16	Number of separately housed units per phase				
17	Overall height of arrester (without supporting structure)	m			

18	Overall height of arrester including grading ring if applicable	mm			
19	Clearances: phase to earth (from centre line) phase to phase (centre line to centre line)	 mm mm			
20	Overall Weight of arrester (without supporting structure)	kg			
21	Maximum cantilever strength	Nm			
22	Maximum force due to wind (at maximum specified gust speed)	Nm			
23	Minimum creepage distance over insulator housing	mm			
24	Insulator shed profile - Reference Document				
25	Terminal palm details - Drawing No.				
26	Earthing terminal - Drawing No.				
27	Type & Description of surge monitoring device				
28	Type test certificate ref/date				
29	Number of the same type of surge arresters supplied to date				

2.6 INSULATOR STRINGS

Sl. No.	**Nominal System Voltage**		**230 kV**	**132 kV**	**33 kV**
1	Manufacturer				
2	Insulator type (normal) and manufacturer's reference				
3	Insulation material				
4	Number of units per string				
5	Outside diameter	mm			
6	Distance between centres	mm			
7	Length of string overall	mm			

8	Maximum working load	kN			
9	Minimum failing load per unit	kN			
10	Mechanical routine load test	kN			
11	Electro-mechanical failing load	kN			
12	Mechanical failing load	kN			
13	Electrostatic capacity	pF			
14	Weight of complete string	kg			
15	50 Hz 1 minute withstand voltage of unit (dry)	kV			
16	50 Hz 1 minute withstand voltage of unit (wet)	kV			
17	Minimum 50 Hz puncture voltage	kV			
18	Dry lightning impulse withstand voltage of string1.2/50 micro sec. wave	kV			
19	Minimum creepage distance per unit: (a) Specified, subject to acceptable shed profile (b) Guaranteed	 mm mm			
20	Protected creepage distance per unit	mm			
21	Radio influence voltage measured at Um/√3 at 1 MHz	µV			

2.7 BUSBAR/JUMPER CONDUCTORS AND CONNECTIONS

Sl. No.	**Nominal System Voltage**		**23kV**	**132 kV**	**33 kV**
A.	**FLEXIBLE CONDUCTORS**				
1	Manufacturer				
2	Conductor material				
3	Material specification aluminium alloy				
4	Minimum use of grease				
5	Number of sub conductor per				

6	Nominal diameter of conductor				
7	Rated current (site rating)				
8	Temperature rise at rated current				
9	Short time withstand current for				
10	Peak withstand current				
11	Conductor spacer type				
12	Creep period of conductor	years			
B.	**SHIELD WIRES**				
1	Manufacturer				
2	Conductor material				
3	Material specification aluminium alloy				
C.	**CLAMPS AND FITTINGS**				
	Manufacturer				
	Types				
	Maximum working stresses				
D	**STEEL STRUCTURES**				
1	Manufacturer				
2	Proposed standards for steel				

PART 3 – TRANSFORMERS

3.1 230/138/33 kV, 225/300 MVA, 3-PHASE AUTO TRANSFORMER

Sl. No.	Description	Unit	Bidder's Data
1	Manufacturer		
2	Type/Model		
3	Continuous rating - ONAN/ONAF	MVA	
4	Voltage ratio no load - HV/LV/TV	kV	
5	Tap changer:		
	- tapping range		
	- size of tapping step		
	- no. of steps		
6	Vector group		
7	On-load voltage control equipment:		
	- type		
	- manufacturer		

Sl. No.	Description	Unit	Bidder's Data
	- range	%	
	- size of steps	%	
	- power frequency withstand test voltage between: first and last contacts of the selector switch between any two adjacent contacts of the selector between open diverter switch contacts		
	- type test certificate reference		
8	Type of cooling		
9	Winding temperature rise at CMR under service conditions stated in Schedule of Technical Requirement	^{0}C	
10	Top oil temperature under service conditions stated in Schedule of Technical Requirement:		
	- CMR	^{0}C	
	- ONAN rating	^{0}C	
11	Maximum hot spot temperature rise in core at rated power	^{0}C	
12	Maximum hot spot temperature rise in copper at rated power	^{0}C	
13	Temperature gradient at rating specified	^{0}C	
14	Flux density in iron at normal voltage and frequency and at normal ratio – no load:		
	- cores	Tesla	
	- yokes	Tesla	
	- Volts/turn	V	
15	Magnetising current (approx.) at nominal ratio:		
	- at 0.9 x nominal voltage	%	
	- at 1.0 x nominal voltage	%	
	- at 1.1 x nominal voltage	%	
	- at 1.2 x nominal voltage	%	
16	Harmonic component of magnetising current at rated voltage as percentage of fundamental:		
	- fifth harmonic	%	
	- seven harmonic	%	
17*	No-load loss (excluding cooling plant losses) at rated voltage, ratio and frequency	kW	
18*	Copper loss (excluding cooling plant losses) at 75^{0}C and at rated voltage, ratio(nominal tap),	kW	

Sl. No.	Description	Unit	Bidder's Data
	frequency and 300 MVA		
19*	Auxiliary loss at 300 MVA (total power input to fans for operation of total installed cooling capacity)	kW	
20	Total loss at 75^0C and normal ratio and 300 MVA (Sl. No. 17+18+19)	kW	
21	Regulation at 75^0C and normal ratio:		
	- at unity power factor	%	
	- at 0.8 lagging power factor	%	
22	Impedance voltage at 75^0C and CMR between HV & LV windings		
	- at extreme minus tap, normal tap and extreme plus tap	%	
	- maximum impedance over tapping range. Corresponding tap	%	
	- minimum impedance over tapping range. Corresponding tap	%	
23	Equivalent circuit zero sequence impedance: HV-LV	%	
24	Maximum current density in windings at CMR		
	- HV winding	A/mm^2	
	- LV winding	A/mm^2	
	- TV winding	A/mm^2	
25	Noise level	dB	
26	Type of transformer (shell or core)		
27	Core steel:		
	- type		
	- grade		
28	Type of winding:		
	- HV		
	- LV		
	- TV		
29	Insulation of winding:		
	- HV		
	- LV		
	- TV		
30	Insulation of:		
	- yoke bolts		

Sl. No.	Description	Unit	Bidder's Data
	- side plates		
31	Safe working temperature of core plate insulation	^0C	
32	Winding connections (brazed or crimped)		
33	For fault with zero impedance external to the transformer and infinite system		
	- maximum axial force	kN	
	- maximum tensile stress in winding	N/m^2	
34	Is facility provided for adjustment of axial pressure on windings	Yes/No	
35	Thickness of transformer tank:		
	- sides	mm	
	- bottom	mm	
36	Material used for gaskets for oil tight joints		
	Radiators, Valves, Fans		
37	Thickness of radiator plates	mm	
38	Valve type/material:		
	- 100mm and below		
	- above 100mm		
39	Equipment for ONAF + cooling state	Radiators on main tank	
40	No. of coolers/radiators or cooler banks		
41	No. of air blowers		
42	Speed of air blowers	rpm	
43	Rating of each air blower motor	kW	
44	Starting current of each air blower motor	A	
	Oil Volumes and Weight		
45	Total oil required including cooler system	litres	
46	Volume of oil to fill transformer above the top yoke	litres	
47	Total volume of conservator	litres	
48	Weight of active copper	tonnes	
49	Weight of active iron in core	tonnes	
50	Weight of core and winding assembly	tonnes	
51	Weight of each cooler bank complete with oil if mounted separately from transformer	tonnes	
52	Total weight of complete transformer including attached coolers, voltage regulating equipment,	tonnes	

Sl. No.	Description	Unit	Bidder's Data
	all fittings and oil		
53	Weight of transformer arranged for transport	tonnes	
54	Manufacture, type and class of oil to IEC 296		
	Transformer Parts Subject to Short-Circuit Test		
55	Brief description of transformer or parts thereof subjected to short-circuit test		
	Bushing insulators		
56	Terminations of terminals:		
	- HV		
	- LV		
	- TV		
	- Neutral		
57	Manufacturer		
58	Rated voltage		
59	Rated current		
60	BCT particulars		
	- HV side: no. of cores per phase rated primary current rated secondary current accuracy class		
	- LV side: no. of cores per phase rated primary current rated secondary current accuracy class		
	- TV side: no. of cores per phase rated primary current rated secondary current accuracy class		
	- Neutral side: no. of cores per phase rated primary current rated secondary current accuracy class		
61	Porcelain Bushing Insulators		

Sl. No.	Description	Unit	Bidder's Data
	- manufacturer		
	- overall length of insulator	mm	
	- weight of insulator	kg	
	- electrostatic capacity of complete bushings	pF	
	- dry lightning impulse voltage withstand	kV	
	- total creepage distance of outdoor shedding	mm	
	- protected creepage distance of shedding	mm	

* Guaranteed values subject to deduction from Contract Price

3.2 132/33kV, 50/75 MVA, 3-PHASE POWER TRANSFORMER:

Sl. No.	Description		Bidder's data
1.1	Name of the Manufacturer		
1.2	Type/Model		
2.1	Continuous Rating - ONAN ONAF		
2.2	Voltage ratio at no-load HV/LV	kV	
3	Tap Changer		
3.1	HV Tap Changer (On load type) Tapping Range		
	Size of tapping step		
	No. of Steps		
4	Vector Group		
5	On-load voltage control equipment:		
	(A) Type. (B) Manufacturer (C) Range (D) Size of steps (E) Power frequency withstand test voltage (BS.4571) between: first and last contacts of the selector switch between any two adjacent contacts of the selector	 % %	

Sl. No.	Description		Bidder's data
	between open diverter switch contacts (F) Type test certificate reference		
6	Type of cooling		
7	Winding temperature rise at CMR under service conditions stated in Schedule of Technical Requirement	°C	
8	Top oil temperature under service conditions stated in Schedule of Technical Requirement (A) CMR (B) ONAN rating	 °C °C	
9	Maximum hot spot temperature rise in core at rated power	°C	
10	Maximum hot spot temperature rise in copper at rated power	°C	
11	Temperature gradient at rating specified	°C	
12	Flux density in iron at normal voltage and frequency and at normal ratio - (no load) (A) Cores (B) Yokes (C) Volts/turn	 Tesla Tesla V	
13	Magnetising current (approx) at nominal ratio and at 0.9 x nominal voltage at 1.0 x nominal voltage at 1.1 x nominal voltage at 1.2 x nominal voltage	 % % % %	
14	Harmonic component of magnetising current at rated voltage as percentage of fundamental (A) Fifth harmonic	 %	

Sl. No.	Description		Bidder's data
	(B) Seven harmonic	%	
15*	No-load loss (excluding cooling plant losses) at rated voltage, ratio and frequency	kW	
16*	Copper loss (excluding cooling plant losses)at 75°C and at rated voltage, ratio (nominal tap),frequency & 75 MVA	kW	
17*	Auxiliary loss at 75 MVA (Total power input to fans for operation of total installed cooling capacity)	kW	

Sl. No.	Description		Bidder's data
18	Total loss at 75˚C and normal ratio and 75 MVA (Sl. No.15+16+17)	kW	
19	Regulation at 75˚C and normal ratio - (A) At unity power factor % (B) At 0.8 lagging power factor	 % %	
20	(i) Impedance voltage at 75˚C and CMR between HV & LV windings (A) at extreme minus tap normal tap extreme plus tap (B) Maximum Impedance over tapping range. Corresponding tap (C) Minimum Impedance over tapping range. Corresponding tap Impedance voltage at 75˚C and CMR(75MVA) between HV & LV at normal tap.	 % % % % % 	
21	Equivalent circuit zero sequence impedance: HV-LV	 %	
22	Maximum current density in windings at C.M.R. (A) HV winding (B) LV winding (C) SV winding	 A/mm2 A/mm2 A/mm2	
24	Noise level	dB	
25	Types of transformers (shell or core)		

Sl. No.	Description		Bidder's data
26	Core steel (a) Type (b) Grade		
27	Types of winding - (A) HV (B) LV		
28	Insulation of (a) HV windings (b) LV windings		
29	Insulation of - (A) Yoke bolts (B) Side plates		
31	Safe working temperature of core plate insulation	°C	
32	Winding connections brazed or crimped		
33	For fault with zero impedance external to the transformer and infinite system (a) Maximum axial force (b) Maximum tensile stress in winding	 kN N/m^2	
34	Is facility provided for adjustment of axial pressure on windings	Yes/No	
35	Thickness of transformer tank (A) Sides (B) Bottom	 mm mm	
36	Material used for gaskets for oil tight joints		
	Radiators, Valves, Fans		
37	Thickness of radiator plates	mm	
38.	Valve type/material: (A) 100mm and below (B) Above 100mm		
39	Equipment for ONAF + cooling state -	Radiators on main tank	

Sl. No.	Description		Bidder's data
40	Number of coolers/radiators or cooler banks per transformer		
41	Number of air blowers per transformer		
42	Speed of air blowers	rpm	
43	Rating of each air blower motor	kW	
44	Starting current of each air blower motor	A	
	Oil Volumes and Weights		
45	Total oil required including cooler system	litres	
46	Volume of oil to fill transformer to above the top yoke	litres	
47	Total volume of conservator	litres	
48	Weight of active copper	tonnes	
49	Weight of active iron in core	tonnes	
50	Weight of core and winding assembly	tonnes	
51	Weight of each cooler bank complete with oil if mounted separately from transformer	tonnes	
52	Total weights of complete transformers, including attached coolers, voltage regulating equipment, all fittings and oil	tonnes	
53	Weight of transformer arranged for transport	tonnes	
54	Manufacture, type and class of oil to IEC 296		
55	**Transformer Parts Subject To Short-Circuit Test**		
56	Brief description of transformer or parts thereof		

Sl. No.	Description		Bidder's data
	subjected to short-circuit test		

Sl. No.	Description				
	Transformer Bushing Insulators		**132 kV**	**33 kV**	**Neutral**
57	Maker				
58	Insulator material (solid, oil-paper etc)				
59	Maker's type reference and rated voltage				
60	Rated current				
61	BCT particulars				
	i) HV Side: Core 1,2: Core 3: ii) LV Side: Core 1,2: Core 3: Core 4: iii) Neutral: Core 1: Core 2:				
62	Manufacturer of porcelain				
63	Length of insulator (overall)	mm			
64	Weight of insulator	kg			
65	Electrostatic capacity of complete bushings	pF			
66	Dry lightning impulse voltage withstand (1.2/50 wave)	kV			
67	50Hz wet withstand voltage without arcing horns	kV			
	Total creepage distance of				

68	outdoor shedding	mm			
69	Protected creepage distance of shedding	mm			

*Guaranteed values subject to deduction from Contract Price

3.3 33/0.415 kV EARTHING/AUXILARY TRANSFORMERS

3.3A EARTHING TRANSFORMER :

Sl. No.	Description	Unit	Bidder's Data
1	Manufacturer		
2	Type		
3	Maximum flux density in core iron at normal voltage and frequency	Tesla	
4	CMR of lower voltage star winding	kVA	
5	No load losses	kW	
6	Load losses at 75^0C at CMR of lower voltage winding	kW	
7	Impedance voltage at CMR of lower voltage winding between HV and LV winding	%	
8	Total range of variation of off load:		
	- ratio	%	
	- size of step		
9	Resistance of higher voltage winding at 75^0C	ohms/ phase	
10	Zero phase sequence impedance at 75^0C with LV windings open circuited	ohms/ phase	
11	Total oil required	litres	
12	Weight of complete transformer including oil	tonnes	
13	Height from base to bottom of neutral bushing insulator	mm	

3.3B AUXILIARY TRANSFORMER:

Sl. No.	Description		
1	Manufacturer		
2	Type		
3	Current density in the interconnected star winding at rated short time current	A/mm^2	
4	Current density in the interconnected star winding -at CMR and -5 second fault rating simultaneously	 A/mm^2 A/mm^2	
5	Maximum flux density in core iron at normal voltage and frequency	Tesla	
6	CMR of lower voltage star winding	kVA	
7	No load losses	kW	
8	Load losses at 75°C at CMR(200KVA) of lower voltage winding	kW	
9	Impedance voltage at CMR(200KVA) of lower voltage winding between HV and LV winding	%	
10	Total range of variation of off load ratio ..... ratio ..... Size of step	 plus % plus %	 5 5 2.5
11	Resistance of higher voltage winding at 75°C	ohms per phase	
12	Zero phase sequence impedance at 75°C with LV windings open circuited	ohms per phase	
13	Total oil required	litres	
14	Weight of complete transformer (including oil)	tonnes	
15	Height from base to bottom of neutral bushing insulator	mm	

PART 4 – AUXILIARY POWER AND MULTICORE CONTROL CABLES
(Schedule to be completed if manufacture not to BS 6346)

Item		01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Number of core		4	4	4	4	4	2	2	2	2	4	7	12	19	27	37
Core section	mm^2															
Core diameter	mm															
Conductor insulation	mm															
Type of filler																
Type of tape																
Sheath thickness	mm															
Sheath outer diameter	mm															
Armour wires	no.															
Armour wires diameter	mm															
Outer covering	type															
Outer covering thickness	mm															
Complete cable:																
Diameter	mm															
Weight per metre	kg															
Maximum drum length	m															
Minimum installed bending radius	mm															
Maximum conductor temperature	^0C															

PART 5 - DC EQUIPMENT
110 V BATTERIES AND CHARGERS

Sl. No.	Description	Unit	Bidder's Data
	Battery		
1	Manufacturer		
2	Type		
3	Electrolyte		
4	Nominal voltage	V	
5	Capacity at 5 hour rate	Ah	
6	Number of cells		
7	Float voltage per cell	V	
8	Battery voltage at end of the duty cycle	V	
9	Normal charging rate	A	
10	Maximum charging rate	A	
11	Ampere-hour efficiency at ten hour rate	%	
12	Ampere-hour efficiency at one hour rate	%	
13	Dimensions of cells	mm	
14	Dimensions of battery complete	mm	
15	Weight of cell complete with electrolyte	kg	
16	Internal resistance per cell when fully charged	ohms	
17	Material of battery case		
	Charger		
18	Manufacturer		
19	Type		
20	AC input voltage and range	kVA	
21	DC output of charger	kW	
22	Type of DC voltage control		
23	Range of DC voltage	V	
24	Output current sharing facility (for parallel operation of chargers)		
25	Regulation	%	
	Charger Cubicle Complete		
26	Manufacturer		
27	Overall dimensions	mm	
28	Total weight	Kg	
	DC Switchboard		
29	Manufacturer		
30	Type		
31	Busbars:		

Sl. No.	Description	Unit	Bidder's Data
	- maximum current rating	A	
	- dimensions	mm	
32	Boost charge contactors:		
	- manufacturer		
	- maximum current rating		
	- coil rating		
	- method of interlocking		
33	Alarm relays:		
	- manufacturer		
	- type and reference		
	- power consumption: a) quiescent b) operated	 A mA	
34	Number and rating of distribution circuits		
35	Overall dimensions	mm	
36	Total weight	kg	

110V/48V DC/DC CONVERTER:

Sl. No.	Description	Unit	Bidder's Data
1	Manufacturer		
2	Type		
3	Input voltage and range		
4	DC output		
5	Type of DC voltage control		
6	Range of DC voltage		
7	Output current sharing facility (for parallel operation of chargers)		
8	**DC Switchboard**		
9	Manufacturer		
10	Type		
11	Busbars:		
	- maximum current rating	A	
	- dimensions	mm	
15	Alarm relays:		
19	Overall dimensions	mm	
20	Total weight	kg	

PART 6 - LVAC EQUIPMENT

Sl. No.	Description	Unit	Bidder's Data
	Distribution Board		
1	Manufacturer		
2	Manufacturer's type designation		
3	Rating	A	
4	Fault rating for 1 sec	kA	
5	Voltage	V	
	Miniature Circuit Breakers		
6	Manufacturer		
7	Type		
8	Rating	A	
9	Fault rating for 1 sec	kA	

PART- 7
SUBSTATION AUTOMATION SYSTEM

Sl. No.	Description	Unit	Bidder's Data
1	**General Requirement:**		
	Standards to be complied with Substation Automation system		
	Test Ca. Damp heat steady state		
	Test Db and guidance; Damp heat cyclic		
	Digital I/O, Analogue I/O dielectric Tests		
	Digital I/O, Surge withstand test		
	Radio interference test		
	Transient fast burst test		
	Static Discharge		
	Electromagnetic fields		
	Temperature range (min/max)	^{0}C	
	Relative humidity	%	
	Intelligent Electronic Devices (IED's)		
	- serial communication interface included?		
	- Protection & Control IED's connected same bus?		
	- self monitoring		
	- display of measured values		
	- remote parameterization		
	- disturbance record upload and analysis		

	Availability Calculation shall be furnished for each equipments as well as for the entire system		
	Main system, HMI, Gateway, IEC have dual communication port		
	SNTP server provide GPS time synchronization to HMI, Gateway, IED		
	System topology		
2	**Detailed Requirements:**		
	Manufacturer of Substation Automation System		
	Name and type of product in supplier's catalogue		
	Origin of manufacturer		
	Number of years of proven field experience of offered system. (Note: proof of experience should be furnished. The components used in the offered system and those with field experience should be the same)	Yrs	
	Design life of substation Automation System	Yrs	
	Manufacturers quality assurance system		
	Dimensions of cubicle: - Width - Depth - Height - Floor load	 mm mm mm N/㎡	
3	**Station Level Equipment:**		
	Station Controller		
	MTBF (Mean time between Failures)		
	MTTR (Mean time to repair)		
	Station computer dual connection to Ethernet		
	Dual wide screen monitor	inch	
	Dual Station Computers Provided in redundant hot Standby		
	Hot standby take over time		
	Annunciator for Station PC system software		
	Number of years of proven field experience of offered software	Yrs	
	Operating System		
	All standard picture as per spec included in HMI		
	Process Status Display & Command Procedures		
	Event processing as per spec		
	Alarm processing as per spec		
	Reports as per spec		
	Trend Display as per spec		
	Graphical Fault l information receiving function		

	Disturbance & Fault recording and analysis with graphical format		
	User Authority levels as per spec		
	System supervision & monitoring as per spec		
	Automatic sequence control as per spec		
4	**Gateway to National Load dispatch Center**		
	Manufacturer		
	Name and type of product in supplier's catalogue		
	Origin of manufacturer		
	Number of years of proven filed experience of offered unit	Yrs	
	Insulation tests		
	Fast disturbance tests		
	Industrial environment		
	Industrial grade hardware with no moving parts (PC based gateway is not accepted)		
	Design life of offered equipment	Yrs	
	Redundant communication channel		
	Redundant CPU		
	Redundant DC/DC Supply		
	MTBF (Mean time between Failures)		
	MTTR (Mean time to repair)		
	Dual connection to Ethernet		
5	**Station Bus:**		
	Type of bus/protocol		
	Physical Medium		
	Dual connection		
	Transfer rate/bus speed		
6	**Interbay Bus**		
	Type of bus/protocol		
	Physical Medium		
	Transfer rate/bus speed		
7	**Printer server**		
	Manufacturer		
	Name and type of product in supplier's catalogue		
	Origin of manufacturer		
	MTBF		
8	**Event Printer**		
	Manufacturer		
	Name and type of product in supplier's catalogue		
	Origin of manufacturer		
	Print speed		

	Paper feed/width		
	Character set		
	MTBF		
9	**Hard Copy colour Printer**		
	Manufacturer		
	Name and type of product in supplier's catalogue		
	Origin of manufacturer		
	Print speed		
	Colours		
	Resolution		
	Character set		
	MTBF		
10	**Master Clock GPS (Global Positioning System) Receiver:**		
	Manufacturer		
	Name and type of product in supplier's catalogue		
	Origin of manufacturer		
	Stability		
	MTBF		
11	**Bay control Unit - HV**		
	Manufacturer		
	Name and type of product in supplier's catalogue		
	Origin of manufacturer		
	Number of years of proven field experience of offered unit	Yrs	
	Separate Bay controller unit provided for each bay & feeder		
	Type of bay controller offered HV/MV		
	Select Before Operate with Open Execute & Close Execute		
	Single bit dependence		
	Interlocking, bay & Station wide		
	Dual connection to Ethernet sw		
	Synchrocheck function: - Maximum Voltage difference - Maximum Frequency difference - Maximum Phase difference		
	Double command blocking		
	Independent settable parameter groups		
	Local Display Unit		
	Sequence of event recorder: - Events - Time resolution		
	Disturbance recorder function		

	Disturbance record transfer function		
	Comtrde file generation		
	Comprehensive self-supervision		
	Battery free backup of events and disturbance records Insulation tests		
	Fast disturbance tests		
	MTBF		
	MTTR		
	Temperature range: IED's - Operation - Transport and storage	 ^{0}C ^{0}C	
	Relative humidity: - Operating max./min. - Transport and storage	 % %	
12	**Back up control mimic -HV**		
	Manufacturer		
	Name and type of product in supplier's catalogue		
	Origin of manufacturer		
	Control functionality: Control of breaker as well as all isolators/earthing switch (Control functionality should not be affected if bay controller fails)		
	Key-Locked		
	Interlock override function		
	Separate backup control mimic provided for each bay & feeder		
15	**Bay Control Unit - LV**		
	Manufacturer		
	Name and type of product in supplier's catalogue		
	Origin of manufacturer		
	Number of years of proven field experience of offered unit	Yrs	
	Separate Bay controller unit provided for each bay & feeder		
	Control functionality implementation in software:		
	Select before Operate with Open Execute & Close Execute		
	Interlocking, Bay & Station Wide		
	Dual connection to Ethernet sw		
	Synchrocheck function - Maximum Voltage difference - Maximum Frequency difference - Maximum Phase difference		
	Local Display Unit		
	Sequence of event recorder - Events		

	- Time resolution	ms	
	Disturbance recorder function		
	Disturbance record transfer function		
	Comtrde file generation		
	Comprehensive self-supervision		
	Insulation tests		
	Fast disturbance tests		
	MTBF		
	MTTR		
	Temperature range: IED's - Operation - Transport and storage	 ^{0}C ^{0}C	
	Relative humidity: - Operating max./min. - Transport and storage	 % %	
16	**Back up control mimic - LV**		
	Manufacturer		
	Name and type of product in supplier's catalogue		
	Origin of manufacturer		
	Control functionality: Control of breaker as well as all isolators/earthing switches Separate backup control mimic provided for each bay & feeder		
17	**System Performance:**		
	Exchange of display (First reaction)	s	
	Presentation of a binary change in the process display	s	
	Presentation of an analogue change in the process display	s	
	From order to process output	s	
	From order to updated of display	S	
18	**Deviations**		
	Please state all deviations from specification		

PART 8 - FIBRE OPTIC MULTIPLEXER EQUIPMENT

SL. No.	Description	Unit	Bidder's Data
1	**GENERAL:**		
	Manufacturer		
	Model No.		
	Type		
	Type of multiplexer		
	Complying to ITU-T rec.		
	Transmission Capacity	Mbit/s	
	Access capacity on 64 kbit/s	channels	
	Access capacity on 2 Mbit/s	channels	
	Redundant central processor		
	Digital cross connect function		
2	**Available AGGREGATES:**		
	Optical aggregates (ITU-T G.957)		
3	**Available TRUNK INTERFACES:**		
	HDB3, 2 Mbit/s interfaces per module	No.	
	Complying to ITU-T rec.		
	HDSL, 2Mbit/s interface: no of copper wires - Capacity on 2Mbit/s or on 1Mbit/s - Capacity selectable	No. ch ch / pair of wire	
4	**Available USER INTERFACES**		
5	**Voice interfaces for trunk lines:**		
	1 + 1 com path protection, available for all		
	Analogue, 4wire with E&M: Input level Output level	dBr dBr	
	Analogue, 2wire with E&M: Input level Output level	dBr dBr	
	Digital, 2Mbit/s CAS or PRI		
6	**Voice interfaces for remote Subscriber:**		
	2wire, subscriber side	dBr	
	2wire, PABX side	dBr	
7	**Integrated teleprotection**		
8	**Interface for Commands:**		
	Number of independent commands	No.	
	Transmission time max.	ms	
	Signal voltage	Vpeak	
	1 + 1 com path protection		
9	**Interface(s) for Distance Protection:**		
	Electrical interface: G.703	kbit/s	
	Optical Interface	kbit/s	
10	**Data: channels per module**		
	1 + 1 com path protection, available for all		
	V.24/V.28 (RS-232): up to 38.4kbit/s	No.	
	V.11/X.24 (RS-422): 64kbit/s	No.	
	V.35: 64kbit/s	No.	
	V.36 (RS-449): 64kbit/s	No.	

SL. No.	Description	Unit	Bidder's Data
	G.703: 64kbit/s	No.	
	Ethernet: 10/100 BaseT WAN capacity Protocols	No. Mbit/s Mbit/s	
11	**Integrated alarm gathering module:**		
	Number of external alarms per module	No.	
	Auxiliary power supply for ext. contacts		
12	**Network Management System**		
	Type/Name of configuration tool		
	For fault / configuration management		
	For local / remote operation		
	Data communication network (DCN)		
13	**Ambient Conditions:**		
	Storage: ETS 300 019-1-1, class 1.2	°C / % hum	
	Transport: ETS 300 019-1-2, class 2.2	°C / % hum	
	Operation: ETS 300 019-1-3, class 3.1E	°C / % hum	
14	**Power Supply**		
	Operation	VDC	
	Fully redundant power supply		

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

PART 9 – PROTECTION

9.1 230 kV Line Distance Protection for Meghnaghat 1 & 2 and Hasnabad 1&2 at Shyampur (Main 1 & Main 2):

SL. No.	Description	Unit	Bidder's Data
1	Manufacturer		
2	Type designations		
3	Phase switched		
4	Zone switched		
5	Number of zones		
6	Shape of impedance characteristic: Zone 1/Zone 2/Zone 3		
7	Reverse looking element (blocking signal initiation)		
8	Sensitivity:		
8.1	Minimum operation current: Earth faults/Phase faults	A	
8.2	Minimum necessary voltage for fault at Zone 1 reach point (if applicable): Earth faults/Phase faults	V	
8.3	Minimum Zone 1 ohmic impedance to which relay can be set	ohms	
8.4	Maximum Zone 1 ohmic impedance to which relay can be set and maintain accuracy	ohms	
8.5	Minimum Zone 2 ohmic impedance to which	ohms	

	relay can be set		
8.6	Maximum Zone 2 ohmic impedance to which relay can be set and maintain accuracy	ohms	
8.7	Maximum Xone 3 ohmic reach: Forward reach/Reverse reach	ohms	
9	Arc forward and reverse reach setting independent of each other?	Yes/No	
10	Can resistance and reactance reaches be set independent of each other	Yes/No	
11	Directional sensitivity	V	
12	Current transformer requirements		
13	Voltage transformer requirements		
14	Back up Zone time ranges: Zone 2/ Zone 3	sec.	
15	Method used to clear close-in faults:		
	which occur when line is already energized in service		
	which exist upon line energisation		
16	Has distance protection previously been used in the type of blocking scheme offered for this contract? If yes: number of scheme in service/year first in service	Yes/No	
17	Approximate number of years distance relay in service (A complete reference list should be submitted stating client, system voltage and year of going into service).		
18	Zone 1 operating times on fault position:		
	Earth faults: 0, 50, 90% of relay setting	ms (min./max.)	
	Phase to phase faults: 0, 50, 90% of relay setting	ms (min./max.)	
	Three phase faults: 0, 50, 90% of relay setting	ms (min./max.)	

9.2 230 kV Line Directional Earth Fault Protection for Meghnaghat 1 & 2 and Hasnabad 1&2 at Shyampur (Back up):

SL. No.	Description	Unit	Bidder's Data
1	Manufacturer		
2	Type designations		
3	Current setting range: Forward element/Reverse element	A	
4	Minimum polarizing quantity required for correct directional decision:		
	Voltage: Forward element/Reverse element	V	
	Current: Forward element/Reverse element	V	
5	Characteristic angle	Degree	
6	Time ranges: Blocking scheme/Back up	sec	
7	Has protection previously been used in the blocking scheme offered for this contract?	Yes/No	
8	Current transformer requirements		

9.3 132 kV Line Distance Relay (21)

SL. No.	Description	Unit	Bidder's Data

1	Manufacturer		
2	Type designations		
3	Phase switched		
4	Zone switched		
5	Number of zones		
6	Shape of impedance characteristic: Zone 1/Zone 2/Zone 3		
7	Reverse looking element (blocking signal initiation)		
8	Sensitivity:		
8.1	Minimum operation current: Earth faults/Phase faults	A	
8.2	Minimum necessary voltage for fault at Zone 1 reach point (if applicable): Earth faults/Phase faults	V	
8.3	Minimum Zone 1 ohmic impedance to which relay can be set	ohms	
8.4	Maximum Zone 1 ohmic impedance to which relay can be set and maintain accuracy	ohms	
8.5	Minimum Zone 2 ohmic impedance to which relay can be set	ohms	
8.6	Maximum Zone 2 ohmic impedance to which relay can be set and maintain accuracy	ohms	
8.7	Maximum Xone 3 ohmic reach: Forward reach/Reverse reach	ohms	
9	Arc forward and reverse reach setting independent of each other?	Yes/No	
10	Can resistance and reactance reaches be set independent of each other	Yes/No	
11	Directional sensitivity	V	
12	Current transformer requirements		
13	Voltage transformer requirements		
14	Back up Zone time ranges: Zone 2/ Zone 3	sec.	
15	Method used to clear close-in faults:		
	which occur when line is already energized in service		
	which exist upon line energisation		
16	Has distance protection previously been used in the type of blocking scheme offered for this contract? If yes: number of scheme in service/year first in service	Yes/No	
17	Approximate number of years distance relay in service (A complete reference list should be submitted stating client, system voltage and year of going into service).		
18	Zone 1 operating times on fault position:		
	Earth faults: 0, 50, 90% of relay setting	ms (min./max.)	
	Phase to phase faults: 0, 50, 90% of relay setting	ms (min./max.)	
	Three phase faults: 0, 50, 90% of relay setting	ms (min./max.)	

9.4 Directional over current and Earth Fault Protection

SL.	Description	Unit	Bidder's Data

No.			
1	Manufacturer		
2	Type designations		
3	Current setting range: Forward element/Reverse element	A	
4	Minimum polarizing quantity required for correct directional decision:		
	Voltage: Forward element/Reverse element	V	
	Current: Forward element/Reverse element	V	
5	Characteristic angle	Degree	
6	Time ranges: Blocking scheme/Back up	sec	
7	Has protection previously been used in the blocking scheme offered for this contract?	Yes/No	
8	Current transformer requirements		

9.5 Inversed Time Overcurrent and Earth Fault Protection

SL. No.	Description	Unit	Bidder's Data
1	Manufacturer		
2	Type designations		
3	Inversed time element		
	Range of current settings: Overcurrent/Earth Fault	A	
	Range of operating times at highest timing setting at ten times current setting	sec.	
	Range of operating times at highest timing setting at twice current setting	sec.	
4	High set instantaneous element range of settings: Overcurrent/Earth Fault	A	
5	Transient overreach at X/R=10		
6	Operating time with Maximum offset current at five times current setting	ms	
7	Burden of relay on minimum inverse time element current setting at a current ten times setting: Overcurrent/Earth fault	VA	

9.6 230 kV Busbar Protection

SL. No.	Description	Unit	Bidder's Data
1	Manufacturer		
2	Type designations		
3	Operating principle, e.g. high impedance		
4	Minimum relay setting	A	
5	Sensitivity of scheme (allowing for CT magnetizing current, etc.)		
6	Maximum through fault current at which protection is stable	A	
7	Current transformer requirements		
8	Estimated magnetizing current at relay setting	A	
9	Operating time at twice relay minimum setting	ms	
10	Operating time at ten times relay minimum	ms	

	setting		

9.7 132 kV Busbar Protection

SL. No.	Description	Unit	Bidder's Data
1	Manufacturer		
2	Type designations		
3	Operating principle, e.g. high impedance		
4	Minimum relay setting	A	
5	Sensitivity of scheme (allowing for CT magnetizing current, etc.)		
6	Maximum through fault current at which protection is stable	A	
7	Current transformer requirements		
8	Estimated magnetizing current at relay setting	A	
9	Operating time at twice relay minimum setting	ms	
10	Operating time at ten times relay minimum setting	ms	

9.8 230/138/33 kV Transformer Biased Differential Protection

SL. No.	Description	Unit	Bidder's Data
1	Manufacturer		
2	Type designations		
3	Range of operating coil settings	% of CT rating	
4	Range of bias coil settings	% of CT rating	
5	Recommended operating coil setting	% of CT rating	
6	Recommended bias coil setting	% of CT rating	
7	Number of bias coils		
8	Minimum sensitivity: Earth faults/Phase faults	% of CT rating	
9	Maximum through fault at which the protective equipment is stable with recommended settings: Earth faults/Phase faults	% of CT rating	
10	Maximum time delay between initiation of fault and emerging of breaker trip circuit	ms	
11	Current transformer requirements		

9.9 230/138/33 kV Transformer Restricted Earth Fault Protection

SL. No.	Description	Unit	Bidder's Data
1	Manufacturer		
2	Type designations		
3	Operating principle, e.g. high impedance		
4	Minimum relay setting	A	
5	Sensitivity of scheme (allowing for CT magnetizing current, etc.)		
6	Maximum through fault current at which protection is stable	A	
7	Current transformer requirements		
8	Estimated magnetizing current at relay setting	A	
9	Operating time at twice relay minimum setting	ms	
10	Operating time at ten times relay minimum setting	ms	

9.10 132/33 kV Transformer Biased Differential Protection

SL. No.	Description	Unit	Bidder's Data
1	Manufacturer		
2	Type designations		
3	Range of operating coil settings	% of CT rating	
4	Range of bias coil settings	% of CT rating	
5	Recommended operating coil setting	% of CT rating	
6	Recommended bias coil setting	% of CT rating	
7	Number of bias coils		
8	Minimum sensitivity: Earth faults/Phase faults	% of CT rating	
9	Maximum through fault at which the protective equipment is stable with recommended settings: Earth faults/Phase faults	% of CT rating	
10	Maximum time delay between initiation of fault and emerging of breaker trip circuit	ms	
11	Current transformer requirements		

9.11 132/33 kV Transformer Restricted Earth Fault Protection

SL. No.	Description	Unit	Bidder's Data
1	Manufacturer		
2	Type designations		
3	Operating principle, e.g. high impedance		
4	Minimum relay setting	A	
5	Sensitivity of scheme (allowing for CT magnetizing current, etc.)		
6	Maximum through fault current at which protection is stable	A	
7	Current transformer requirements		
8	Estimated magnetizing current at relay setting	A	
9	Operating time at twice relay minimum setting	ms	
10	Operating time at ten times relay minimum setting	ms	

9.12 Breaker Failure Protection

SL. No.	Description	Unit	Bidder's Data
1	Manufacturer		
2	Type designations		
3	Setting of current elements: Phase faults/Earth faults	A	
4	Timer setting range	sec.	
5	Burden of relay at minimum current setting at ten times CT secondary rated current during: Phase faults/Earth faults	VA	
6	Operating time/Reset time	ms	

9.13 Tripping Relays

SL. No.	Description	Unit	Bidder's Data

1	Manufacturer		
2	Type designations		
3	Nominal operating voltage	V	
4	Minimum operating voltage	V	
5	Operation indicator		
6	Operating time at nominal voltage	ms	
7	Contact rating:		
	Make and carry continuously	VA	
	Make and carry for 3 sec.	VA	
	Break: resistive inductive	W VA	

9.14 33kV Over current and Earth Fault Protection

SL. No.	Description	Unit	Bidder's Data
1	Manufacturer		
2	Type designations		
3	Inversed time element		
	Range of current settings: Overcurrent/Earth Fault	A	
	Range of operating times at highest timing setting at ten times current setting	sec.	
	Range of operating times at highest timing setting at twice current setting	sec.	
4	High set instantaneous element range of settings: Overcurrent/Earth Fault	A	
5	Transient overreach at X/R=10		
6	Operating time with Maximum offset current at five times current setting	ms	
7	Burden of relay on minimum inverse time element current setting at a current ten times setting: Overcurrent/Earth fault	VA	

9.15 Overall Fault Clearance Times

SL. No.	Description	Unit	Bidder's Data
1	230 kV Busbar Faults:		
	Main protection relay operating time	ms	
	Auxiliary and tripping relay time (where used)	ms	
	Circuit breaker time	ms	
	Total	ms	
2	132 kV Busbar Faults:		
	Main protection relay operating time	ms	
	Auxiliary and tripping relay time (where used)	ms	
	Circuit breaker time	ms	
	Total	ms	
3	230/138/33 kV Transformer Faults:		
	Main protection relay operating time	ms	
	Auxiliary and tripping relay time	ms	
	Circuit breaker time	ms	
	Total	ms	

4	132/33 kV Transformer Faults:		
	Main protection relay operating time	ms	
	Auxiliary and tripping relay time	ms	
	Circuit breaker time	ms	
	Total	ms	
	Total	ms	

PART 10 – Digital Fault and Disturbance Recorder (DFDR).

10.1 DFDR for New Shyampur 230/132kV SS.

6.11	Digital Fault and Disturbance Recorder [DFDR]	UNITS	BIDDER'S DATA
(A)	**GENERAL**		
1	Manufacturer's name & address		
2	Type		
3	Power Supply -power Supply for printer	VDC VAC	
(B)	**ANALOGUE INPUTS**		
1	Number of Channel -Expandability		
2	Nominal Current	Amp	
3	Nominal voltage - Current	Vac/Vdc mA/Amp	
4	Frequency response		
5	Cut-off frequency		
	(a) Bandwidth	dB	
	(b) Attenuation at	dB	
	(c) Auto adjusted anti-aliasing filters for chosen sampling rate	Yes/No	
d	Simultaneously programmable sampling rate for all feeders/inputs -Locally Changeable -Remotely Changeable	 Yes/No Yes/No	
e	Possible sampling rates	 Samples/sec Samples/sec Samples/sec	
6	DC coupled inputs	Yes/No	
7	Resolution	bits	
8	Accuracy	%	
9	Burden 1. Current Circuit at IN 2. Voltage Circuit	 VA VA	
10	Over load 1. Current 2. Voltage circuit	 % In % Vn	
(C)	**DIGITAL INPUTS**		
1	Number of Channel -Expandability (Without and time skew)		
2	Selectable input level	Vdc	
3	Type		
4	Resolution	ms	

(D)	**MEMORY**		
1	Size	MB	
2	Type		
3	Pre-fault time (fast scanning rate)	sec	
4	Post-fault (fast scanning rate	sec	
5	Pre and Post-fault time (slow scanning rate)	sec	
6	In-Built hard disk (auto-maintained	GB	
(E)	SENSORS/ TRIGERRING CRITERIA		
	All sensors/trigerrs are preferable Programmable and Virtually recordable	Yes/No	
1.	Logical combination sensor	Yes/No	
2.	Three phase over or under Voltage / Current	Yes/No	
3.	Mono phase over or under Voltage / Current	Yes/No	
4.	*du/dt, dp/dt, dq/dt, [Single/3 Phases], df/dt. etc.	Yes/No	
5.	RMS [Voltage / Current]	Yes/No	
6.	Zero Sequence	Yes/No	
7.	Negative, Positive Sequence	Yes/No	
8.	Frequency	Yes/No	
9.	DC Step	Yes/No	
10.	Pendling / Swing	Yes/No	
11.	Digital level and edge	Yes/No	
12.	Sensor trigger	Yes/No	
13.	Event Trigger	Yes/No	
14.	Manual Trigger	Yes/No	
15.	Remote Trigger	Yes/No	
(F)	CLOCK SYSTEM		
1.	Internal Clock	Yes/No	
2.	Accuracy		
3.	External Synchronization	Yes/No	
4.	Time resolution between 2 synchronized pulses		
(G)	OUTPUT ALARM RELAY CONTACT		
1.	Max. operation Voltage DC/AC	Vac / Vdc	
2.	Make and carry for 0.5 sec	A	
3.	Carry Continuously	A	
4.	Break (DC) – resistive	W	
(H)	INTERFACE FOR DATA COMMUNICATION		
1.	Full definition compression	Yes/No	
2.	Maximum transmission rate	bits / Sec	
3.	Standard serial port (EIA-232-D)	Yes / No	
4.	Printer Port	Yes/No	
5.	Dedicated serial port for modem	Yes/No	
(I)	PRINTER DATA		
1.	Printer amplitude (scaling peak to peak)		
2.	Time Scal (mm / s)		
3.	Printer resolution	mm	

4.	Auto printing	Yes/No	
(J)	Fault Priority transmission	Yes/No	
(K)	Fault location (distance calculation)	Yes/No	
(L)	Test certificates from internationally recognized Laboratories	Yes/No	
(M)	COMMUNICATION AND REMOTE ANALYZING UNIT		
	1. Processor Pentium	(MHz) Yes/No	
	2. Co-Processor pentium	Yes/No	
	3. Main memory capacity	(Mb) Yes/No	
	4. Color graphics board S-VGA	Yes/No	
	5. Screen S-VGA	Yes/No	
	6. Hard disk unit	Yes/No	
	7. Printer	Yes/No	
	8. Modem	Yes/No	
***Note: du/dt=Change of voltage, dp/dt=Change of active power, dq/dt=change of reactive power, df/dt=Change of frequency.**			

10.2 DFDR for Existing Tongi 230/132kV SS.

6.11	**Digital Fault and Disturbance Recorder [DFDR]**	**UNITS**	**BIDDER'S DATA**
(A)	**GENERAL**		
1	Manufacturer's name & address		
2	Type		
3	Power Supply -power Supply for printer	VDC VAC	
(B)	**ANALOGUE INPUTS**		
1	Number of Channel -Expandability		
2	Nominal Current	Amp	
3	Nominal voltage - Current	Vac/Vdc mA/Amp	
4	Frequency response		
5	Cut-off frequency		
	(a) Bandwidth	dB	
	(b) Attenuation at	dB	
	(c) Auto adjusted anti-aliasing filters for chosen sampling rate	Yes/No	
d	Simultaneously programmable sampling rate for all feeders/inputs -Locally Changeable -Remotely Changeable	 Yes/No Yes/No	
e	Possible sampling rates	 Samples/sec Samples/sec Samples/sec	
6	DC coupled inputs	Yes/No	
7	Resolution	bits	
8	Accuracy	%	
9	Burden 1. Current Circuit at IN 2. Voltage Circuit	 VA VA	

10	Over load 1. Current 2. Voltage circuit	 % In % Vn	
(C)	**DIGITAL INPUTS**		
1	Number of Channel -Expandability (Without and time skew)		
2	Selectable input level	Vdc	
3	Type		
4	Resolution	ms	
(D)	**MEMORY**		
1	Size	MB	
2	Type		
3	Pre-fault time (fast scanning rate)	sec	
4	Post-fault (fast scanning rate	sec	
5	Pre and Post-fault time (slow scanning rate)	sec	
6	In-Built hard disk (auto-maintained	GB	
(E)	SENSORS/ TRIGERRING CRITERIA		
	All sensors/trigerrs are preferable Programmable and Virtually recordable	Yes/No	
1.	Logical combination sensor	Yes/No	
2.	Three phase over or under Voltage / Current	Yes/No	
3.	Mono phase over or under Voltage / Current	Yes/No	
4.	*du/dt, dp/dt, dq/dt, [Single/3 Phases], df/dt. etc.	Yes/No	
5.	RMS [Voltage / Current]	Yes/No	
6.	Zero Sequence	Yes/No	
7.	Negative, Positive Sequence	Yes/No	
8.	Frequency	Yes/No	
9.	DC Step	Yes/No	
10.	Pendling / Swing	Yes/No	
11.	Digital level and edge	Yes/No	
12.	Sensor trigger	Yes/No	
13.	Event Trigger	Yes/No	
14.	Manual Trigger	Yes/No	
15.	Remote Trigger	Yes/No	
(F)	CLOCK SYSTEM		
1.	Internal Clock	Yes/No	
2.	Accuracy		
3.	External Synchronization	Yes/No	
4.	Time resolution between 2 synchronized pulses		
(G)	OUTPUT ALARM RELAY CONTACT		
1.	Max. operation Voltage DC/AC	Vac / Vdc	
2.	Make and carry for 0.5 sec	A	
3.	Carry Continuously	A	
4.	Break (DC) – resistive	W	
(H)	INTERFACE FOR DATA COMMUNICATION		
1.	Full definition compression	Yes/No	

2.	Maximum transmission rate	bits / Sec	
3.	Standard serial port (EIA-232-D)	Yes / No	
4.	Printer Port	Yes/No	
5.	Dedicated serial port for modem	Yes/No	
(I)	PRINTER DATA		
1.	Printer amplitude (scaling peak to peak)		
2.	Time Scal (mm / s)		
3.	Printer resolution	mm	
4.	Auto printing	Yes/No	
(J)	Fault Priority transmission	Yes/No	
(K)	Fault location (distance calculation)	Yes/No	
(L)	Test certificates from internationally recognized Laboratories	Yes/No	
(M)	COMMUNICATION AND REMOTE ANALYZING UNIT		
	1. Processor Pentium	(MHz) Yes/No	
	2. Co-Processor pentium	Yes/No	
	3. Main memory capacity	(Mb) Yes/No	
	4. Color graphics board S-VGA	Yes/No	
	5. Screen S-VGA	Yes/No	
	6. Hard disk unit	Yes/No	
	7. Printer	Yes/No	
	8. Modem	Yes/No	
***Note: du/dt=Change of voltage, dp/dt=Change of active power, dq/dt=change of reactive power, df/dt=Change of frequency.**			

10.3 DFDR for Existing Old Airport 230/132kV SS.

6.11	**Digital Fault and Disturbance Recorder [DFDR]**	**UNITS**	**BIDDER'S DATA**
(A)	**GENERAL**		
1	Manufacturer's name & address		
2	Type		
3	Power Supply -power Supply for printer	VDC VAC	
(B)	**ANALOGUE INPUTS**		
1	Number of Channel -Expandability		
2	Nominal Current	Amp	
3	Nominal voltage - Current	Vac/Vdc mA/Amp	
4	Frequency response		
5	Cut-off frequency		
	(a) Bandwidth	dB	
	(b) Attenuation at	dB	
	(c) Auto adjusted anti-aliasing filters for chosen sampling rate	Yes/No	
d	Simultaneously programmable sampling rate for all feeders/inputs -Locally Changeable -Remotely Changeable	 Yes/No Yes/No	

e	Possible sampling rates	Samples/sec Samples/sec Samples/sec	
6	DC coupled inputs	Yes/No	
7	Resolution	bits	
8	Accuracy	%	
9	Burden 1. Current Circuit at IN 2. Voltage Circuit	 VA VA	
10	Over load 1. Current 2. Voltage circuit	 % In % Vn	
(C)	**DIGITAL INPUTS**		
1	Number of Channel -Expandability (Without and time skew)		
2	Selectable input level	Vdc	
3	Type		
4	Resolution	ms	
(D)	**MEMORY**		
1	Size	MB	
2	Type		
3	Pre-fault time (fast scanning rate)	sec	
4	Post-fault (fast scanning rate	sec	
5	Pre and Post-fault time (slow scanning rate)	sec	
6	In-Built hard disk (auto-maintained	GB	
(E)	SENSORS/ TRIGERRING CRITERIA		
	All sensors/trigerrs are preferable Programmable and Virtually recordable	Yes/No	
1.	Logical combination sensor	Yes/No	
2.	Three phase over or under Voltage / Current	Yes/No	
3.	Mono phase over or under Voltage / Current	Yes/No	
4.	*du/dt, dp/dt, dq/dt, [Single/3 Phases], df/dt. etc.	Yes/No	
5.	RMS [Voltage / Current]	Yes/No	
6.	Zero Sequence	Yes/No	
7.	Negative, Positive Sequence	Yes/No	
8.	Frequency	Yes/No	
9.	DC Step	Yes/No	
10.	Pendling / Swing	Yes/No	
11.	Digital level and edge	Yes/No	
12.	Sensor trigger	Yes/No	
13.	Event Trigger	Yes/No	
14.	Manual Trigger	Yes/No	
15.	Remote Trigger	Yes/No	
(F)	CLOCK SYSTEM		
1.	Internal Clock	Yes/No	
2.	Accuracy		
3.	External Synchronization	Yes/No	
4.	Time resolution between 2 synchronized pulses		
(G)	OUTPUT ALARM RELAY CONTACT		
1.	Max. operation Voltage DC/AC	Vac / Vdc	
2.	Make and carry for 0.5 sec	A	

3.	Carry Continuously	A	
4.	Break (DC) – resistive	W	
(H)	INTERFACE FOR DATA COMMUNICATION		
1.	Full definition compression	Yes/No	
2.	Maximum transmission rate	bits / Sec	
3.	Standard serial port (EIA-232-D)	Yes / No	
4.	Printer Port	Yes/No	
5.	Dedicated serial port for modem	Yes/No	
(I)	PRINTER DATA		
1.	Printer amplitude (scaling peak to peak)		
2.	Time Scal (mm / s)		
3.	Printer resolution	mm	
4.	Auto printing	Yes/No	
(J)	Fault Priority transmission	Yes/No	
(K)	Fault location (distance calculation)	Yes/No	
(L)	Test certificates from internationally recognized Laboratories	Yes/No	
(M)	COMMUNICATION AND REMOTE ANALYZING UNIT		
	1. Processor Pentium	(MHz) Yes/No	
	2. Co-Processor pentium	Yes/No	
	3. Main memory capacity	(Mb) Yes/No	
	4. Color graphics board S-VGA	Yes/No	
	5. Screen S-VGA	Yes/No	
	6. Hard disk unit	Yes/No	
	7. Printer	Yes/No	
	8. Modem	Yes/No	
***Note: du/dt=Change of voltage, dp/dt=Change of active power, dq/dt=change of reactive power, df/dt=Change of frequency.**			

PART-11: HV Power Cables and Accessories

11.1 230kV XLPE CABLE

Item	Description	Requirement	Manufacturer's Particulars
1	Voltage		
	Rated Voltage	230kV	
	Maximum System Voltage	245kV	
2	**Cores**		
	Number of cores	1 (one)	
3	**Conductor**		
	Cross sectional area	1000mm^2	
	Material	Copper	
	Design (standard of segmental)	Milliken (4 segment)	
4	**Conductor Screen**		
	Material	Semi conducting tape	

		& extruded semi conducting compound	
	Thickness (approx)		
5	**Insulation**	XLPE	
	Type of curing (dry)	Dry Curing (MDCV/CCV/VCV)	
	Thickness (Minimum)	23 mm	
6	**Insulation screen**		
	Material	Extruded semi conducting compound	
	Thickness approx.	1.5 mm	
7	**Material Screen**		
	Type	Corrugated Aluminium Sheath /Corrugated Seamless Aluminium Sheath /Lead Sheath	
	Thickness (nominal)	3.2 mm approx.	
8	**Water Swellable Tape**		
	Type	Non Conducting	
	Thickness (nominal)		
9	**Protection Tapes**		
	Material	Semi-conducting water blocking tapes under aluminium sheath	
	Nominal thickness and width approx	.05/120	
10	**Outer Covering**		
	Material	MDPE	
	Minimum average thickness	5 mm	
	Type of termite repellent	MDPE is Anti Termite	
11	**Completed Cable**		
	Overall diameter (approx)		
	Weight per meter (approx)		
	Maximum drum length (approx.)	300 m	
12	**Cable Drums**		
	Overall diameter (approx)		
	Width (approx)		
	Weight loaded (approx)		
13	Continuous Current carrying capacity based on the conditions special laid in the ground.	SPB * & Trefoil	
	One circuit		
	Two circuit		
	Three circuit		
	Drawing into ducts		
	One circuit		
	Two circuit	Same as mentioned above provided the length of into the duct shall not exceed 5% of route	
	Three circuit		

	In air		
14	Permissible overload in service conditions for a period of	29% 2 hrs in a day 100 hrs in a month 500 hrs in total life	
15	Max Conductor temperature		
	Laid direct ground	ºC	
	Draw into ducts	ºC	
	Elected in air	ºC	
16	Conductor short circuit current cable loaded	280 kA/1sec	
	Carrying capacity for three second cable loaded		
	As above prior to short circuit		
	Final conductor temperature	ºC	
17	Sheath Earth Fault Current Carrying capacity for three second cable loaded as above prior to each fault		
	Final Conductor temperature	250ºC	
18	Max. Dielectric stress all the conductor screen (assumed smooth)		
19	Minimum radius of bend around which cable can be laid		
	Laid direct	20 x overall diameter of cable in meters	
	In ducts		
	In air		
	Ducts		
20	Nominal Internal diameter of pipes on ducts through which cable may be pulled		
21	Maximum DC resistance per km of cable at 20ºC	0.009 ohm/km	
22	Of conductor		
	Of metallic layer		
	Maximum ac resistance per km of cable at maximum conductor temperature	0.0138 ohm/km	
23	Insulation Resistance per km of cable per core		
24	At 20ºC	mega ohm. Km	
	At maximum rated temperature	mega ohm. Km	
	Equivalent star Reactance per meter of 1- phase circuit at nominal frequency		
25	Maximum electrostatic capacitance per meter of cable approx	0.24 μm/km	
26	Maximum charging current per core per meter pf cable at nominal voltage Uo	9.7A/km	
27	Maximum dielectric loss cable per uncle of 3 phase circuit when laid direct in the ground ay nominal voltage Uo, normal sequence at maximum conductor temperature.		

28	Maximum induced voltage on metal sheath under fault condition (single core only)		
29	Maximum dielectric Dissipation factor of charging of cable when laid direct in the ground at nominal voltage Uo, normal piquancy at		
	Conductor temperature of 20ºC		
	Maximum conductor temperature (90deg. C)		
30	Sheath loss of cable per meter of phase circuit at nominal voltage Uo, normal frequency.		
31	Cree page	6250 mm (approx)	
	Total creepage distance of outdoor sealing approx. mm and porcelain.		
32	Earth continuity copper Conductor (IF REQD)	400 mm^2	
33	Condition upon which current carrying capacity are based		
	Soil thermal resistivity	ºC. cm/W	
	Ground temperature	ºC	
	Air temperature	ºC	
	Burial depth	M	
	Axial spacing between phase cables	mm	
	Axial spacing between circuits	mm	
	Type of earth bonding.		

* SPB - Single point bonding: in such a system the metallic sheath screen connected and earthed at one end of the route.
* DPB – Double point bonding: in such a system the metallic sheath/ screen connected and earthed at both ends of the route.

11.1A Outdoor Cable Sealing End

Item	Description	Unit	Requirement	Manufacturer's Particulars
			230kV	
1	Voltage rating	kV	230	
2	Current rating	amp	As per cable	
3	Type		Elastomeric stress cone with porcelain insulator.	
4	Insulator material		Porcelain	
5	Pitch circle diameter	mm		
6	Overall length of insulator	mm		
7	Weight of bushing including sealing compound	kg		
8	Total creepage distance of shedding	mm	6250mm (approx)	
9	Impulse withstand voltage (External)			
	(a) Positive			

		kV	1050	
	(b) negative	kV	1050	
10	Standards		IEC 62067	
11	Height of steel mounting Structure over the finished switchyard level	mm	2500 (min.)	

11.2 132kV XLPE CABLE

Item	Description	Requirement	Manufacturer's Particulars
1	Voltage		
	Rated Voltage	132kV	
	Maximum System Voltage	145kV	
2	**Cores**		
	Number of cores	1 (one)	
3	**Conductor**		
	Cross sectional area	1000mm^2	
	Material	Copper	
	Design (standard of segmental)	Milliken (4 segment)	
4	**Conductor Screen**		
	Material	Semi conducting tape & extruded semi conducting compound	
	Thickness (approx)		
5	**Insulation**	XLPE	
	Type of curing (dry)	Dry Curing (MDCV/CCV/VCV)	
	Thickness (Minimum)	17 mm	
6	**Insulation screen**		
	Material	Extruded semi conducting compound	
	Thickness approx.	1.5 mm	
7	**Material Screen**		
	Type	Corrugated Aluminium Sheath /Corrugated Seamless Aluminium Sheath /Lead Sheath	
	Thickness (nominal)		
8	**Water Swellable Tape**		
	Type	Non Conducting	
	Thickness (nominal)		
9	**Protection Tapes**		
	Material	Semi-conducting water blocking tapes under aluminium sheath	
	Nominal thickness and width approx		
10	**Outer Covering**		
	Material	MDPE	
	Minimum average thickness		

	Type of termite repellent	MDPE is Anti Termite	
11	**Completed Cable**		
	Overall diameter (approx)		
	Weight per meter (approx)		
	Maximum drum length (approx.)	300 m	
12	**Cable Drums**		
	Overall diameter (approx)		
	Width (approx)		
	Weight loaded (approx)		
13	Continuous Current carrying capacity based on the conditions special laid in the ground.	SPB * & Trefoil	
	One circuit		
	Two circuit		
	Three circuit		
	Drawing into ducts		
	One circuit		
	Two circuit	Same as mentioned above provided the length of into the duct shall not exceed 5% of route	
	Three circuit		
	In air		
14	Permissible overload in service conditions for a period of	29% 2 hrs in a day 100 hrs in a month 500 hrs in total life	
15	Max Conductor temperature		
	Laid direct ground	ºC	
	Draw into ducts	ºC	
	Elected in air	ºC	
16	Conductor short circuit current cable loaded	kA/1sec	
	Carrying capacity for three second cable loaded		
	As above prior to short circuit		
	Final conductor temperature	ºC	
17	Sheath Earth Fault Current Carrying capacity for three second cable loaded as above prior to each fault		
	Final Conductor temperature	250ºC	
18	Max. Dielectric stress all the conductor screen (assumed smooth)		
19	Minimum radius of bend around which cable can be laid		
	Laid direct	15 x overall diameter of cable in meters	
	In ducts		
	In air		
	Ducts		
20	Nominal Internal diameter of pipes on ducts through which cable may be		

	pulled		
21	Maximum DC resistance per km of cable at 20ºC		
22	Of conductor		
	Of metallic layer		
	Maximum ac resistance per km of cable at maximum conductor temperature		
23	Insulation Resistance per km of cable per core		
24	At 20ºC	mega ohm. Km	
	At maximum rated temperature	mega ohm. Km	
	Equivalent star Reactance per meter of 1- phase circuit at nominal frequency		
25	Maximum electrostatic capacitance per meter of cable approx	µm/km	
26	Maximum charging current per core per meter pf cable at nominal voltage Uo	A/km	
27	Maximum dielectric loss cable per uncle of 3 phase circuit when laid direct in the ground ay nominal voltage Uo, normal sequence at maximum conductor temperature.		
28	Maximum induced voltage on metal sheath under fault condition (single core only)		
29	Maximum dielectric Dissipation factor of charging of cable when laid direct in the ground at nominal voltage Uo, normal piquancy at		
	Conductor temperature of 20ºC		
	Maximum conductor temperature (90deg. C)		
30	Sheath loss of cable per meter of phase circuit at nominal voltage Uo, normal frequency.		
31	Cree page	mm	
	Total creepage distance of outdoor sealing approx. mm and porcelain.		
32	Earth continuity copper Conductor (IF REQD)	mm2	
33	Condition upon which current carrying capacity are based		
	Soil thermal resistivity	ºC. cm/W	
	Ground temperature	ºC	
	Air temperature	ºC	
	Burial depth	M	
	Axial spacing between phase cables	mm	
	Axial spacing between circuits	mm	
	Type of earth bonding.		

* SPB - Single point bonding: in such a system the metallic sheath screen connected and

earthed at one end of the route.

* DPB – Double point bonding: in such a system the metallic sheath/ screen connected and earthed at both ends of the route.

11.2A Outdoor Cable Sealing End

Item	Description	Unit	Requirement	Manufacturer's Particulars
			132kV	
1	Voltage rating	kV	132	
2	Current rating	amp	As per cable	
3	Type		Elastomeric stress cone with porcelain insulator.	
4	Insulator material		Porcelain	
5	Pitch circle diameter	mm		
6	Overall length of insulator	mm		
7	Weight of bushing including sealing compound	kg		
8	Total creepage distance of shedding	mm	3625mm (approx)	
9	Impulse withstand voltage (External)			
	(a) Positive			
		kV	650	
	(b) negative	kV	650	
10	Standards		IEC 62067	
11	Height of steel mounting Structure over the finished switchyard level	mm	1500 (min.)	

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

11.3 33kV XLPE CABLE

Item	Description	Requirement	Manufacturer's Particulars
1	Voltage		
	Rated Voltage	33kV	
	Maximum System Voltage	36kV	
2	**Cores**		
	Number of cores	1 (one)	
3	**Conductor**		
	Cross sectional area	$185mm^2$	
	Material	Copper	
	Design (standard of segmental)		
4	**Conductor Screen**		
	Material	Semi conducting tape & extruded semi conducting compound	
	Thickness (approx)		
5	**Insulation**	XLPE	
	Type of curing (dry)	Dry Curing (MDCV/CCV/VCV)	

	Thickness (Minimum)		
6	**Insulation screen**		
	Material	Extruded semi conducting compound	
	Thickness approx.		
7	**Material Screen**		
	Type	Corrugated Aluminium Sheath /Corrugated Seamless Aluminium Sheath /Lead Sheath	
	Thickness (nominal)		
8	**Water Swellable Tape**		
	Type	Non Conducting	
	Thickness (nominal)		
9	**Protection Tapes**		
	Material	Semi-conducting water blocking tapes under aluminium sheath	
	Nominal thickness and width approx		
10	**Outer Covering**		
	Material	MDPE	
	Minimum average thickness		
	Type of termite repellent	MDPE is Anti Termite	
11	**Completed Cable**		
	Overall diameter (approx)		
	Weight per meter (approx)		
	Maximum drum length (approx.)		
12	**Cable Drums**		
	Overall diameter (approx)		
	Width (approx)		
	Weight loaded (approx)		
13	Continuous Current carrying capacity based on the conditions special laid in the ground.	SPB * & Trefoil	
	One circuit		
	Two circuit		
	Three circuit		
	Drawing into ducts		
	One circuit		
	Two circuit	Same as mentioned above provided the length of into the duct shall not exceed 5% of route	
	Three circuit		
	In air		
14	Permissible overload in service conditions for a period of	29% 2 hrs in a day 100 hrs in a month 500 hrs in total life	
15	Max Conductor temperature		

	Laid direct ground	ºC	
	Draw into ducts	ºC	
	Elected in air	ºC	
16	Conductor short circuit current cable loaded	kA/1sec	
	Carrying capacity for three second cable loaded		
	As above prior to short circuit		
	Final conductor temperature	ºC	
17	Sheath Earth Fault Current Carrying capacity for three second cable loaded as above prior to each fault		
	Final Conductor temperature	250ºC	
18	Max. Dielectric stress all the conductor screen (assumed smooth)		
19	Minimum radius of bend around which cable can be laid		
	Laid direct	15 x overall diameter of cable in meters	
	In ducts		
	In air		
	Ducts		
20	Nominal Internal diameter of pipes on ducts through which cable may be pulled		
21	Maximum DC resistance per km of cable at 20ºC		
22	Of conductor		
	Of metallic layer		
	Maximum ac resistance per km of cable at maximum conductor temperature		
23	Insulation Resistance per km of cable per core		
24	At 20ºC	mega ohm. Km	
	At maximum rated temperature	mega ohm. Km	
	Equivalent star Reactance per meter of 1- phase circuit at nominal frequency		
25	Maximum electrostatic capacitance per meter of cable approx	µm/km	
26	Maximum charging current per core per meter pf cable at nominal voltage Uo	A/km	
27	Maximum dielectric loss cable per uncle of 3 phase circuit when laid direct in the ground ay nominal voltage Uo, normal sequence at maximum conductor temperature.		
28	Maximum induced voltage on metal sheath under fault condition (single core only)		
29	Maximum dielectric Dissipation factor of charging of cable when laid direct in the ground at nominal		

	voltage Uo, normal piquancy at		
	Conductor temperature of 20ºC		
	Maximum conductor temperature (90deg. C)		
30	Sheath loss of cable per meter of phase circuit at nominal voltage Uo, normal frequency.		
31	Cree page	mm	
	Total creepage distance of outdoor sealing approx. mm and porcelain.		
32	Earth continuity copper Conductor (IF REQD)	mm2	
33	Condition upon which current carrying capacity are based		
	Soil thermal resistivity	ºC. cm/W	
	Ground temperature	ºC	
	Air temperature	ºC	
	Burial depth	M	
	Axial spacing between phase cables	mm	
	Axial spacing between circuits	mm	
	Type of earth bonding.		

* SPB - Single point bonding: in such a system the metallic sheath screen connected and earthed at one end of the route.
* DPB – Double point bonding: in such a system the metallic sheath/ screen connected and earthed at both ends of the route.

A. OVERHEAD PORTION

A.1 TOWER

NOT USED

A.2 PILED FOUNDATION DETAILS

A2.1 230kV Portion

A2.1.1 Double Circuit

Tower Type Particulars	2DL (Standard)	2D1 (Standard)	2D25 (Standard)	2DT6 (Standard)
Type of piled foundation				
No. of piles per leg*				
Length of pile* (mm)				
Diameter of pile (mm)				

* The final figures shall be attained during detailed design of tower foundations and their approval thereof, after award of contract and the foundations shall be supplied accordingly within the contract price.

A2.1.2 Four Circuit

Tower Type Particulars	2QL (Standard)	2Q15 (Standard)	2Q30 (Standard)	2QT6 (Standard)
Type of piled foundation				
No. of piles per leg*				
Length of pile* (mm)				
Diameter of pile (mm)				

* The final figures shall be attained during detailed design of tower foundations and their approval thereof, after award of contract and the foundations shall be supplied accordingly within the contract price.

A2.2 132kV Portion

A2.2.1 132kV Double Circuit Portion

Tower Type Particulars	1DL (Standard)	1D1 (Standard)	1D25 (Standard)	1DT6 (Standard)
Type of piled foundation				
No. of piles per leg*				
Length of pile* (mm)				
Diameter of pile (mm)				

* The final figures shall be attained during detailed design of tower foundations and their approval thereof, after award of contract and the foundations shall be supplied accordingly within the contract price.

A2.2.1 132kV Four Circuit Portion

Tower Type Particulars	1QL (Standard)	1Q15 (Standard)	1Q30 (Standard)	1QT6 (Standard)
Type of piled foundation				
No. of piles per leg*				
Length of pile* (mm)				
Diameter of pile (mm)				

* The final figures shall be attained during detailed design of tower foundations and their approval thereof, after award of contract and the foundations shall be supplied accordingly within the contract price.

A.3 CONDUCTOR & EARTHWIRE

A3.1 230kV Overland Portion

Parameter	Unit	Conductor	Earthwire
Conductor Designation & Type		ACSR Mallard	(Not used)
Reference standard		ASTM B232	
Number & Diameter of strands	No. x mm		
Overall Diameter	mm		
Guaranteed Ultimate Tensile Strength	kN		
Final Modulus of elasticity	N/mm²		
Coefficient of Linear Expansion	1/degree		
D.C. Resistance at 20°C	ohm/km		
Standard Weight	kg/km		
Weight of grease	Kg/km		
Drop point of grease	°C		
Standard length on drum	m		
Lay Direction			
Weight of complete drum	Kg		
Percentage of random short drum lengths(not more than 4 percent)	%		

A3.2 132kV Portion

Parameter	Unit	Conductor	Earthwire
Conductor Designation & Type		ACSR Grosbeak	(Not Used)
Reference standard		ASTM B232	
Number & Diameter of strands	No. x mm		
Overall Diameter	mm		
Guaranteed Ultimate Tensile Strength	kN		
Final Modulus of elasticity	N/mm²		
Coefficient of Linear Expansion	1/degree		
D.C. Resistance at 20°C	ohm/Km		
Standard Weight	Kg/Km		
Weight of grease	Kg/Km		
Drop point of grease	°C		
Standard length on drum	m		
Lay Direction			
Weight of complete drum	kg		
Percentage of random short drum lengths(not more than 4 percent)	%		

A.4 OPGW & FITTINGS

A4.1 230kV Line

Parameter	Unit	7 × 4.00 S Earthwire equivalent OPGW
OPGW Designation & Type		
Number of fiber		48
Reference standard		
Number and Diameter of Aluminium strands	mm	
Number and Diameter of Steel strands	mm	
Corrosion Protection of Steel Strands		
Internal Fibre tube diameter	mm	
Overall diameter	mm	
Guaranteed Ultimate Tensile strength	kN	
Final Modulus of Elasticity	N/mm²	
Co-efficient of linear Expansion	1/degree	
DC Resistance at 20°C	ohms/m	
Maximum short circuit current capacity	kA² sec	25
Assumed temperature rise	°C	
Standard Weight	kg/m	
Weight of grease	kg/m	
Standard length on drum *	m	
Weight of complete drum	kg	
Maximum drum length	m	
Installation minimum bending radius	m	
OPTICAL CHARACTERISTICS:		
Cut off Wave length	nm	
Attenuation at ……. Nm	dB/km	
Zero dispersion wave length	nm	
Chromatic dispersion at ……. nm	ps/km	
Individual splice loss	dB	
Bit error rate		
OPGW FITTINGS:		
Guaranteed Ultimate Tensile strength		
Suspension set	kN	
Tension set	kN	
Overall length of set		
Suspension set	mm	
Tension set	mm	
Mass of set		
Suspension set	kg	
Tension set	kg	
Drawing Numbers :		
Cross section of OPGW		
Cross section of Non metallic cable		
Joint box		
Fixing Clamps		
OPGW Suspension set		
OPGW Tension set		
OPGW Vibration Damper		

* Drum length to be finalized after finalization of tower locations as per check survey.

A4.2 132kV Line

Parameter	Unit	
OPGW Designation & Type		
Reference standard		
Number and Diameter of Aluminium strands	mm	
Number and Diameter of Steel strands	mm	
Corrosion Protection of Steel Strands		
Internal Fibre tube diameter	mm	
Overall diameter	mm	
Guaranteed Ultimate Tensile strength	kN	
Final Modulus of Elasticity	N/mm²	
Co-efficient of linear Expansion	1/degree	
DC Resistance at 20°C	ohms/m	
Maximum short circuit current capacity	kA² sec	
Assumed temperature rise	°C	
Standard Weight	kg/m	
Weight of grease	kg/m	
Standard length on drum *	m	
Weight of complete drum	kg	
Maximum drum length	m	
Installation minimum bending radius	m	
OPTICAL CHARACTERISTICS:		
Cut off Wave length	nm	
Attenuation at ……. Nm	dB/km	
Zero dispersion wave length	nm	
Chromatic dispersion at …… nm	ps/km	
Individual splice loss	dB	
Bit error rate		
OPGW FITTINGS:		
Guaranteed Ultimate Tensile strength		
Suspension set	kN	
Tension set	kN	
Overall length of set		
Suspension set	mm	
Tension set	mm	
Mass of set		
Suspension set	kg	
Tension set	kg	
Drawing Numbers :		
Cross section of OPGW		
Cross section of Non metallic cable		
Joint box		
Fixing Clamps		
OPGW Suspension set		
OPGW Tension set		
OPGW Vibration Damper		

* Drum length to be finalized after finalization of tower locations as per check survey.

A.5 INSULATOR SETS & FITTINGS

A5.1 230kV Line

Parameter	Unit	Insulator Set Type				
		Suspension/ Jumper Suspension	Heavy Suspension	Tension	Upright Low Duty	Inverted Low Duty
Insulator Unit Type No.		U120B	U210B	U210B	U120B	U120B
Dielectric Material		{ …….	…….	Porcelain	……...	……..}
Total creepage per unit	(mm)					
Spacing	(mm)					
Overall shed diameter	(mm)					
Puncture Voltage of unit	(kV)					
Electro Mechanical Failing Load of unit	(kN)					
Drawing No. of Unit						
Type test Certificate No. of Unit						
Number of units per string						
Total creepage of string	(mm)					
Overall length of set	(mm)					
Sag adjuster type and step	(mm)					
Ultimate strength of set	(kN)					
Mass of set	(kg)					
Anticipated -Lightning impulse withstand Voltage	(kV)					
-Power Frequency withstand Voltage	(kV)					
-Corona extinction level	(kV)					

A5.1 132kV Line

Parameter	Unit	Insulator Set Type				
		Suspension/ Jumper Suspension	Heavy Suspension	Tension	Upright Low Duty	Inverted Low Duty
Insulator Unit Type No.		U70B	U120B	U120B	U70B	U70B
Dielectric Material		{ …….	…….	Porcelain	……...	……..}
Total creepage per unit	(mm)					
Spacing	(mm)					
Overall shed diameter	(mm)					
Puncture Voltage of unit	(kV)					
Electro Mechanical Failing Load of unit	(kN)					
Drawing No. of Unit						
Type test Certificate No. of Unit						
Number of units per string						
Total creepage of string	(mm)					
Overall length of set	(mm)					
Sag adjuster type and step	(mm)					
Ultimate strength of set	(kN)					
Mass of set	(kg)					
Anticipated						
-Lightning impulse withstand Voltage	(kV)					
-Power Frequency withstand Voltage	(kV)					
-Corona extinction level	(kV)					

A.6 SPACER DAMPERS

Parameter	Unit	
Unit Weight	kg	
Material	-	
No. of spacer dampers to be used for each phase per span*	nos.	
Total quantities of spacer dampers for one basic span*	nos.	

- These quantities shall be based on the design of the proposed spacer dampers. The quantities mentioned above may increase at the contractor's cost, if during design approval such increase is necessary.

A.7 VIBRATION DAMPERS

Parameter	Unit	
Unit Weight of vibration dampers		
-for 7 x 4.0 S earthwire	kg	
- for 7 x 4.0 S earthwire equivalent OPGW	kg	
- for 7/3.25 S earthwire equivalent OPGW	kg	
- for ACSR Grosbeak	kg	

* These quantities shall be based on the design of the proposed vibration dampers. The quantities mentioned above may increase at the contractor's cost, if during design approval such increase is necessary.

POWER GRID COMPANY OF BANGLADESH LIMITED

BIDDING DOCUMENT

FOR

CONSTRUCTION AND COMPLETION OF 132/33KV GIS SUBSTATION AT DHAMRAI, 230/132KV GIS SUBSTATION AT SHYAMPUR AND ASSOCIATED TRANSMISSION LINES ON TURNKEY BASIS.

SCHEDULE F

PROPOSED SUBCONTRACTORS

POWER GRID COMPANY OF BANGLADESH LIMITED

BIDDING DOCUMENT

Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

SCHEDULE F

PROPOSED SUBCONTRACTORS

The bidder shall propose a list of the Sub-contractors in the following table as per sub-clause 2.6, Item 8 & 9, Subcontractors, Section-3, Evaluation and Qualification Criteria, Volume 1 of 3 of the Bidding Document.

Sl. No.	Name and Address of the Subcontractor

Signature ----------

Date ----------

POWER GRID COMPANY OF BANGLADESH LIMITED

BIDDING DOCUMENT

FOR

CONSTRUCTION AND COMPLETION OF 132/33KV GIS SUBSTATION AT DHAMRAI, 230/132KV GIS SUBSTATION AT SHYAMPUR AND ASSOCIATED TRANSMISSION LINES ON TURNKEY BASIS.

SCHEDULE G

COEFFICIENT AND INDICES FOR PRICE ADJUSTMENT

POWER GRID COMPANY OF BANGLADESH LIMITED

BIDDING DOCUMENT
FOR

Construction and completion of 132/33kV GIS substation at Dhamrai, 230/132kV GIS substation at Shyampur and associated transmission lines on turnkey basis.

SCHEDULE G

COEFFICIENT AND INDICES FOR PRICE ADJUSTMENT

Coefficient Scope of Index	Country of Origin; Currency of Index	Source of Index; Title/Definition	Value on Stated Dates	
			Value	Date
For Transformer: a=0.15 b=0.22 c=0.25 d=0.15 e=0.03 f=0.2				