

# **TECHNICAL** **SPECIFICATIONS**

## **CHAPTER 1- PROJECT SPECIFIC REQUIREMENTS (PSR)**

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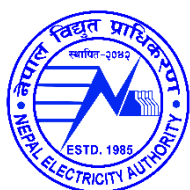
### **PACKAGE KC-6**

*of*

## **KOSHI CORRIDOR 220kV TRANSMISSION LINE PROJECT**

**IFB No.: KOSHI/NEA/KC-6**

**Procurement of Design, Supply, Installation, Testing  
and Commissioning of 220kV(GIS)/132kV  
Substation Expansion at Dhungesanghu Substation**



**नेपाल विद्युत प्राधिकरण**  
(नेपाल सरकारको स्वामित्व)  
**Nepal Electricity Authority**

*(A Government of Nepal Undertaking)*

## CHAPTER 1– PROJECT SPECIFIC REQUIREMENTS (PSR)

### 1.0 PROJECT DESCRIPTION

The primary objective of Nepal Electricity Authority (NEA) is to generate, transmit and distribute adequate, reliable and affordable power by planning, constructing, operating and maintaining all generation, transmission and distribution facilities in Nepal's power system both interconnected and isolated.

The Koshi Corridor 220 kV Transmission Line Project, implemented by the Nepal Electricity Authority (NEA), has completed, among other Facilities:

- a. 220kV Double Circuit Transmission line with single circuit stringing of Tumlingtar-Baneshwar-Basantapur-Inaruwa.
- b. Tumlingtar 220/132/33kV AIS Substation in Tumlingtar, Sankhuwasabha, Baneshwar 220/33kV AIS Substation at Baneshwar, Sankhuwasabha, Basantapur 220/132/33kV AIS Substation at 6, Sankhuwasabha District, Koshi Province, Nepal.
- c. Dhungesangu 132/33kV AIS substation at Dhungesangu, Taplejung District, Koshi Province, Nepal
- d. Basantapur-Dhungesangu 220kV Double Circuit Transmission Line

NEA has signed Power Purchase Agreements (PPAs) for a total capacity of 1,200 MW with Independent Power Producers (IPPs) connected at Dhungesangu Substation. Some IPP hydropower projects have their connection points at the 220 kV busbar, while others are connected at the 132 kV busbar with a delivery point at 220 kV. In view of these arrangements, the timely construction and expansion of the 220 kV substation is of paramount importance.

#### 1.1 Associated Transmission system

The following already constructed transmission line is associated with this substation: -

***Basantapur-Dhungesangu 220kV Double Circuit Twin Moose Transmission Line (34.3 km)***

### 2.0 INTENT OF SPECIFICATION/SCOPE

The specification includes design, engineering, manufacture, fabrication, testing at manufacturers works, supply & delivery, unloading at site, storage, erection, testing and commissioning at site of the **220/132kV** Dhungesangu substations described below:

Description	220kV	132 kV
Type	GIS	AIS
Bus Bar Configurations	Double Main	Double Main with Bypass Isolator
New/Extension	New	Extension
No of Bays	Line- 6 Nos. Transformer-2 Nos.	Transformer-1 No. Exiting line bay shall be used as transformer bay -1



Description	220kV	132 kV
	Reactor-1 No. Bus Coupler-1 No. Total: 10 Nos.	No. Total: 2 Nos.
<b>Future No of Bays for consideration</b>	Line- 8 Nos. Transformer- 1 bank Total:9 Nos.	Line-2 Nos. Transformer-1 bank Total: 3 Nos.

This includes all associated bays equipments, Transformers, Reactors, outdoor equipment, Control & Protection, integration with existing Substation Automation System, integration with existing communication System and other electrical and mechanical auxiliary systems, associated civil works, roads, drains, necessary buildings etc. in order to complete the works as define in the detail scope of works.

### 3.0 DETAIL SCOPE

The scope of this specification covers the following:

Design, engineering, manufacture, testing, supply including transportation & insurance, storage, erection, testing and commissioning of following equipments and items at Dhungesangu (Taplejung) substation complete in all respect:

#### 3.1 245kV Gas Insulated Switchgear

245kV SF6 gas insulated switch gear shall have double main bus bar arrangement. The Switchgear (50 Hz) shall be complete with all necessary terminal boxes, SF6 gas filling, interconnecting power and control wiring, grounding connections, earthing material, gas monitoring equipment & piping and support structures along with necessary base plate & foundation bolts. In addition, all necessary platforms, supports, ladders and catwalks etc. for operation & maintenance work shall also be supplied. All above items including SF6 gas and duct, cable termination inside GIS building are part of respective GIS Module and deemed to be included in respective module.

The SF6 gas insulated switch gear (50 Hz) shall be of the indoor metal- enclosed type, comprising of following modules: -

- a) Three phases, 4000A, 50kA for 1 second, SF<sub>6</sub> gas-insulated metal enclosed **245kV bus bar module**, each set comprising of the following: -
  - (i) Three (3) individual 1-phase/one (1) 3-phase bus bars enclosures running the length of the switchgear to interconnect each of the circuit breaker bay modules in Double Bus bar system.
  - (ii) One (1) numbers 3-phase, 4000A, group operated isolator switches, complete with manual and motor driven operating mechanisms.

- (iii) One (1) number 3-phase, group operated safety grounding switches, complete with manual and motor driven operating mechanisms.
  - (iv) One (1) number 3-phase, high speed fault make grounding switch, complete with group operated manual and motor driven operating mechanisms.
  - (v) Three (3) numbers 1-phase Potential Transformers with motorized isolating link.
  - (vi) Gas monitoring devices, barriers, pressure switches, UHF PD Sensors etc. as required.
  - (vii) End Piece module with the test link for Future extension of Bus bar module at one end. The end piece module may be designed in such a way so that future GIS module may be tested without extending voltage to existing bus by removing the test link. In case, 245kV Main Bus bar is offered with 3-ph enclosure, extension piece module shall include Adapter module to convert it to three individual 1-ph bus bar enclosures and same shall be deemed to be included in 245kV Bus Bar module.
  - (viii) Local Control Cubicle, if required separately.
- b) 245kV, 50kA for 1 second, 1600A, SF6 gas-insulated metal enclosed **ICT feeder bay module** for Auto Transformer each set comprising of the following: -
- (i) One (1) number 3-phase, SF6 insulated circuit breaker complete with operating mechanism.
  - (ii) Three (3) numbers 1-phase, 5-core, multi ratio, current transformers.
  - (iii) Two (2) numbers 3-phase, group operated isolator switches, complete with manual and motor driven operating mechanisms.
  - (iv) Two (2) numbers 3-phase, group operated safety grounding switches, complete with manual and motor driven operating mechanisms.
  - (v) Three nos. 1-phase, individual pole operated isolator switches complete with manual and motor driven operating mechanisms.
  - (vi) Three nos. 1-phases, individual operated safety grounding switches complete with manual and motor driven operating mechanisms.
  - (vii) Three Nos., 1-phase, individual pole operated, isolator switches, Grounding switches complete with manual and motor driven operating mechanisms for switching of Spare ICT through 245kV Auxiliary bus including Gas monitoring devices, barriers, pressure switches, UHF PD Sensors etc. as required. End Piece module (on one side or both sides as per requirements) with the test link for Future extension of ICT Bank sharing the same spare transformer. The isolator must meet the operational requirement in terms of insulation withstand requirement for connecting the same to auxiliary bus.
  - (viii) One (1) number 3-phase, high speed fault make grounding switch, complete with group operated manual and motor driven operating mechanisms.



- (ix) 220 kV Auxiliary Bus along with necessary arrangement to connect spare unit of Transformer.
  - (x) Three nos. 1-phase (isolated) SF6 ducts inside GIS hall (up to outer edge of wall).
  - (xi) Gas monitoring devices, barriers, pressure switches, Partial Discharge measurement Sensors, terminal boxes, interconnecting wires, grounding, support structures, platform etc. as required
  - (xii) Local Control Cubicle
- c) 245kV, 2000A, 50kA for 1 second, SF6 gas-insulated metal enclosed Line Bay module each set comprising of the following: -
- (i) One (1) number 3-phase, SF6 insulated circuit breaker complete with operating mechanism.
  - (ii) Three (3) numbers 1-phase, 5-core, multi ratio, current transformers. Additional 2- core metering CT (for tariff metering purpose) shall be provided separately for each nos. of HEP line feeders (for 4 nos. line bays) as shown in the Single Line Diagram.
  - (iii) Three (3) numbers 3-phase, group operated isolator switches, complete with manual and motor driven operating mechanisms.
  - (iv) Two (2) numbers 3-phase, group operated safety grounding switches, complete with manual and motor driven operating mechanisms.
  - (v) One (1) number 3-phase, high speed fault make grounding switch, complete with group operated manual and motor driven operating mechanisms.
  - (vi) Three nos. 1-phase (isolated) or 3-phase SF6 ducts inside GIS hall (up to outer edge of wall) for NEA line bays.
  - (vii) The GIS module shall be suitable for termination of 220kV XLPE Power Cable (for HEP line bays)
  - (viii) Gas monitoring devices, barriers, pressure switches, UHF PD Sensors, terminal boxes, interconnecting wires, grounding, support structures, platform etc. as required.
  - (ix) Local Control Cubicle
- d) 245kV, 50kA for 1 second, SF6 gas-insulated metal enclosed Reactor Bay module for 220 kV Reactor each set comprising of the following: -
- (i) One (1) number 3-phase, 1600A, SF6 insulated circuit breaker without PIR complete with operating mechanism.
  - (ii) Three (3) numbers 1-phase, 1600A, 5-core multi ratio, current transformers.



- (iii) Three (3) numbers 3-phase, 1600A, group operated isolator switches, complete with manual and motor driven operating mechanisms.
  - (iv) Three (3) numbers 3-phase, group operated safety grounding switches, complete with manual and motor driven operating mechanisms.
  - (v) Three nos. 1-phase (isolated) or 3-phase SF<sub>6</sub> ducts inside GIS hall (up to outer edge of wall) for NEA line bays.
  - (vi) Gas monitoring devices, barriers, pressure switches, UHF PD Sensors etc. as required.
  - (vii) Local Control Cubicle
- e) 245kV, 3000A, 50kA for 1 second, SF<sub>6</sub> gas-insulated metal enclosed **Bus Coupler Bay module** each set comprising of the following: -
- (i) One (1) number 3-phase, SF<sub>6</sub> insulated circuit breaker without PIR complete with operating mechanism.
  - (ii) Three (3) numbers 1-phase, 5-core, multi ratio, current transformers.
  - (iii) Two (2) numbers 3-phase, group operated isolator switches, complete with manual and motor driven operating mechanisms.
  - (iv) Two (2) numbers 3-phase, group operated safety grounding switches, complete with manual and motor driven operating mechanisms.
  - (v) Gas monitoring devices, barriers, pressure switches, UHF PD Sensors etc. as required.
  - (vi) Local Control Cubicle
- f) 245kV Gas Insulated Bus (GIB) Ducts: -
- 245kV Three phase/single phase Gas Insulated Bus Enclosure Bus Duct (Including support structure, gas monitoring device, gas barrier, UHF PD Sensor etc.) from GIS building (outer edge of GIS Hall Wall) to Centre line of SF<sub>6</sub>/Air Bushing shall be as per BPS. SF<sub>6</sub> gas duct inside GIS building are part of respective GIS Module and deemed to be included in respective module.
- g) 245kV XLPE Cable: -
- 245kV 1CX1600 sqmm XLPE Cable from GIS building (GIS Module to Centre line of Cable/Air termination Bushing shall be as per BPS.
- h) 245kV, 1600A/2000A (as per BPS), 3-phase/1-phase SF<sub>6</sub> to air/oil/cable termination bushings as per BPS
- i) Testing and Maintenance Equipment's as per BPS.
- j) Mandatory Spares as per BPS.
- k) A tentative layout / GA drawing of the switchyard is enclosed with this specification for 220/132kV Substation. The GIB duct length shall be optimized



further without affecting the switchyard arrangement and bay orientation and also any of the functional requirements specified.

- l) Surge Arrestors and Capacitive Voltage Transformers are outdoor type as per BPS and specifications and other necessary equipment to complete the scope of work.
- m) 245 kV Overhead conductor and associated gantry structure for connecting SF6/Air bushing
- n) Any other equipment/material required to complete the specified GIS scope of work.

During Engineering contractor is required to furnish the detailed document enlisting each and every GIS Module (indoor and outdoor) complete along with its enclosure, gasket and all active parts such as conductor, conductor joints, corona shield etc. identifiable. The Purpose of above said document is to identify (as a part no.) each and every GIS Module individually in supplied GIS installation.

### 3.2 Auto/Power Transformers

Supply, Erection, testing & commissioning following auto transformers along-with all required fittings and accessories, transformer Marshalling Box (MB), digital RTCC panel, Spare switching control cabinet, neutral bushing CTs, OLTC, RIP Bushing (HV and MV side) etc. complete as per specification.

Sr.No.	Description	Type	Capacity	Required Online Monitoring Accessories	Quantity
1	220/132/33 kV	Auto	53.33/66.66 MVA	Online Dissolved Gas (Multi-8 gas) & Moisture Analyzer	As per the number of transformers in the BPS

The scope also includes supply of transformer bushing end terminal connectors suitable for overhead/SF6 connection, complete in all respect for the above-mentioned transformer as per technical specification. The cost of full scope of these works is deemed to be included in the price quoted for transformers.

### 3.3 Reactor

Supply, Erection, testing & commissioning of following Bus Shunt Reactors along-with all required fittings and accessories (including online DGA) complete in all respect as per technical specifications.

Sr.No.	Description	Type	Capacity	Required Online Monitoring Accessories	Quantity
1	220 kV Bus Shunt	Fixed	25 MVAR	Online Dissolved Gas (Multi-8 gas) & Moisture Analyzer	As per the number of reactors in the BPS

The scope also includes supply of bus shunt reactor bushing along with end terminal connectors suitable for overhead/SF6 connection, complete in all respect for the above-mentioned reactors as per technical specification. The cost full scope of these works is deemed to be included in the price quoted for reactors.

The capacity of 25 MVAR is based on preliminary calculations. The final required capacity may change during detailed engineering stage. If a larger size is determined to be required, its payment shall be as per the rate quoted in Price Schedule 6.

### 3.4 Air insulated switchgear (AIS) and Other Main Equipment

Design, engineering, manufacture, testing, supply on for destination site basis including transportation & insurance, storage, erection, testing and commissioning of the following equipments/items, complete in all respects.

- a) 132kV circuit breaker as per ratings as given in BPS.
- b) 132kV & 33kV isolators earth switches, current transformers as per ratings as given in BPS.
- c) 220kV, 132kV, 66 kV & 33kV Bus Post Insulators as specified in BPS.
- d) 220kV & 132kV Capacitive Voltage Transformers & Surge Arresters.
- e) Complete control and protection system for 220kV and extended 132kV bays as per Chapter 14–Control and Relay panels.

The Busbar protections scheme for 220kV shall be low impedance distributed type.

The existing 132 busbar protection scheme at Dhungesangu Substation is as follows:

132kV: Low Impedance Centralized type

The necessary extension/ augmentation of bus bar protection for all the bays under present scope is in the scope of contract.

#### **The protection to be provided on 220kV Lines shall be as under:**

**Type-I:** Main-I & Main-II both shall be provided as line differential protection relay with built-in distance protection as per chapter 14: control & Relay Panel and BPS.

- f) The existing Dhungesangu substation is equipped with substation Automation system based on IEC 61850 of Siemens make. In the present scope, contractor shall include BCUs required for 220/132kV bays including all necessary hardware and software to integrate with the existing Substation Automation Systems including up-dation of system database, displays, and development of additional displays and reports as per requirement. The existing SAS Architecture drawing of Dhungesangu substation is enclosed with is specification.



- g) In order to integrate all the bays under present scope to existing SCADA system of Nepal Electricity Authority, Load Dispatch Centre (located in Siuchatar, Kathmandu), contractor shall configure all the Gateway ports at substation end with communication protocol IEC 104 as per requirement and technical specifications. The details of Data acquisition principles (types of analogue /digital data) for control, monitoring of substation is as per technical specification.
- h) The scope of work includes integration of all 220 kV & 132 kV Bays of the substations under present/existing scope with MCC of corresponding grid division office. All the bays shall be controllable from local substations as well as from remote MCC at respective locations. The bidder shall provide all the required hardware/Software accessories with non-expiring license as per the architecture for MCC integration purpose, covered under substation automation topic in price schedule. MCC's software is based on GE's Grid Solution SCADA software where all the signals from the substations shall be integrated. The IP addresses for the substation gateways shall be provided by MCC.
- i) Digital protection couplers (DPCs) as per BPS. Scope includes cable, converter etc., as required, for connecting DPC with the Communication equipment in the substation control room building. The existing Fiber Optic Terminal Equipment (FOTE) is Hitachi make FOX-615.
- j) Extension/Augmentation of existing Visual Monitoring System for watch and ward of present scope of works. Details of the existing Visual Monitoring System is enclosed at Annexure-III.
- k) Complete Earth mat inside the GIS building (Applicable only for GIS Substation), Transformers and Reactors and outdoor yard for present scope as per BPS. Extension of existing 50X10 sqmm MS flat Earth mat with copper conductor by connecting bi-metallic connector. Earthing of all indoor & outdoor equipment including Transformers, Reactors etc. complete as per specification. Measurement of earth resistivity is in the scope of Contractor.
- l) Direct Stroke Lighting Protection (DSLP)  
Direct stroke lightning protection design for complete present and future bays of 220kV and 132kV. The construction and installation shall be done to protect all the present and future transformer/reactor bays and GIS hall and present scope line bays.
- m) Erection hardware such as Insulator strings and hardware, clamps & connectors, terminal connector, conductor, earth wire and earthing materials & cables, spacers, cable supporting angles/channels, cable trays & covers, Junction box, cable sealing system, buried cable trenches, PVC pipes for cabling of equipment etc. as per requirement. etc.
- n) Nitrogen Injection Fire protection system as per technical specifications/BPS. Portable Fire Extinguishers as per BPS shall also be provided.
- o) LT switchgear (AC/DC Distribution boards) as per technical specifications



- I. Extension of existing LT AC system (if spare feeder is not not sufficient)  
Supply & installation of ACDB extension module in order to meet the present scope of works.
  - II. Extension of existing DCDB system (if spare feeder is not available or not sufficient) if extendable.  
Supply & installation of DCDB extension module in order to meet the present scope of works. (If extendable is not possible new DCDB system installation shall be done)
- p) Batteries & Battery Chargers  
The capacity for batteries and battery chargers shall be worked out by the Contractor for the present and future bays as specified and shall be subject to Employer's approval. However, the capacity for battery & ratings for battery chargers shall be selected from the below ratings and shall not be less than the calculated size.
- 110V Battery AH: min. 600 AH
  - Float cum Boost Charger (110V): 160A
- q) 1.1 kV grade Power & Control cables along with complete accessories for
- a. Switchyard/Substation complete
- r) Complete lighting and illumination of buildings shall be in deem to be included in plinth area rate of respective buildings as per BPS of civil works. However, Switchyard, street Lightning are as per BPS.
- s) Air Conditioning System for the
- a. Panel rooms or as per requirement
- t) Air Handling Unit (AHU) for 220kV GIS Buildings
- u) Exhaust fans shall be provided in LT Switchgear room where air conditioners are not provided as per requirement of technical specification.
- v) EOT Cranes for GIS Halls as per technical specification.
- w) Two set 3½C x 300 Sq. mm XLPE power cable for oil filtration units of transformers/reactors shall be provided along with 250Amps, TPN MCCB receptacles covering maximum three units of transformers/reactors. The cable shall be terminated at 250A MCCB receptacle at two points near Transformer in the switchyard.
- x) Lattice and pipe structures (galvanized): All Towers & Beams, LM tower, all outdoor Equipment support structures shall be shall be designed & supplied by Contractor.
- b) AIS CB support structure is under scope of CB manufacturer as per their design & drawings approved by Employer.

- y) GIS support structure (which is part of GIS module) including duct support structures (which is part of GIS bus duct) is under scope of GIS manufacturer as per their design & drawing approved by Employer.
- z) Extension of existing 132 kV Busbar with the Jack bus
- aa) Existing 132kV Line bay shall be used as Transformer bay. Hence the Line bay C&R panel cabling shall be diverted/re-cabling to present scope supply Transformer control & protection Panel.
- bb) Any other equipment/material required for completing the specified scope, shall be included in the scope of supply and the offer should be complete & comprehensive.

**3.5 Civil Works** - The scope of work shall include but shall not be limited to the following based on design and drawings to be developed by the contractor as given below: -

- I. The design of foundation shall be based on the soil investigation report and other parameters as per relevant IS/BS/Equivalent international codes & technical specification. The foundations may be open foundation or pile foundation as per the site requirement / soil report.
- II. The scope of work shall include but shall not be limited to the following based on design and drawings to be developed by Contractor as given below: -
  - a) **Soil investigation work:** - Soil investigation work needs to be conducted as per the technical specification. The necessary soil investigation layout and final soil report shall be proposed by Contractor for approval to Employer.
  - b) **Site levelling work:** The work includes Contouring of area under present scope of works with 10m offset; however, area to be levelled shall be decided during detailed engineering.
  - c) Layout Preparation, detail design and construction of catch drains, external drainage system, outdoor cable trench, buried cable trench, switchyard drainage, internal and approach road, switchyard fencing along with Gate of the substation as per technical specification.
  - d) Structural concrete for foundation, structures, buildings and all load bearing members shall be of M25 grade and work shall be carried out in accordance with the Technical Specification.
  - e) TMT deformed bars of grade Fe-500 D conforming to relevant Indian Standards shall be used for reinforcement
  - f) Structure and Foundation for Gantry and Beam Structure, Lightning Mast (LM), Outdoor Equipment Support Structure, Bus Duct foundation etc. as per specification.
  - g) 220kV Buried cable trench as per Technical Specification as per BPS. The buried cable trench for other cables if required are not payable separately and shall be deemed to be included in cost of cable installation.



- h) Notwithstanding anything contained in the Technical Specifications, cable trenches and road crossings shall be constructed using **precast RCC Hume pipes only**, strictly in accordance with approved drawings and relevant standards
- i) Internal roads shall be rigid pavement type.
- j) Design, Engineering and execution of all civil works of the following buildings as per the tender drawings, specification, complete in all respect.
  - a. GIS Hall
  - b. AHU Building
  - c. C&R Room/Battery/ACDB/DCDB Room
  - d. SF6 Gas cylinder storage Room
- k) For PEB buildings, the complete civil works including brick masonry, internal Cable Trench, internal and external finishing, plinth protection, drain along plinth protection etc. required to complete the building in all respect as per the drawing shall be payable in the plinth area rate. However, the quantity of the earthwork (excavation, backfilling, disposal etc.), concrete (all types), reinforcement steel shall be measured and paid under respective items under BPS.
- l) Design, Engineering and execution of PEB Buildings for 220kV GIS (GIS Hall, Relay Panel Room & AHU room and SF6 Gas cylinder storage Room): The size of 220kV GIS Buildings shall be suitable to accommodate the present and future bay (for 1 transformer bay only) as per tender SLD in addition to the maintenance bay which will be extendable type for future line bays. EOT crane shall be provided in the 220kV GIS Buildings as per relevant section of technical specification.
- m) All civil works including foundations associated with erection of SF6 gas insulated metal enclosed switchgear along with its SF6 ducts up to the outer edge of the wall of GIS Hall. Civil works including all foundations for all equipment inside GIS Hall, cable trenches inside GIS halls & associated LCC/relay panel are included in the plinth area cost of GIS buildings.
- n) Design, Engineering and execution of all civil works of the following buildings as per the tender drawings, specification, complete in all respect.

SN	Buildings	Types	Standard Drawings	Size of Building	Scope
1	GIS Building & AHU	PEB	Not Provided	As per requirement	Included
2	Panel Room	PEB	Not Provided	As per requirement	Included



SN	Buildings	Types	Standard Drawings	Size of Building	Scope
				t	
3	SF6 gas cylinder storage store	PEB	Not Provided	As per requirement	Included /Not included

- o) Foundation for Bus duct supporting structures outside GIS Hall & GIS (SF6/Air) bushing.
- p) Foundation of Transformers/reactor including Rail cum road, unloading platform, jacking pad, Oil pit/ common oil pit, pulling block, gratings, pylon support, firewall, NIFPES firefighting system, etc. as per technical specification.
- q) Stone spreading, anti-weed treatment and PCC (1:5:10) in the switchyard. A layout for the same shall be developed by the contractor.
- r) Preparation of storm water drainage layout as per specifications.
- s) All roads as per the layout. Road layout shall be developed by the Contractor.
- t) Slope protection works & retaining walls: - The design & execution of retaining wall (RRM and RCC), Gabion wall, slope protection shall be in the scope of contractor and the same shall be paid under items such as excavation, PCC, RCC, reinforcement steel, etc. shall be measured and paid under respective items of BPS.”
- u) [Notwithstanding anything contained in the Technical Specifications, gabion boxes shall be fabricated using double twisted hexagonal mesh of size not greater than **80 mm × 100 mm (8×10)** with **heavily galvanized steel wire (minimum 240 GSM zinc coating) and PVC coating**. The wire diameter, selvedge wire, and lacing wire shall conform to the Technical Specifications. All gabions shall be supplied from approved manufacturers and shall be free from defects, with uniform coating and proper binding.]
- v) Supply and installation of dewatering pumps for transformer pit, sump pit or wherever required including panel, necessary pipe line and fittings.
- w) Foundation for lighting poles, Bay marshaling box, panels and control cubicles of equipment wherever required. The cost of these foundations shall be included in erection/installation of corresponding equipment of BPS.
- x) Any other item/design/drawing for completion of scope of works
- y) Payment for all civil construction works shall be made in accordance with the mode of payment for civil works as specified in the Technical Specifications.



- 3.6 The bidders are advised to visit the substation sites and acquaint themselves with the topography, infrastructure and also the design philosophy. Before proceeding with the construction work of the Sub-stations, the Contractor shall fully familiarize himself with the site conditions and General arrangements & scheme etc. Though the Employer shall endeavor to provide the information, it shall not be binding for the Employer to provide the same. The bidder shall be fully responsible for providing all equipment, materials, system and services specified or otherwise which are required to complete the construction and successful commissioning, operation & maintenance of the substation in all respects. All materials required for the Civil and construction/installation work shall be supplied by the Contractor.
- 3.7 The complete design and detailed engineering shall be done by the Contractor based on conceptual tender drawings except design/drawings which are specifically stipulated in the scope of Employer (i.e. Employer supplied design/drawing listed above).
- 3.8 The Contractor shall also be responsible for the overall co-ordination with internal/external agencies, project management, training of Employer's manpower, loading, unloading, handling, moving to final destination for successful erection, testing and commissioning of the substation/switchyard.
- 3.9 Design of substation and its associated auxiliaries systems under this contract, are covered under the scope of the Contractor.
- 3.10 Any other items not specifically mentioned in the specification but which are required for erection, testing and commissioning and satisfactory operation of the substation are deemed to be included in the scope of the specification unless specifically excluded.
- 3.11 Employer has standardized its technical specification for various equipments and works for different voltage levels. Items, which are not applicable for the scope of this package as per schedule of quantities described in BPS, the technical specification for such items should not be referred to.

#### 4.0 SPECIFIC EXCLUSIONS

The following items of work are specifically excluded from the scope of the specifications for all substations:

- (a) Employer's site office.
- (b) *Control Room & Administrative Building*
- (c) *DG Set platform*
- (d) *Car Parking Shed*
- (e) *Underground Water Storage Tank*
- (f) *Water Supply & Plumbing Works*
- (g) *Fire Fighting Pump House Building*
- (h) *Auxiliary Building (11 kV Or 33 kV Indoor Switchgear Building)*
- (i) *Fire Fighting Water Tank*
- (j) *Store Building*
- (k) *Stone Soling: Notwithstanding anything contained in the Technical Specifications, stone soling/dry stone pitching shall **not be carried out beneath any foundations** under this project. The provision of stone soling, if required, shall be*



*limited only to areas explicitly indicated in approved drawings or as directed by the Employer/PMC for site development works, and no separate payment shall be made unless specifically provided in the BOQ]*

## 5.0 PHYSICAL AND OTHER PARAMETERS

### 5.1 Meteorological data :-

S.N.	Description	Values
i)	Maximum ambient air temperature (°C)	34
ii)	Minimum ambient air temperature (°C)	5
iii)	Altitude (above M.S.L.) (mtrs)	1340-1370
iv)	Relative humidity - Maximum	85
v)	Relative humidity - Minimum	30%
vi)	Amount of snow fall (mm)	0
vii)	Wind speed	Wind Zone 4 (47m/s)
ix)	Pollution Level	Light
x)	Maximum rainfall (mm/month)	1800
xi)	Rainy months	June - September

\*Seismic Requirement for Substations equipment: 0.5g (Horizontal peak acceleration value). Seismic Requirement for Substations civil structure: Minimum value of 0.36g (Horizontal peak acceleration value).

However, for design purposes, maximum average ambient temperature should be considered as 50 degree centigrade and Relative humidity 100%.

5.2 The fault level of all equipment to be supplied under present scope shall be as indicated below:

S.N.	Voltage Level	Fault Level
1	220kV	50kA for 1 Sec
2	132kV	40kA for 1 Sec
3	66 kV	40 kA for 1Sec
3	33 kV	31.5kA for 1 Sec

5.3 The creepage distance shall not be less than 25 mm/kV.

5.4 The insulation levels given in chapter GTR/ other technical specifications are applicable for altitude up to 1000 meters above M.S.L. For higher altitudes, suitable correction factor as per relevant IEC shall be applied.

## 6.0 SCHEDULE OF QUANTITIES

The requirement of various items/equipments and civil works are indicated in Bid price Schedules (BPS).



All equipment/items and civil works for which bill of quantity has been indicated in BPS (Bid price Schedules) shall be payable on unit rate basis/quoted rate basis. During actual execution, any variation in such quantities shall be payable as per relevant clauses incorporated in Letter of award.

Wherever the quantities of items/works are indicated in LS/Lot/Set, the bidder is required to estimate the quantity required for entire execution and completion of works and incorporate their price in respective Bid price schedules. For erection hardware items, Bidders shall estimate the total requirement of the works and indicate module-wise lump sum price bay wise and include the same in relevant Bid price schedules. For module identification, Bidder may refer the specifications. Any material/works for the modules not specifically mentioned in the description in BPS, as may be required shall be deemed to be included in the module itself.

Bidder should include all such items in the bid proposal sheets, which are not specifically mentioned but are essential for the execution of the contract. Item which explicitly may not appear in various schedules and required for successful commissioning of substation shall be included in the bid price and shall be provided at no extra cost to Employer.

## 7.0 BASIC REFERENCE DRAWINGS & DATA

The reference drawings, which form a part of the specifications, are given at Chapter-Drawings. The bidder shall maintain the overall dimensions of the substation, phase to earth clearance, phase to phase clearance and sectional clearances.

The enclosed drawings give the basic scheme, layout of substation, substation buildings, associated services etc. In case of any discrepancy between the drawings and text of specification, the requirements of text shall prevail in general. However, the Bidder is advised to get these clarified from Employer.

Soil parameters as per the preliminary soil investigation carried out by the Employer are summarized below.

S.N.	Soil Parameters	Values
1	Soil Bearing Capacity (kN/m <sup>2</sup> )	<b>Existing Substation Designed at SBC = 150KN/m<sup>2</sup>. In filled-up area net SBS shall not be &gt; 50KN/m<sup>2</sup></b>
2	Average Soil Resistivity (Ohm-M)	

The above soil parameters are provided to facilitate the bidders for better estimation of civil works and grounding system. However, the Contractor shall thoroughly carry out the Soil Investigation including soil resistivity test during detailed engineering to execute the project with the best practical approach.

## 8.0 ORDER OF PRECEDENCE OF DIFFERENT CHAPTERS OF TECHNICAL SPECIFICATION



For the purpose of present scope of work, technical specification shall consist of following parts and they should be read in conjunction with each other.

SN	Chapter Details
(a)	Chapter 1: Project Specification Requirement (PSR)
(b)	Chapter 2: General Technical Requirement (GTR)
(c)	Chapter 3A: Circuit Breakers
(d)	Chapter 3B: Instrument Transformers
(e)	Chapter 3C: Isolators
(f)	Chapter 3D: Surge Arrestors
(g)	Chapter 4: LT Switchgear
(h)	Chapter 5: Power & Control Cable
(i)	Chapter 6: Battery & Battery Charger
(j)	Chapter 7: Power/Auto Transformers
(k)	Chapter 8: Shunt Reactors
(l)	Chapter 9: Fire Protection System
(m)	Chapter 10: Lighting System
(n)	Chapter 13: Air Conditioning System
(o)	Chapter 14: Control & Relay Panels
(p)	Chapter 15: Substation Automation System
(q)	Chapter 16: Switchyard Erection
(r)	Chapter 19: EHV XLPE Cables
(s)	Chapter 20: Gas Insulated Switchgear (GIS)
(t)	Chapter 21: Visual Monitoring System
(u)	Chapter 22: Civil Works
(v)	Chapter 23: Structures
(w)	Chapter 24: Drawings

In case of any discrepancy between Chapter 1-PSR, Chapter 2-GTR and other technical specifications on scope of works, Chapter 1-PSR shall prevail over all other chapters.

In case of any discrepancy between Chapter 2-GTR and individual chapters for various equipments, requirement of individual equipment chapter shall prevail.

## 9.0 Mandatory Spares

The detailed bill of quantities of the mandatory spares is as per BPS. The prices of each item of the spares shall mandatorily be given by the Bidder in the relevant schedule of BPS. It shall not be binding on the Employer to procure all of these mandatory spares.

For GIS mandatory spares, bidders shall ensure each type & rating spare shall be included considering one to one replacement in installation as per actual site condition in case of requirement due to maintenance or failure. Contractor is



required to submit an undertaking along with GIS spares that in case of replacement requirement, considered spare against specified mandatory spare include each type and rating and everything necessary for one-to-one replacement for complete GIS installation without necessitating any further manufacturing and supply.

The bidder is clarified that no mandatory spares shall be used during the commissioning of the equipment. Any spares required for commissioning purpose shall be arranged by the Contractor. The unutilized spares if any brought for commissioning purpose shall be taken back by the contractor.

#### **10.0 SPECIAL TOOLS AND TACKLES**

The bidder shall include in his proposal the supply of all special tools and tackles required for operation and maintenance of equipment. The special tools and tackles shall only cover items which are specifically required for the equipment offered and are proprietary in nature. However, a list of all such devices should be indicated in the relevant schedule provided in the BPS. In addition to this the Contractor shall also furnish a list of special tools and tackles for the various equipment in a manner to be referred by the Employer during the operation of these equipment. The scope of special tools and tackles are to be decided during detail engineering and the list of special tools and tackles, if any shall be finalized.

#### **11.0 FACILITIES TO BE PROVIDED BY THE EMPLOYER**

Employer shall make available the auxiliary HT power supply from NEA on chargeable basis at a single point in the Sub-station. The contractor has to do necessary process with concerned distribution office for meter. The prevailing energy rates of the state shall be applicable. All further distribution from the same for construction and permanent auxiliary supply shall be made by the contractor. However, in case of failure of power due to any unavoidable circumstances, the contractor shall make his own necessary arrangements like diesel generator sets etc. at his own cost so that progress of work is not affected and Owner shall in no case be responsible for any delay in works because of non-availability of power.

Employer shall make available construction water supply at a single point in the substation. All further distribution for the same shall be made by the Contractor. In case of non-availability or inadequate availability of water for construction work, the contractor shall make his own arrangement at his own cost and the Employer shall in no case be responsible for any delay in works because of non-availability or inadequate availability of water.

#### **12.0 SPECIFIC REQUIREMENT**

**12.1** The Bidders are advised to visit Sub-stations site and acquaint themselves with existing facilities, the topography, infrastructure, etc. Before proceeding with the construction work in the existing substation, the Contractor shall fully familiarize himself with the site conditions and General arrangements & scheme etc. Though the Employer shall endeavor to provide the information, it

shall not be binding the Employer to provide the same. The bidder shall be fully responsible for providing all equipment, materials, system and services specified or otherwise which are required to complete the construction and successful commissioning, operation & maintenance of the substation in all respects. All materials required for the Civil and construction/installation work including cement and steel shall be supplied by the Contractor.

- 12.2** The complete design (unless specified otherwise in specification elsewhere) and detailed engineering shall be done by the Contractor based on conceptual tender drawings, fulfilment of full scope of works and Employer's requirements. This shall include but not be limited to submission of engineering & construction drawings, design basis reports, design calculations, quality assurance plans, testing procedures, operation and maintenance manuals, commissioning procedures, etc. The Employer may provide necessary existing drawings of the existing facilities / structures within Dhugnesanghu Substation as required to the Contractor after placement of award, in sequence, suiting the project requirement.
- 12.3** Design of substation and its associated electrical & mechanical auxiliaries systems includes preparation of single line diagrams, electrical layouts, Erection key diagrams, direct stroke lightning protection, electrical and physical clearance diagrams, control and protection schematics, wiring and termination schedules, foundation & cable trench layout drawing including associated invert levels, civil designs and drawings, lighting/illumination and other relevant drawings & documents required for engineering of all facilities within the fencing to be provided under this contract, are covered under the scope of the Contractor. The above designs shall be done through advanced software as agreed by the employer.
- 12.4** The facilities shall be so designed to accommodate at least 8 numbers of 220kV bays, 3 numbers of 132kV bays, and 1 number of 220/132kV transformer in the future in addition to the present scope. The substation area has been developed by large quantities of cutting and filling; this shall be taken into consideration during the design of the facilities and the stability of the cut and fill slopes and the substation as a whole shall be ensured.
- 12.5** The Contractor shall request a shutdown at least one week in advance, specifying the required reasonable time and duration. If the requested duration is insufficient, any resulting additional costs shall be borne by the Contractor in accordance with NEA guidelines.
- 12.6** Currently temporary arrangement of dead end and gantry has been done to charge the line at 132kV level. This shall be removed and new DE and gantries constructed. Tower material is already available at Dhungesangu SS only Foundation, erection and stringing shall be performed.
- 12.7** The Contractor is also required to move any material or equipment lying outdoor within the substation premises to within designated store within the substation. The material or equipment shall be moved with care and stored in an organized manner as per standard storage methods.
- 12.8** Some of the bays in the present scope of works are being constructed for Independent Power Producers (IPPs) whose power will be evacuated using these



facilities. In order for the Employer to keep separate accounts of expenses with the IPPs, the Contractor shall submit bay-wise cost calculations in two stages. The first stage shall be the Contractor's estimate while initiating procurement of goods and works and the second stage shall be the actual cost incurred after completion of works.

- 12.9** The Contractor shall carry out dismantling, shifting (if required), and restoration/reconstruction of all existing facilities affected during construction works, including but not limited to drains, cable trenches, fences, control room building (CRB) connections, roads, culverts, foundations, slopes, and other utilities. All such works shall be executed in a planned manner to ensure minimum disruption to existing substation operations. Materials suitable for reuse shall be carefully salvaged, stored, and reused as directed by the Employer/PMC. Restoration works shall be carried out to match or improve the original condition and in accordance with approved drawings and specifications. The cost of all dismantling, handling, disposal of unserviceable materials, and restoration shall be deemed to be included in the BPS, and no separate payment shall be made unless specifically provided.
- 12.10** The bidder shall clearly indicate in their offer, the sources from where they propose to procure Equipment, System, Conductor, Insulators, Earthwire, hardware fittings and all type of accessories for conductor and earth wire. The technical description of these items is given in relevant chapter of this Volume of the bidding documents.
- 12.11** The Contractor shall also be responsible for the overall co-ordination with internal/external agencies; Supplier of Employer's supplied equipments, project management, training of Employer's manpower, loading, unloading, handling, moving to final destination for successful erection, testing and commissioning of the substation/switchyard.
- 12.12** The Contractor shall be responsible to select and verify the route, mode of transportation and make all necessary arrangement with the appropriate authorities for the transportation of the equipment. The dimension of the equipment shall be such that when packed for transportation, it will comply with the requirements of loading and clearance restrictions for the selected route. It shall be the responsibility of the contractor to coordinate the arrangement for transportation of the equipment for all the stages from the manufacturer's work to site.
- 12.13** The conditions of roads, capacity of bridges, culverts, necessary line shutdown etc. in the route shall also be assessed by the bidders. The scope of any necessary modification/ extension/ improvement to existing road, bridges, culverts etc. shall be included in the scope of the bidder.
- 12.14** The bidder shall be responsible for safety of human and equipment during the working. The Environment Health and Safety (EHS) guidelines should be approved before commencement of any site activities. The EHS guidelines shall be submitted by Contractor for approval. It will be the responsibility of the Contractor to co-ordinate and obtain Electrical Inspector's clearance before commissioning. Any additional items, modification due to observation of such statutory authorities shall be provided by the Contractor at no extra cost to the



Owner.

- 12.15** The Contractor shall arrange all T&P (such as necessary supports, cranes, ladders, platforms etc.) for erection, testing & commissioning of the system at his own cost. Further, all consumables, wastage and damages shall be to the account of contractor.
- 12.16** Contractor shall make his own arrangement at his own cost for the storage of the materials. In any case, Employer shall not be responsible for non-availability storage area inside the substation boundary. Contractor shall maintain separate register for all certificates of Inspection (CIP) and Material Inspection Clearance Certificates (MICC) issued by NEA/Consultant. For each issue of CIP/MICC a serial number will be given and it shall be recorded by inspection engineer on CIP clearances/MICC.
- 12.17** Any other items not specifically mentioned in the specification but which are required for Erection, Testing and Commissioning and satisfactory operations of the substation are deemed to be included in the scope of the specification and the same shall be supplied and erected by the contractor unless specifically excluded elsewhere.
- 12.18** Obtaining of any consents, licenses and approvals from relevant statutory authorities, other than those obtained by the Employer and required as per law. The scope of Contractor also covers extending necessary assistance wherever logically required to enable Employer to obtain the requisite approval.
- 12.19** Quality assurance of all work related to scope of work of the Contractor.
- 12.20** Submission of schedule of work from zero date to handing over to Employer complete plant and equipment in the form of chart, 'S'-curve; write up etc for Employer's approval. Submission of monthly progress reports, photographs, graphs etc. for engineering, supply, construction and commissioning for all major works with suggestions and plans for making up back log if any for review of Employer. To attend meetings, review, discussion etc. for resolving all issues.
- 12.21** Submission of shipping schedule of equipment and material from country of origin up to receipt at site for off shore supply and ex-works to site for on-shore supply matching with schedule of work for approval of Employer.
- 12.22** Manufacture, fabrication, quality control, shop testing of equipment and material after approval of required technical data and drawings by Employer. To furnish notice to Employer for inspection.
- 12.23** Packing, forwarding, shipment and transportation (including port handling and custom clearance) from the manufacturer's works to site Comprehensive marine/transit-cum-storage-cum-erection insurance coverage of all equipment from Nepal Border / ex-works to project site till the equipment supplied is taken over by Employer. Preservation of all equipment during transportation till testing and commissioning stage.
- 12.24** Hiring of a suitable storing area which shall be approved by the Employer.



- 12.25** Receipt at site, unloading, movement to proper storage, carriage to storage area / interim / final foundation location, security, preservation and conservation of equipment/material at the site.
- 12.26** Supply of all manuals covering installation, stringing and commissioning, performance testing, operation, preservation, and capital maintenance including supply of as-built drawings and services required for satisfactory completion of the project.
- 12.27** Supply of all construction consumables, e.g., welding electrodes, cleaning agents, diesel oil as well as materials required for temporary supports, scaffolding, storage tanks, illumination as necessary.
- 12.28** Deployment of all skilled and unskilled manpower required for installation, stringing, commissioning, testing, etc, supervision of erection, commissioning, testing etc for services to be rendered.
- 12.29** Deployment of all erection tools & tackles adequate number and capacity of cranes, construction machinery, transportation vehicles, and all other implements in adequate number, capacity and size.
- 12.30** Any other tools, tackles and resources required to complete the Contract with required quality and with the schedule.
- 12.31** For detailed scope the stipulation given in each Chapter shall be applicable and governing.
- 12.32** Erection, testing and commissioning of GIS equipment, Transformers, Reactors, outdoor type Circuit breakers, Isolators, Indoor switchgears, Substation automation system, Control and protection Panels, communication equipment etc. shall be done by the contractors under the supervision of respective equipment manufacturers. Charges for the above supervision shall be included by the bidder in the erection charges for the respective equipment in the BPS.
- 12.33** The SF6 to Oil duct connections (as applicable) should be such that it is possible to remove transformer for repair and maintenance conveniently.
- 12.34** The lighting fixtures for switchyard lighting shall be mounted on LMs and gantry structures or on lighting poles to be provided by the contractor.
- 12.35** Material required for Transmission line side insulator String (including Hardware) i.e. tension insulator on the line side of the takeoff gantry for 220kV lines termination shall be provided by the employer, others insulator String (including Hardware) for the connection shall be in the present scope of works as a part of erection hardware of that bay.
- 12.36** The Contractor shall provide AC/DC feeders for complete future bays also as per single line diagram in addition to bays under present scope.
- 12.37** The reference of IS standard (i.e. Indian Standard) mentioned in the technical specification shall be read as equivalent IEC or BS or equivalent International



Standard.

**12.38** Non CFC refrigerant shall be utilized for Air conditioning system, offered for Control room building and switchyard panel room is under the scope of contract.

**12.39** For supply of SF6 Gas, the contractor shall obtain necessary license from the concerned statutory authorities in Nepal. The contractor shall comply with all the legal & statutory requirements as per the local laws for importing, handling & storage of SF6 gas in Nepal. For this purpose, NEA shall extend necessary assistance (documentation etc) for obtaining such clearance & licenses, however the complete responsibility for submitting the application and co-ordination with authorities shall be in the scope of contractor.

#### **12.40 Additional Requirements**

- a. OLTC shall be vacuum type.
- b. For transformer Tertiary winding, tertiary loading shall not be applicable. However, delta formation is required.
- c. Ladder is required as per Chapter 10.
- d. AC and ventilation system shall be as per BPS.
- e. Rated extended primary current shall be 150% for Bus Coupler Bay on all cores of the CTs.
- f. Duct and cable arrangement in line bays may be modified during detailed engineering stage as per space availability or any other constraint/requirement with quantity variation.
- g. Relay setting shall be carried out by direct measurement of line sequence impedances for lines completed at the time of carrying out of these works. For the remaining lines, relay setting shall be based on calculations.
- h. In Chapter 22: Civil Works, the following are required:

S.N.	Clause	PSR	Remarks
1	2.1.2: Geotech investigation	Geotechnical investigation works as per the BPS are to be performed by the Contractor as per specifications.	
2	2.2.2: Borehole Location	Boreholes required in GIS area - 1 no. Transformer/ reactor area – 2 no.s	
3	4.3.1: Slope Protection Works	No other specific requirement	



i. Chapter 23: Substation Structure

Structures may be pipe or lattice type as proposed by the Contractor and approved by the Employer during engineering stage.

- 13.0** The gas cylinder shall be supplied shall be handover to NEA after filling the gas in GIS compartments. Also, the spare 10% Gas shall be supplied properly stored in SF6 Gas storage building.
- 14.0** Empty metallic Cable drums, oil drums and Packaging material (metallic) shall be handover to NEA after use. Any wooden drums, packaging wooden material shall also be removed from the substation by the contractor in time. Failure to do so in a timely manner the employer will reserve the right to delay the issuance of operational acceptance certificate. Additionally, any costs incurred for handling or storing or managing the unreturned cylinders will be deducted from the contractor's invoice/retention payment.
- 15.0** In Chapter 2 GTR and other technical specifications, the term "Purchaser" and/or "Owner" may be read as "Employer".
- 16.0** The Contractor shall impart the necessary training to Employer's Personnel as per following details: -

**16.1 Training for Employer's Personnel by Bidder's/Manufacture's**

**Instructor in Abroad:** The Contractor shall include in the training charges NEA trainees' lodging, meals, local transportation, training materials, to and fro economy class air ticket from Nepal to place of training and payment of USD 150 per Diem allowances per trainee per day for the duration of training.

**The training shall be provided as per BPS.**

**16.2 Training for Employer's Personnel by Manufacture's Instructor in**

**Kathmandu Nepal:** The Contractor shall include training charges of NEA trainees' lodging, meals, local transportation, training materials in the training charges. The training, traveling and daily allowances of Owner's personnel for the training programme conducted in Nepal shall be borne by the Owner.

**The training shall be provided as per BPS.**

- 16.3** Contractor shall develop details syllabus and day wise schedule of the trainings and get it approved from Employer before conducting the trainings. All the above trainings shall be conducted within twelve months after the effectiveness of the Project.

**17.0 Support Services**



Throughout the design, implementation, factory testing, and field installation and testing phases, the Contractor shall provide consulting and technical assistance, as required by the Employer, for site preparation, field installation, and any other areas where technical support may be necessary.

The Contractor shall be responsible for any minor facility renovation and for the operation and maintenance of the supplied system up to the issuance of the Operational Acceptance Certificate.

After final operational acceptance of the plant, the Contractor shall remain liable for providing continuing technical support, as required, and for the rectification of any defects arising during the Defect Liability Period/Extended Defect Liability Period, in accordance with the terms and conditions of the Contract.

The Contractor shall provide the names, addresses, and contact details of the authorized representatives for each manufacturer of the equipment supplied under the Contract. The Employer shall be included in the Contractor's official mailing list to receive timely notifications regarding the identification, documentation, and resolution of hardware and software issues, as well as any updates or improvements related to the supplied equipment.

Upon expiry of the Defects Liability Period (DLP) or Extended Defects Liability Period (EDLP), as applicable, the Contractor and/or the Manufacturer shall continue to provide technical support services and ensure the availability of essential spare parts for all equipment supplied under the Contract for their entire specified service life, reckoned from the date of issuance of the Operational Acceptance Certificate (OAC). The minimum service life support shall be not less than twenty (20) years for substation primary equipment, including Gas Insulated Switchgear (GIS), Circuit Breakers (CB), Instrument Transformers, Power Transformers, and Reactors, and not less than fifteen (15) years for substation secondary equipment, including Protection Relays, Energy Meters, Control & Relay Panels (CRP), and Substation Automation Systems (SAS). For Fiber Optic Terminal Equipment (FOTE), such support services shall be provided for a minimum period of fifteen (15) years or seven (7) years from the date of formal declaration of product obsolescence or withdrawal from production, whichever occurs earlier.

Such support services and spare parts shall be provided upon written request of the Employer on a paid basis at prevailing market rates, under terms and conditions to be mutually agreed. The Contractor and/or Manufacturer shall respond to the Employer's request within a reasonable period and shall not unreasonably withhold or delay such support.

Failure or refusal by the Contractor and/or Manufacturer to provide the required support services and/or spare parts, without valid and justifiable cause, shall constitute a material non-performance. In such event, and without prejudice to any other rights or remedies available under the Contract or applicable law, the Employer shall have the right, at its sole discretion, to:



- a) declare the Contractor ineligible for participation in future bidding processes of the Employer for such period as deemed appropriate; and/or
- b) suspend or remove the Manufacturer from the Employer's approved list of manufacturers.

The above obligations shall survive completion of the Contract and shall be binding upon the Contractor and the Manufacturer accordingly.

## **18.0 Completion, Commissioning & Operational Acceptance**

- 18.1** Completion of the Facilities shall be deemed to have been achieved when the Facilities (or any specified part thereof) are completed both operationally and structurally, placed in a tight and clean condition, and all pre-commissioning activities have been successfully carried out, including charging of the Facilities at rated voltage, in accordance with the relevant Chapters of the Specifications and all other applicable provisions of the Conditions of Contract.
- 18.2** Commissioning of the Facilities shall be deemed to have been achieved upon successful completion of a continuous trial run of seventy-two (72) hours after charging, during which the Facilities operate satisfactorily without interruption. In the event of any interruption due to equipment failure or malfunction, the Contractor shall rectify the defect, and the trial run shall be recommenced for a continuous period of seventy-two (72) hours.
- 18.3** Operational Acceptance of the Facilities shall be deemed to have been achieved only after successful Completion and Commissioning of the Facilities, achievement of the specified Functional Guarantees, where applicable (such as for the Substation Automation System), and fulfilment of all other procedures and requirements outlined in the Conditions of Contract pertaining to Operational Acceptance.
- 18.4** Up to the issuance of the Operational Acceptance Certificate (OAC), the Contractor shall be responsible for the care and custody of the Facilities, or the relevant parts thereof, and shall bear the risk of any loss or damage thereto; however, the Employer shall be free to use the Facilities after completion and during the period prior to issuance of the Operational Acceptance Certificate, for its commercial purposes. During this period, the Contractor shall ensure safe, reliable and uninterrupted operation of the Facilities.
- 18.5** The Contractor shall deploy at least two (2) qualified supervisory personnel at the Substation site to assist the Employer in the operation and minor maintenance of the Facilities for a period of one (1) year from the date of issuance of the Operational Acceptance Certificate (OAC). The cost for such deployment shall be deemed included in the Contractor's offer. The deployed personnel shall provide technical support, guidance, and necessary assistance to the Employer's staff in the operation, routine inspection, troubleshooting, and minor maintenance of the installed equipment.