1. INTRODUCTION

1.1. Comprehensive Scheme for Strengthening of Transmission & Distribution system in NER Intra State - Arunachal Pradesh for which POWERGRID has been appointed as Design-cum-Implementation Supervision Consultant.

These Specifications are applicable to Changlang Bay Ext.

This Volume-II of the Tender Document describes the technical specifications for all equipments and works including civil works associated with above mentioned project.

2. SCOPE OF WORK

The scope of works under these packages is as follows:

Package	Scope/Description	Unit	Qty
Changlang Bay Ext.	Construction of 33/11 kV New Bay	NO.	01

The scope of work shall include, in complete conformity with subsequent sections of this volume i.e. site survey, planning, design, engineering, assembly manufacturing, testing, supply, loading, transportation, unloading, insurance, delivery at site, handling, storage, installation, testing, commissioning and documentation of all items/material required to complete the following works:

2.1. **Details of Bay Extension** are given in subsequent sections where package wise scope is described. The 33 KV equipments shall be out door type and 11 kV shall be indoor type. 33 KV bus shall be the strung bus. The scope of work includes preparation of single line diagrams and **foundation layout**, electrical layouts, erection key diagrams, electrical clearance diagrams, design calculations for earth mat and Direct Stroke Lightning Protection (DSLP). control and protection schematics, wiring and termination schedules, civil designs and drawings, switchyard equipment structure and foundation, fire fighting, indoor and outdoor lighting/illumination, road, drain, boundary wall, fencing and other relevant drawings & documents required for all facilities within the boundary wall of substation.

All controls will be designed for 110 Volts DC.

All works executed under this contract shall be under contractor's warranty for a period of two years from date of commissioning/ taking over by concerned

DISCOM or Electricity Department whichever is later. This supersedes all other clause in this regard mentioned elsewhere in this TS.

2.2. Integration of IEDs with SAS of remote 132kV substation:

All protective relay (IEDs) shall be connected to Ethernet switch on IEC61850 which shall then be connected to local SDH equipment by optical fibre cable for integration to SAS server at a remote 132kV substation via WAN. It shall be responsibility of the Contractor to connect up to the local SDH equipment. SAS/SCADA at remote 132kV substation shall be in the scope of a separate contract. However, the Contractor will do all necessary coordination and extend all required inputs for successful integration of the substation IEDs in the SAS/SCADA of remote 132kV substation.

Each Ethernet switch shall have minimum 03 spare ports (at least one port of each type used) for future use.

Trivector meters are also envisaged to communicate with remote SAS/SCADA through MODBUS /IEC protocol convertor and all wiring etc. shall be in the scope of contractor.

3. GENERAL TECHNICAL REQUIREMENT

3.1. Owner has standardized the technical specification of various equipments and works for different voltage level, Items which are not applicable for the scope of this package, as per schedule of quantity described in the BPS, the technical specification of such items should not be referred to.

3.2. The detailed technical specifications for the equipments/materials have been enclosed in the subsequent sections of this specification. The specification given in those sections covers the design, manufacture, assembly, testing/inspection before dispatch, packing, forwarding, transportation to site, insurance (during transit, storage, erection and commissioning), storage, erection, supervision, site testing and commissioning.

3.3. The drawings enclosed are for implementation purpose. In case of any discrepancy between the drawings and text of specification, the requirements of text shall prevail.

3.4. **MISCELLANEOUS**

3.4.1 Payment to the contractor shall be made as per the actual quantity executed. The contractor will apply due diligence to estimate the quantity of various items required as per site conditions. Any material supplied but not erected shall be taken back by the contractor at no commercial implication to owner.

3.4.2 The Contractor shall not be required to return to the Purchaser empty conductor/earth-wire/cable left over drums and shall dispose of the same at his cost.

4. FINAL SCHEDULE

The BOQ of the items required to be supplied/services under the respective packages are given in the Bid Proposal Sheets. The items and their quantities indicated therein are only provisional.

The Contractor shall supply/service all the items required as per the detailed engineering/ actual site requirement based on survey and they shall be paid for the actual executed quantities based on the unit rate incorporated in the contract.

5. STATUTORY REGULATIONS

The Contractor is required to follow local statutory regulations stipulated in The Electricity Act, 2003, Indian Electricity Rules 1956 as amended and other local rules and regulations referred in these specifications.

6. Services to be performed by the equipment being furnished

6.1. All equipment shall perform satisfactorily under various electrical, electromechanical and meteorological conditions of the site of installation

6.2. All equipment shall be able to withstand all external and internal mechanical, thermal and electromechanical forces due to various factors like wind load, temperature variation, ice & snow (wherever applicable), short circuit etc. for the equipment.

6.3. The bidder shall design terminal connector of the equipment taking into account various forces that are required to withstand.

7. SYSTEM PARAMETERS

Sl No	Description of the parameter	66kV System	33kV System	11kV System
1.	System operating voltage	66kV	33kV	11kV
2.	Maximum operating voltage of the system (rms)	72.5kV	36 kV	12 kV
3.	Rated frequency	50 Hz	50 Hz	50 Hz
4.	No. of phases	3	3	3
5.	Rated Insulation levels			
	Full wave impulse withstand voltage (1.2/50 micro sec.)	325kVp	170 kVp	75 kVp
	One minute power frequency dry and wet withstand voltage (rms)	140kV	70kV	28 kV
6.	Min. creepage distance (for Sub-station equipment)	25 mm/ kV (1813mm)	25 mm/ kV (900 mm)	25 mm/ kV (300 mm)
7.	Min. clearances (**Plus altitude factor wherever applicable**)			
	Phase to earth	630 mm	320 mm	140 mm
	Phase to phase	750 mm	640 mm	280 mm
	Sectional clearances	3000mm	2800 mm	2600 mm
8.	Rated short circuit (for 3 sec)	31.5 kA	25 kA	25 kA
9.	System neutral earthing	Solidly earthed	Solidly earthed	Solidly earthed

8. REFERENCE STANDARDS

8.1. The works covered by the specification shall be designed, engineered, manufactured, built, tested and commissioned in accordance with the Acts, Rules, Laws and Regulations of India.

8.2. The equipment to be furnished under this specification shall conform to latest issue with all amendments of standard and codes of this section, unless specifically mentioned in the specification.

8.3. The Bidder shall note that standards mentioned in the specification are not mutually exclusive or complete in themselves, but intended to compliment each other.

8.4. The Bidder shall also note that list of standards presented in this specification is not complete. Whenever necessary the list of standards shall be considered in conjunction with specific IS/IEC.

8.5. Other internationally accepted standards, which ensure equivalent or better performance than that specified in the standards referred, shall also be accepted. Copies of such standards shall be submitted by the **bidder during detailed Engineering.**

8.6. In case governing standards for the equipment is different from IS or IEC, the salient points of difference shall be clearly brought out in additional information schedule along with English language version of standard or relevant extract of the same. The equipment conforming to standards other than IS/IEC shall be subject to Employer approval.

8.7. The bidder shall clearly indicate in his bid the specific standards in accordance with which the works will be carried out.

8.8. The codes and/or standards referred to in the specifications shall govern, in all cases wherever such references are made. In case of a conflict between such codes and/or standards and the specifications, latter shall govern. Such codes and/or standards, referred to shall mean the latest revisions, amendments/changes adopted and published by the relevant agencies unless otherwise indicated. Other internationally accepted standards which ensure equal or better performance than those specified shall also be accepted, subject to prior approval by the Purchaser. In case no reference is given for any item in these specifications, latest REC specification & Construction Standards may also be referred to.

8.9. In case specification of any equipment /material is not included in this volume, the same shall be supplies as per relevant standards.

9. APPROVAL PROCEDURE

The scheduled dates for the submission of the drawings as well as for, any data/information to be furnished by the Employer would be discussed and finalised at the time of award. The following schedule shall be followed generally for approval and for providing final documentation.

Approval/comments/by Employer on initial submission	:	As per agreed schedule
Resubmission (whenever required)	:	Within 3 (three) weeks from date of comments including both ways postal time).
Approval or comments	:	Within 3 weeks of receipt of resubmission.
Furnishing of hard and soft copies of instruction/ operation /**approved GTP,drawings, type test reports**	:	As per agreed schedule

NOTE:

- ✓ The contractor may please note that all resubmissions must incorporate all comments given in the earlier submission by the Employer or adequate justification for not incorporating the same must be submitted failing which the submission of documents is likely to be returned.
- ✓ The Instruction Manuals shall contain full details of drawings of all equipment being supplied under this contract, their exploded diagrams with complete instructions for storage, handling, erection, commissioning, testing, operation, trouble shooting, servicing and overhauling procedures.
- ✓ If after the commissioning and initial operation, the instruction manuals require any modifications/ additions/changes, the same shall be incorporated and the updated final instruction manuals shall be submitted by the Contractor to the Employer.

10. MATERIAL/ WORKMANSHIP

10.1. All doors, removable covers and plates of control cabinets Junction boxes, terminal boxes, Marshalling box, ACDB & DCDB shall be gasketed all around with suitably profiled EPDM/Neoprene gaskets. The gaskets shall be tested in accordance with approved quality plan, IS:11149 and IS:3400. The gasket shall be either of type 2A, 2B, IA, IB, 1C as per IS:11149. The quality of gasket shall be such that it does not get damaged/cracked for ten years of operation of the equipment or its major overhaul whichever is earlier. All gasketed surfaces shall be smooth straight and reinforced if necessary to minimize distortion and to make a tight seal. **All joints in the panel enclosure shall be continuously welded.**

10.2. The bidders shall furnish catalogues, engineering data, technical information, design documents, drawings etc fully in conformity with the technical specification.

10.3. The Bidder may have standardized on the use of certain components, materials, processes or procedures different from those specified herein. Alternate proposals offering similar equipment based on the manufacturer's standard practice will also be considered provided such proposals meet the basic designs, standard and performance requirements and are acceptable to the Employer. Unless brought out clearly, the Bidder shall be deemed to conform to this specification scrupulously. All deviations from the specification shall be clearly brought out in the respective schedule of deviations. Any discrepancy between the specification and the catalogues or the bid, if not clearly brought out in the specific requisite schedule, will not be considered as valid deviation.

10.4. Wherever a material or article is specified or defined by the name of a particular brand, Manufacturer or Vendor, the specific name mentioned shall be understood as establishing type, function and quality and not as limiting competition.

10.5. Equipment furnished shall be complete in every respect with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/or needed for erection, completion and safe operation of the equipment as required by applicable codes though they may not have been specifically detailed in the Technical Specifications unless included in the list of exclusions. Materials and components not specifically stated in the specification, but which are necessary for commissioning and satisfactory operation of the work unless specifically excluded shall be deemed to be included in the scope of the specification and shall be supplied without any extra cost.

10.6. Where the specification does not contain references to workmanship, equipment, materials and components of the covered equipment, it is essential that the same must be new, of highest grade of the best quality of their kind, conforming to best engineering practice and suitable for the purpose for which they are intended.

10.7. In case where the equipment, materials or components are indicated in the specification as “similar” to any special standard, the Employer shall decide upon the question of similarity. When required by the specification or when required by the Employer the Contractor shall submit, for approval, all the information concerning the materials or components to be used in manufacture. Machinery, equipment, materials and components supplied, installed or used without such approval shall run the risk of subsequent rejection, it being understood that the cost as well as the time delay associated with the rejection shall be borne by the Contractor.

10.8. The design shall be such that installation, replacements and general maintenance may be undertaken with a minimum of time and expenses. Each component shall be designed to be consistent with its duty and suitable factors of safety, subject to mutual agreements. All joints and fastenings shall be devised, constructed and documented so that the component parts shall be accurately positioned and restrained to fulfill their required function. In general, screw threads shall be standard metric threads. The use of other thread forms will only be permitted when prior approval has been obtained from the Employer.

10.9. Whenever possible, all similar part shall be made to gauge and shall also be made interchangeable with similar parts. All spare parts shall also be interchangeable and shall be made of the same materials and workmanship as the corresponding parts of the Equipment supplied under the Specification. Where feasible, common component units shall be employed in different pieces of equipment in order to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.

10.10. All materials and equipment shall be installed in strict accordance with the manufacturer's recommendation(s) with the best technology. Installation shall be considered as being the erection of equipment at its permanent location. This, unless otherwise specified, shall include unpacking, cleaning and lifting into position, grouting, leveling, aligning, coupling of or bolting down to previously installed equipment bases/foundations, performing the alignment check and final adjustment prior to initial operation, testing and commissioning in accordance with the manufacturer's tolerances, instructions and the Specification.

11. DESIGN IMPROVEMENTS / COORDINATION

11.1. The bidder shall note that the equipment offered by him in the bid only shall be accepted for supply. However, the Employer or the Contractor may propose changes in the specification of the equipment or quality thereof and if the Employer & contractor agree upon any such changes, the specification shall be modified accordingly.

11.2. If any such agreed upon change is such that it affects the price and schedule of completion, the parties shall agree in writing as to the extent of any change in the price and/or schedule of completion before the Contractor proceeds with the change. Following such agreement, the provision thereof, shall be deemed to have been amended accordingly.

11.3. The Contractor shall be responsible for the selection and design of appropriate equipments to provide the best co-ordinated performance of the entire system. The basic design requirements are detailed out in this Specification. The design of various components, sub-assemblies and assemblies shall be so done that it facilitates easy field assembly and maintenance.

12. PACKAGING & PROTECTION

12.1. All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. On request of the Employer, the Contractor shall also submit packing details/associated drawing for any equipment/material under his scope of supply, to facilitate the Employer to repack any equipment/material at a later date, in case the need arises. The Contractor shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. Any demurrage, wharfage and other such charges claimed by the transporters, railways etc. shall be to the account of the Contractor. Employer takes no responsibility of the availability of the wagons.

12.2. All coated surfaces shall be protected against abrasion, impact, discolouration and any other damages. All exposed threaded portions shall be suitably protected with either a metallic or a non-metallic protecting device. All ends of all valves and piping and conduit equipment connections shall be properly sealed with suitable devices to protect them

from damage.

13. FINISHING OF METAL SURFACES (PAINTING)

All metal surfaces shall be subjected to treatment for anti-corrosion protection.

13.1. All sheet steel work shall be degreased, pickled, phosphated in accordance with the IS-6005 “Code of practice for phosphating iron and sheet”. All surfaces, which will not be easily accessible after shop assembly, shall beforehand be treated and protected for the life of the equipment. The surfaces, which are to be finished painted after installation or require corrosion protection until installation, shall be shop painted with at least two coats of primer. Oil, grease, dirt and swaf shall be thoroughly removed by emulsion cleaning. Rust and scale shall be removed by pickling with dilute acid followed by washing with running water, rinsing with slightly alkaline hot water and drying.

13.2. After phosphating, thorough rinsing shall be carried out with clean water followed by final rinsing with dilute dichromate solution and oven drying. The phosphate coating shall be sealed with application of two coats of ready mixed, stoving type zinc chromate primer. The first coat may be “flash dried” while the second coat shall be stoved.

13.3. After application of the primer, two coats of finishing synthetic enamel paint shall be applied, each coat followed by stoving. The second finishing coat shall be applied after inspection of first coat of painting.

13.4. The exterior colour of the paint shall be as per shade no: 697 of IS-5(for out door & shade no. 692 of Is 5 for indoor) and inside shall be glossy white for all equipment, marshalling boxes, junction boxes, control cabinets, panels etc. unless specifically mentioned under respective sections of the equipments. Each coat of primer and finishing paint shall be of slightly different shade to enable inspection of the painting. A small quantity of finishing paint shall be supplied for minor touching up required at site after installation of the equipments.

13.5. In case the Bidder proposes to follow his own standard surface finish and protection procedures or any other established painting procedures, like electrostatic painting etc., the procedure shall be submitted alongwith the Bids for Employer’s review & approval.

14. STRUCTURE, GALVANISHING, NUTS & BOLTS

Structures for Substation

Towers, girders, and equipment structures shall be lattice type fabricated from structural steel conforming to **minimum Grade E250A (Fe410W)** of IS 2062(latest) while meeting worst combination of different type of loads, stresses, seismic forces, short circuit forces as per relevant IS codes.

Galvanizing:

All structures shall be galvanized.
All metal surfaces shall be subjected to treatment for anti-corrosion protection. All ferrous surfaces for external use unless otherwise stated elsewhere in the specification or specially agreed, shall be hot dip galvanized after fabrication according to IS:2629**/IS 4759.**

The galvanized surfaces shall consist of a continuous and uniform thick coating of zinc, firmly adhering to the surface of steel. The finished surface shall be clean and smooth and shall be free from defects like discoloured patches, bare spots, unevenness of coating, spelter which is loosely attached to the steel globules, spiky deposits, blistered surfaces, flaking or peeling off, etc. The presence of any of these defects shall render the material liable to rejection.

After galvanizing no drill or welding shall be performed on the galvanized part of the equipment excepting that nuts may be threaded after galvanizing. Sodium dichromate treatment shall be provided to avoid formation of white rust after hot dip galvanization.

Fasteners: Bolts, Nuts and Washers

All bolts and nuts shall conform to IS:6639. All bolts and nuts shall be galvanized as per IS-1367 - (Part 13)/IS-2629. All bolts and nuts shall have hexagonal heads, the heads being forged out of solid truly concentric, and square with the shank, which must be perfectly straight.

Bolts up to M16 and having length up to 10 times the diameter of the bolt should be manufactured by cold forging and thread rolling process to obtain good and reliable mechanical properties and effective dimensional control.. Bolts should be provided with washer face in accordance with IS:1363 Part-1 to ensure proper bearing.

Nuts should be double chamfered as per the requirement of IS:1363 Part-III. It should be ensured by the manufacturer that nuts should not be over tapped beyond 0.4 mm oversize on effective diameter for size up to M16.

Fully threaded bolts shall not be used. The length of the bolt shall be such that the threaded portion shall not extend into the place of contact of the component parts.

All bolts shall be threaded to take the full depth of the nuts and threaded enough to permit the firm gripping of the component parts but no further. It shall be ensured that the threaded portion of the bolt protrudes not less than 3 mm and not more than 8 mm when fully tightened. All nuts shall fit and tight to the point where shank of the bolt connects to the head.

Flat washers and spring washers shall be provided wherever necessary and shall be of positive lock type. Spring washers shall be electro-galvanised. The thickness of washers shall conform to IS:2016-1967.

To obviate bending stress in bolt, it shall not connect aggregate thickness more than three time its diameter.

Bolts at the joints shall be so staggered that nuts may be tightened with spanners without fouling.

15. HANDLING, STORING AND INSTALLATION

15.1. The Contractor shall be responsible for examining all the shipment and notify the Employer immediately of any damage, shortage, discrepancy etc. for the purpose of Employer's information only. The Contractor shall submit to the Employer every week a report detailing all the receipts during the weeks. However, the Contractor shall be solely responsible for any shortages or damages in transit, handling and/or in storage and erection of the equipment at Site. Any demurrage, wharfage and other such charges claimed by the transporters, railways etc. shall be to the account of the Contractor.

15.2. The Contractor shall be fully responsible for the equipment/material until the same is handed over to the Employer in an operating condition after commissioning. Contractor shall be responsible for the maintenance of the equipment/material while in storage as well as after erection until taken over by Employer, as well as protection of the same against theft, element of nature, corrosion, damages etc.

15.3. The Contractor shall be responsible for making suitable indoor storage facilities, to store all equipments which require indoor storage.

15.4. The words 'erection' and 'installation' used in the specification are synonymous.

15.5. Exposed live parts shall be placed high enough above ground to meet the requirements of electrical and other statutory safety codes and Indian Electricity Rules, 1956 and Electricity Act.

15.6. If at any stage during the execution of the Contract, it is observed that the erected equipment(s) do not meet the above minimum clearances as given in appropriate clause the Contractor shall immediately proceed to correct the discrepancy at his risks and cost.

16. NAME PLATE/ LABELS

All apparatus shall be clearly labeled. Details of name plate/ labels of major equipment shall be submitted to Employer for approval.

17. TRANSPORTATION OF EQUIPMENT

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.

The conditions of roads, capacity of bridges, culverts etc. in the route shall also be assessed by the bidders. The contractor shall carry out the route survey along with the transporter and finalise the detail methodology for transportation of equipment. Based on route survey, any minor modification/ extension/ improvement to existing road, bridges, culverts etc. if required may be carried out by the bidder.

18. IMPORTED EQUIPMENT / MATERIAL / ITEM / PARTS / COMPONENT

18.1. Any imported equipment/material/item/parts/component to be supplied under the contract shall be tested in the certified laboratories to check for any kind of embedded malware/trojans/cyber threats and for adherence to Indian Standards as per the directions issued by Ministry of Power/Govt. of India from time to time. In case of such import from specified "prior reference" countries, the requirement of prior permission from the Govt. of India including protocol for testing in certified and designated laboratories by Ministry of Power/Govt. of India shall also be complied with by the contractor.

18.2. The equipment offered by the contractor shall at least conform to the requirements specified under relevant IS standard. In case of discrepancy between IS and other international standard, provisions of IS shall prevail. The Contractor shall also note that the list of standards presented in this specification is not complete. Whenever necessary, the list of standards shall be considered in conjunction with specific IS. If the IS standard is not available for an equipment/material, then other applicable International standard (IEC/Equivalent), as per the specification, shall be accepted."

18.3. The bidder/contractor shall list out the products and components producing Toxic e-waste under the contract and shall furnish to the Employer the procedure of safe disposal at the time of closing of the contract.