

**BIDDING DOCUMENT  
FOR  
1x500 MW VIZAG (Gazuwaka) HVDC BACK TO BACK  
PACKAGE C**

**ASSOCIATED WITH  
REFURBISHMENT OF HVDC POLE-1 UNDER ADD-CAP**

**Volume-II: TECHNICAL SPECIFICATIONS. PART- I**

## 1.0 INTENT OF THE SPECIFICATION

Power Grid Corporation of India Ltd. (POWERGRID), A Govt. of India Enterprise is responsible for bulk Power transmission of electrical energy from various Central Govt. Power Projects to various utilities/beneficiaries and interconnecting regional grids, operating and maintaining the National electrical grid of India. It is established with mandate of "We will become a Global Transmission Company with Dominant Leadership in Emerging Power Markets with World Class Capabilities by:

- a) World Class: Setting superior standards in capital project management and operations for the industry and ourselves.
- b) Global: Leveraging capabilities to consistently generate maximum value for all stakeholders in India and in emerging and growing economies.
- c) Inspiring, nurturing and empowering the next generation of professionals.
- d) Achieving continuous improvements through innovation and state-of-the-art technology.
- e) Committing to the highest standards in health, safety, security and environment as its mission.

Vizag (Gazuwaka) Back-to-Back(BTB) HVDC has been commissioned by POWERGRID in 1999 (Pole-1) and 2005 (Pole-2). The BTB station has acted as an asynchronous link between the Eastern Region and the Southern Region and aided the system operator in adjoining AC network loading. It is used as a major inter-regional power transfer link between ER & SR for power exchange and as well as Grid stability.

As the Pole-1 (500 MW) of Vizag (Gazuwaka) Back to Back HVDC system has already completed 25 years of its useful life, the Employer intends to extend the useful life of the HVDC System through replacement of all the equipment's listed below:

- 1) Thyristor valves, structures and associated equipment including optical fibers.
- 2) DC measuring devices, i.e ZFCT( zero flux current transformer) and DC voltage divider along with cable and all accessories including Electronics for valve hall.
- 3) HVDC Control and Protection Systems including Pole control, Station/Master control, Reactive Power Control, Valve Control, Valve Base Electronics (VBE), Station Mimic, TFR and SCADA system for complete station. Existing Key interlock panel or new key interlock panel to be integrated/interfaced with the new C&P system.
- 4) Valve Cooling System with dry type coolers and associated piping, including control, monitoring and Valve Cooling mimic.
- 5) Valve arresters and surge arrestors inside valvehall.
- 6) AC Control and protection system for 400 kV Busbar (East and South), AC PLC filter harmonic filter, converter transformer and converter bays
- 7) Associated supply of interfaces as required for the proper operations of the new supplies.

- 8) Erection hardware in valve hall including bus works, Clamps and connectors for valve hall and connecting with converter transformer bushing.
- 9) Replacement of 48V and 220V battery and battery Chargers.
- 10) PLC Filter with CVD (Capacitive Voltage Divider) to provide voltage reference for firing signal.
- 11) Power and Control Cables
- 12) UV/Arc detection system
- 13) DG set

Employer intends to use the existing Valve Hall Building, Converter Transformers, wall Bushings, AC Filter Equipment and AC Yard equipment. The layout diagram indicating the above is enclosed as **Annexure-B**.

The Contractor's scope of work shall be as described in Clauses 1.1, 1.2, 1.3 and 1.4 herein. The exclusion of equipment, materials and services which are to be provided by the Employer are detailed in Clause 1.5 herein.

All other equipment, materials and services, whether explicitly stated or otherwise, that are necessary for the satisfactory operation of the HVDC system under present scope and its integration with the existing 400 kV AC systems and existing Pole-II of Vizag Back to Back HVDC as described in the Specification shall be deemed to be included in the present scope of work.

The equipment and systems shall conform in all aspects to high standards of engineering, design and workmanship and shall be capable of continuous commercial operation in the specified manner for an anticipated minimum life of 25 years and shall also be in line with the current practice for reliable and efficient functioning of the HVDC system. (25 years of lifetime pertains to main HVDC equipment's, however, computers and peripherals are not covered in this clause). The Employer shall interpret the meaning of the Specifications, data & drawings etc., and shall have a right to reject or accept any work or material which in his assessment does not meet the requirements of this Specification and/or applicable National and International standards, codes, rules, etc. mentioned elsewhere in the Specification.

In the event of a conflict between requirements of any two clauses of the Specification/documents or requirements of different codes/standards specified, the more stringent requirement as per the interpretation of the Employer shall apply, unless confirmed otherwise by the Employer in writing based on a written request from the Contractor.

Whenever a material or equipment is specified herein by reference to a particular brand name, manufacturer or vendor, the Contractor may supply another manufacturer's equivalent product if the products proposed are equivalent or superior to those named.

All the items along with the quantities mentioned in the Bill of Quantity (BOQ) submitted along with the bid shall be considered as indicative only and the

Contractor shall supply at no extra cost to the Employer any additional material /equipment /services not covered by these lists but which are found to be required for the fulfilment of the Specification.

In this specification the word 'Pole' and 'Block' has been used synonymously.

The details of existing pole-1 of Vizag (Gazuwaka) HVDC System is enclosed as **Annexure-A1** (Main Circuit Parameters, Harmonic Filters data, Converter Transformer, AC bus arrester, Service Building layout GF & FF, Details of ACDB/DCDB, Overall Switchyard layout, Valve Cooling layout etc.).

The details of existing pole-2 of Vizag (Gazuwaka) HVDC System is enclosed as **Annexure-A2** (Details of Station/Master control including interface signal list). However, Contractor is advised to visit the site at their own cost to familiarize the system before submission of bids.

## **1.1 DISMANTLING**

The Contractor shall carry out safe and structured dismantling of the existing valve-hall equipment of Pole-1 (including thyristor valves, quadruple valve structures, ZFCT, valve hall arresters, DC voltage divider, Optical fibers, UV/arc detector, Bus work and connectors, Valve cooling system including controls and valve cooling mimic, HVDC control & protection equipment, HVDC station mimic, AC control and protections system, PLC Filter with CVD (East and South), DG Set, power and control cables, Battery and Battery chargers (48V & 220V) etc. before taking up the Installation of new equipment in scope of supply.

Dismantling of Valve modules and its components for quadruple valve mechanical structure, valve cooling pipes, reactor module and Optical fibres shall be carried out in structured manner, packed and stacked in store and handed over for employers' further use. Any component not covered above in the valve hall shall also be under the scope of dismantling.

The dismantled materials shall be safely handled, stored at the employer's demarcated place at the station premises and handed over to the employer. Bidder shall be fully responsible for any collateral damage to employer's facility and shall replace/rectify the damage if any with no financial implication to employer.

Considering the nature of works covered under the subject package, in the eventuality of damages to the Employers' facilities during execution by the Contractor, the requisite analysis for the same shall be carried out. Bidder shall attributable to the Employer, so as to restore the damaged facilities to its condition as existing before commencement of subject work by the contractor.

## SCOPE OF WORK

a) The scope of work for the refurbishment of existing Pole-1 of Vizag (Gazuwaka) Station includes the refurbishment of one completely operational back to back HVDC Pole (1 X 500 MW) (Pole1) and shall include the overall project management, studies, design, Engineering, training of Employer's personnel; manufacturing, factory testing, supply of all items, delivery to the sites, unloading, storing, handling, and moving into final position, dismantling, installation, testing, commissioning and placing into successful commercial operation of the HVDC System/all Equipment as below:

1. Thyristor valves and associated equipment (Floor mounted quadruple Thyristor valves and associated equipment, optical fibers, cooling pipes etc.).
2. HVDC control , protection system including converter control , valve control, valve cooling system and associated piping , including control , MCC , dry cooler fans and valve cooling UPS. Operator Control Desk for converter station, AC switchyard and HVDC system is also under present scope.
3. DC measuring devices, i.e ZFCT( zero flux current transformer) and DC voltage divider along with cable and all accessories including Electronics for valve hall.
4. Valve arresters and Surge arresters inside Valve Hall.
5. Installation of High-definition PTZ CCTV camaras inside the valve hall to cover complete Valves along with monitor inside the Control Room and feature to access the cameras from remote locations
6. PLC filter with CVD (capacitive voltage divider)/ CVT to provide voltage reference for firing signal.
7. Power and Control Cables
8. Hybrid UV+IR fire detection system inside valve hall.
9. DG set.
10. Associated integration works of the above replacement works.
11. In case any new equipment to be added then the necessary panels along with its cable and protection to be provided.
12. Dismantling and removal of existing equipment as per clause 1.1.
13. Erection hardware in valve hall (existing valve hall earth switches, if compatible with OEM, may be used). Alternatively, new Valve Hall earth switches are also acceptable.
14. AC Control and protection system for 400 kV Busbar, AC harmonic filter and converter bays, Converter transformers and line bays along with associated reactors. AC Control and Protection shall be de-centralized type with switchyard panel rooms.

Scope for AC control and protection system for AC Yard is as follows:

- i. Replacement of Complete Bus bar protection from High impedance to low impedance for Eastern side and Southern Side Bus Bars along with Cables from Switchyard to HVDC Control room.
- ii. Converter transformers bays, Line bays (Jeypore 1 & 2 ) along with associated Reactors and AC filter bays for Pole-1 on both East and South side.
- iii. AC filter sub bank bays for Pole-1 on both East and South side
- iv. Replacement of High Impedance Interzone protection with low Impedance Interzone protection.

Existing C&P cubicles for the above shall be completely dismantled and stored at site.

15. 220V and 48V Battery and battery chargers (new charger system should have facilities for DC earthing & Monitoring) and integration with existing DCDB.

16. Suitable covered storage Area as per **Annexure store area**.

Space for storage Area is marked in Annexure store Area, approx. 1800 Sq. meter. Space for Valve cooling coolers are shown in **Annexure Valve cooling Area**.

17. LED based Video Projection System (VPS) of reputed make and latest technology, comprising of minimum 4x2 array (minimum 55" screen size for each LED) for optimum viewing from control desk, shall be supplied. The above shall be used for monitoring the DC and AC equipment associated with the converters, complete with status indication devices and measured values. LED display shall include full active display for the complete DC equipment and AC systems of Vizag BTB station and essential indications and measured analog values.

18. Necessary interface requirement for successful integration with existing Pole-II (1 x 500 MW)

**19.** Replacement of all control and power cables as per **Annexure- Power & control cable scope**.

20. Routing of fibre optic cables inside valve hall from valve base cubicles shall be offset to the hanging valve structures to the extent possible to avoid damage of fibres in case of fire in Valve Structure

21. The supply of all spare parts, equipment handling, testing, maintenance and commissioning equipment as required for satisfactory operation of the HVDC systems under the scope of the contract.

22. Contractor shall install new interface panel (comprising of signals of Pole-1 which are required for integrated operation of Pole-1 & Pole-2 together) for further use in HVDC control and Protection and SCADA system. Contractor may make suitable arrangements to bring the signals of Pole-1 to interface panel in control room. Further, at present, Monitoring of pole -2 is available in Pole-1 HMI through remote interface panel placed in Pole-1 control room. This

monitoring of Pole-2 shall also be made available in new HMI under present scope. All works related to this interface is under present scope of contractor.

23. The HVDC Control Software should be equipped for real-time debugging of control and protection logic with standardized logic symbols to streamline fault diagnosis and troubleshooting.
24. Employer intends to have Power compensation facility in Pole-1 till its rated capacity in case of outage of Pole-2. Any signals required from Pole-2 for Power Compensation feature shall be arranged by Employer in Control Room.
25. Employer intends to Bypass the FSC of 400kV Jeypore-Gajuwaka line in case of detection of ferro resonance. Such Bypass feature need to be provided for Pole-1 under present scope. This Bypass facility is already functional for Pole-2. Input of ferro resonance may be taken from Pole-2.
26. Civil works for Switchyard panel rooms is also in present scope of work. Additional Civil work and/or modification of existing foundation for installation of new equipment like Valve structure in valve hall, valve hall equipment, cooler fans foundation, valve cooling system, new store building, battery room and PLC filter etc. if required is in the scope of contractor.
27. **Integration Scope:** Details of existing system for auxiliary supply, Battery, Battery Charger, Station UPS, Auxiliary Signal List with SCADA, Interfacing signal of ACDB, DCDB , UPS and other Auxiliary etc. is enclosed at **Annexure-C**. If any changes are required in existing Auxiliary Supply, LT system, Battery, UPS etc., same is included in bidder's scope. All these auxiliary system shall be integrated in SCADA system for monitoring & control. Monitoring of employer AC Yard (Converter station East side and South side) is also to be integrated for run up/runback control as well as display in SCADA System. Valve hall pressure, temperature, and humidity monitoring to be integrated into the station SCADA system. In case the existing SCADA UPS system does not have the sufficient capacity for the HMI system to be supplied under present scope, the contractor needs to supply redundant UPS System for additional capacity (the backup time shall be 30 minutes and requirement of single phase/ three phase shall be decided during the detailed engineering).
28. The provision of personnel for the supervision of operation and maintenance of the converter stations in accordance with **clause 1.4.3**.  
The Contractor's responsibilities under the Contract shall also generally include:
  - i) The adherence to the dimensions of parts, specification and locations thereof as shown on the drawings/documents except for deviations or variations specifically reviewed and authorized by the Employer.
  - ii) To ensure the strength of all parts, material and equipment to withstand all stresses including electrical, mechanical, seismic and other forces which may be experienced or expected during long term station operations as well as those stresses caused by faults, switching operations and abnormal ac/dc system conditions.
  - iii) The correct application and the satisfactory and proper performance of all materials, equipment, structures, systems, and auxiliary station services under

all specified operating conditions without signs of undue strain and without breakdown, damage or deterioration of any of the equipment due to faulty or unsuitable material, equipment, workmanship, design, erection, construction, installation, and commissioning.

- iv) The correct, safe and proper installation of all equipment at the Site.
- v) Installation of the entire HVDC Control & Protection and monitoring system for pole-1 in integration with the HVDC and HVAC system, as defined in the specification, into successful commercial operation related to present scope of work.
- vi) The transportation of all temporary and permanent materials, equipment and apparatus from the places of manufacture to the Site and the subsequent removal of temporary materials, equipment and structures.
- vii) The supply of complete documentation including drawings, specifications, study reports, quality control documents, operating & maintenance, comprehensive O&M manuals for each major equipment, commissioning procedures, sub-system and system tests and manuals for all works/ Equipment.
- viii) The bidder shall provide detailed drawings of valve hall components, such as stress shields, support structures, and hardware fittings, along with original supplier details.
- ix) The provision and execution of training programs (for present scope) so as to thoroughly train the Employer's staff to properly operate and maintain the converter station over the long term.
- x) To replace/modify/correct any faulty Equipment/ systems found at any time up to the completion of the guaranteed period.
- xi) To adherence with all applicable Indian Law(s), Rule(s), Act(s), Standard(s), Code(s) of Practice.

The above responsibilities of the Contractor are further detailed in following paragraphs and elsewhere in the Specification.

## **SCOPE OF CONTRACTOR'S SUPPLY**

The scope of supply of the Contractor shall include, but not be limited to, the following major items listed below:

- i) System engineering and studies.
- ii) Engineering and detailed design
- iii) Engineering, design, manufacture, factory testing, supply, preparation for shipping, transportation, insurance, unloading, storage, erection, installation, testing & commissioning at completely operational HVDC converter stations at Vizag.
- iv) Civil works for Switchyard panel rooms is also in present scope of work. Additional Civil work and/or modification of existing foundation for installation of new equipment like Valve structure in valve hall, valve hall equipment, cooler fans foundation, valve cooling system, new store building, battery room and PLC filter etc. if required is in the scope of contractor. If any modification or changes in the

existing foundation of Valves structure is required, the same is also included in the present scope of work.

v) Supply of spares, Test instruments and Tools & Plants

The broad details of the major items are given below. Further details have been specified in subsequent sections of this Specification.

### **1.3.1 SYSTEM ENGINEERING AND STUDIES**

The Contractor shall be responsible for overall system engineering studies and detailed design for all elements, systems, facilities and equipment. This shall include the proper definition and execution of all the interfaces with the existing systems of the Employer including the material and services as listed in clause 1.5 of this Specification, which are to be provided to the Contractor by the Employer for incorporation into the Works, all as required for the proper and correct design, performance and operation of the HVDC converter station. (Existing system are the systems which have interface with the equipment/system under the scope of contractor)

The engineering to be performed by the Contractor shall include, but not be limited to, the following items as detailed further in the Specification:

a) All necessary system studies ( on PSS/E, PSCAD, real time Simulations, any other tools) as required, determining that the conversion equipment design and performance meets the specification and that the design shall provide correct operation. Such studies shall include basis for assumptions made, establishment of the relevant parameters, equipment requirements and control & protection requirements. The studies shall also include adequate representation of the connecting AC systems.

The Contractor shall carryout the validation studies in contractor's premises on the real time digital simulator. The factory system Test (FST) of Control and protection systems shall be carried out in India. Employer shall have right to join/associate in these studies under the overall supervision of contractor's personnel. Real Time Digital Simulator and HVDC C&P Replica supply is not part of present scope.

b) Studies for insulation co-ordination for AC and DC systems; studies for integration of the HVDC system in to the existing HVDC/HVAC system; studies to ensure the proper coordination of the metal oxide surge arresters with those of existing HVAC system surge arresters.

c) Studies for deciding the operational logic.

The operational logic refers to the specific operational guidelines and/or restrictions, which shall be required to be imposed on the HVDC system operation if it is to operate in an environment for which it has not been designed. This environment could exist because of the factors beyond the control of the Employer but in which the HVDC system being in operation becomes useful. The Employer then needs to know the limitations of the HVDC system. These

environmental conditions could be characterized by factors like wide variation in voltage, frequency, temperature, pollution levels, humidity etc.

d) All necessary studies to determine the requirements for communication between HVDC station and the remote load dispatch centres at Kolkata (ERLDC) and Bangalore (SRLDC) and RTAMC Secunderabad, NTAMC Manesar and Back up NTAMC at Bangalore . The contractor's work shall be limited to the design, engineering, supply, installation, commissioning and integration of the interface equipment like serial port, modems etc. to establish the communication with remote load dispatch & remote operation centre for above locations using IEC 60870-5-104 protocol. Telecommunication link (OPGW link) through AC Lines Network shall be provided by Employer.

e) Studies to ensure and demonstrate that the nearby generators including those at Rengali and Indhrawati in Eastern grid and NTPC Simhadri in Southern grid shall not be adversely affected by the HVDC system, particularly with regard to SSO/SSR and harmonic injection.

f) Factory system testing for control cubicles as per Technical Specification shall be performed with all dc controls and protections, station monitoring, recording system, transient fault recorders etc.

The Contractor shall, in addition, carry out all the studies proposed in his Bid and shall perform all studies according to the schedule established for the Contract. (Scope of studies are further detailed in Chapter 4).

The Contractor shall also carry out all studies which are necessary for completion of the design and engineering, whether these have been mentioned in the Bid/Specification or not. The Employer shall have the right to observe and participate in the studies performed as part of the Contract, and shall have access to all data (non intellectual property) necessary for a complete understanding of the purpose & procedure of such studies as well as the validity of the results.

The Employer shall, from time to time, notify in advance the Contractor which of the aforesaid studies he wishes to observe and participate in and the contractor shall give the Employer at least thirty days prior notice before commencement of the above said studies. The Contractor shall make all the programs and facilities described in his bid and any other programs or facilities subsequently developed or found necessary for the design.

The Contractor, however, shall have his database approved by the Employer prior to commencement of studies during post award detailed engineering. The Contractor shall make available to the Employer all his data files on USB external hard disk. He shall also furnish base case data file(s) for the studies carried out and other files as and when requested by the Employer.

### **1.3.2 ENGINEERING AND DETAILED DESIGN**

The Contractor shall be responsible for the engineering and detailed design of the Thyristor Valves and Control and Protection systems in the converter stations. The detailed design (under present scope) shall include, but not be

limited to, the following main items in accordance with requirements of the Specification.

- a) Design and specification of all equipment, systems, subsystems, facilities and auxiliary station services.
- b) Station design including all electrical, mechanical and civil engineering, construction and installation specifications.
- c) Detailed design of all interfaces with the equipment, services and facilities supplied by the Employer.

The employer shall carry out design review during detailed engineering. The design review shall include at least the following major equipment/system:

- Thyristor Valves and associated equipment
- HVDC Control, Protection System and SCADA system
- Valve Cooling System

The Contractor shall provide all necessary information as sought by the employer during design review.

The surface / subsurface data given in Chapter 2 are only indicative. Contractor shall carry out soil investigation for outdoor cooler area, storage area and PLC area before submission of bid. The Contractor shall be fully responsible for all soil investigations required to establish foundation criteria and parameters for all site buildings and structures, as applicable.

### **1.3.3 MANUFACTURING AND/OR SUPPLY OF EQUIPMENT**

The equipment to be designed, manufactured, tested, supplied, installed and commissioned by the Contractor in accordance with the specification shall include the items as specified in 1.2.a) above.

### **1.3.4 TYPE TESTING**

The bidder shall offer type tested equipment for the project and the Employer shall accept the equipment type test reports under the following conditions:

- (i) Type test in accordance with the relevant specified Standards & Technical specification
- (ii) The type tested equipment shall be of the same design, insulation class as per the equipment offered under this contract. Technical justification will be submitted for differences between tested and offered equipment. Employer's interpretation for this shall be final.

In the event that equipment furnished includes important modifications of, or significant departure from, the designs of equipment on which type test report has

been furnished or if there is evidence that the equipment does not comply with the requirements of the Specifications, type test procedure was not properly followed as laid down in standards, the Contractor shall conduct the type test without any cost implication to the Employer. In case equipment of same design and rating are supplied under this contract from different works, they shall be type tested separately. In the price bid, the type test charges shall be included in the contract price and no separate type test charges shall be indicated by the bidder.

Notwithstanding above, following broad categories shall be adhered to:

- a) Thyristor valves shall be type tested under this contract and type test report shall be approved by the Employer.
- b) For DC measurement devices and DC surge arresters, AC PLC Filter and AC Voltage Measuring Device tests performed within 15 years from originally scheduled date of bid opening shall be considered subject to condition that either the type tests were performed on the identical equipment or performed on an equipment of similar type and design as mentioned in para (ii) above. A justification report shall also be submitted by Contractor along with the type-test report for Employer's review.
- c) HVDC control and protection equipment, fibre-optic communication equipment, power/control and any other equipment not covered above (in a& b) , tests performed within 10 years for FO Cable from date of bid opening shall be considered subject to condition that either the type tests were performed on the identical equipment or performed on an equipment of same design as mentioned in para (ii) above. A justification report, shall also be submitted by Contractor along with the type-test report for Employer's review.
- d) For other equipment, following validity from originally scheduled date of bid opening shall be considered.

- 1) Cable and associated accessories: 10 years
- 2) Battery charger: 7 Years
- 3) DG Set: 10 years
- 4) Insulators (Porcelain/Glass): 10 Years
- 5) Insulators (Composite): 5 years

e) For standard market products (like motors, air-compressors, air conditioners, fans etc.), of reputed make, which have good market and on-site service credentials, once in life-time type-test requirement shall be applicable. However, it shall be justified that the product design has not been altered from the type-tested object.

Acceptance of the type test reports shall be at the discretion of the Employer. All type tests performed after the date of award of the Contract shall be witnessed by the Employer unless authority to proceed with the tests in his absence is received from the Employer in writing.

As per CEA (Central Electricity authority) the Guidelines for validity period of type test(s) conducted on Major Electrical equipment in Power Transmission system is available in the official website of CEA.

### **1.3.5 CIVIL WORKS**

The civil (including structural) works to be provided by the Contractor, in accordance with the Specification, shall include the design & construction of all the items required in HVDC. Some of the major items are listed below.

- i) Any civil /structural work modifications required for installation of all the equipment's under the scope with new design equipment shall be in the scope of contractor.
- ii) Additional Civil work for installation of new equipment like cooler fans foundation, valve cooling system, new store building, DG Set, Cable trench (if required) etc. If required, existing PLC filter and DG Set foundation may be used and if any modification is needed the same is bidder scope. If any modification or change in the existing foundation of Valves structure is required, the same is included in the present scope of work.
- iii) Valve Cooling UPS battery building as per Annexure- Battery Room. Finishing schedule shall be as per Annexure-Finishing schedule.
- iv) Existing DG set details as per Annexure-Existing DG set.

#### **1.3.4.1 SITE AND GENERAL SERVICES**

- a) Site preparation including dismantling the existing facilities to accommodate new equipment in the scope of work as per TS.
- b) Any Civil work, if required, related to Valve Hall, Valve Cooling System, Valve Cooling UPS, PLC equipment and Cable Trench to be covered in the present scope of work as per TS.
- c) New Store Building in the scope of work as per TS.

#### **1.3.4.3 FOUNDATIONS AND STRUCTURES**

- a) Foundations for all equipment, structures & other services required for new equipment installation in the scope of contractor.
- b) other foundations and structures found necessary to be constructed, as a result of detailed design.

### **1.3.5 PACKING TRANSPORTATION AND STORAGE**

#### **1.3.5.1 Packing, Marking and Shipping**

The packing and shipping shall be carried out in accordance with the standard practice of Contractor and with the following additional requirements

- a) The Contractor shall prepare the equipment for shipment and storage in such a manner as to protect the equipment from damage or deterioration during shipping or storage. In India, shipments shall be exposed to heavy rains, hot

sun, high humidity and sudden extreme changes of temperature. The equipment shall be packed and shipped so as to protect it from all such conditions and any other abnormal conditions, generally expected during shipping & storage.

To the maximum degree possible the Contractor is recommended to utilize the "Containerized shipping" system for any equipment being shipped to India.

The contractor shall ensure that the equipment shall be properly packed, blocked, padded, coated and protected so as to ensure that such equipment is not damaged due to possible mishandling and varying environmental conditions.

The metallic containers shall be considered as the property of the Contractor and he shall remove them from site once the contents are unpacked, inspected, documented and placed in temporary storage or in final position in accordance with the Specification.

- b) The equipment shall be shipped in such a manner as to facilitate unloading, handling and storage en-route and at the site(s). The Contractor shall provide lifting lugs and special lifting devices for proper handling and erection.
- c) The Contractor shall be liable for any damage or loss resulting due to careless, improper or insufficient packing and any careless, improper or poor handling.
- d) All shipments shall be shipped in units as large as practicable, but within the transportation limits. The equipment may be nested in each other where desirable to reduce shipping volume provided such nesting shall not cause any damage to any such nested parts. Each piece of Works or Equipment which is to be shipped as a separate piece or smaller parts packed within the same crate shall be legibly marked to show the unit of which it is a part and match marked to show its relative position in the unit, to facilitate handling/assembling at sites.
- e) All small parts shall be adequately tagged, boxed and crated. The crates shall be of closed wooden construction, lined with waterproof paper or equivalent and adequately reinforced and strapped on all sides and ends with steel strapping of suitable dimensions and strength. The tools shall be packed in separate closed wooden crates, lined with waterproof paper. Where practicable, instruments and relays and any other part of the Works which may be damaged by moisture or humidity shall be given a transparent coating or plastic cover. If applicable a coating of good quality grease can also be given, providing such coating does not damage the Works.
- f) Spare parts and spare equipment shall be packed separately in containers adequate for long term storage, plainly marked "Spare Parts only". They shall be created individually or in kits to be used in, one single renewal or overhaul operation. Other spare parts or kits shall not be disturbed when using one set or kit. For the convenience of export shipping, more than one set of spare parts may be packed in one /single crate or case.

A Packing List indicating the contents of each crate or box shall be furnished in a moisture proof envelope securely fastened to the outside of the crate or box.

- g) The Contractor shall at all times protect and preserve from damage, loss, corrosion, and all other forms of damage to all parts of the Works.

- h) Prior to making any shipments, the Contractor shall send to the Employer a complete Packing List for such shipment. This packing List shall include at least the following information: the description of part or equipment, reference drawing number, quantity of each item, numbers of the parts, assembly number to which the parts relate, date of dispatch and method of transport.
- i) Sketches illustrating the proposed method of shipping large components shall also be submitted to the Employer prior to the commencement of such shipment.
- j) Packaging should be such that long time storage at site, if required, should not deteriorate the performance and life of any equipment supplied by the Contractor.

#### 1.3.5.2 TRANSPORTATION

The Contractor shall be responsible for transportation of all the materials & equipment to the work Site including overseas and inland transportation, as well as for unloading, handling and storage of the equipment at the site.

The Contractor shall be responsible for the full cost of any repairs or restorations required on any railway/road which is damaged or otherwise altered due to the transportation of equipment in his supply, including the replacement of any posts, signs, bollards, etc. which have been damaged or moved and of any overhead wires or structures moved or brought down.

#### 1.3.5.3 INSURANCE

The Contractor shall insure all shipments and Works at his own expense for not less than the full replacement cost plus any additional cost for accelerated manufacture of the replacement parts. Loss of or damage to equipment during shipping or transportation to the work site or otherwise shall not constitute grounds for claims for extension in time or for extra payment.

#### 1.3.5.4 STORAGE OF EQUIPMENT

The Contractor shall provide and construct adequate storage sheds (annexure store area) for proper storage of both present scope and dismantled equipment. Sensitive equipment's shall be stored indoors under controlled environment, if required. All equipment during storage shall be protected against damage due to act of nature or accidents. The storage instructions of the equipment manufacturers shall be strictly adhered to. (Dismantled equipment are under operation and hence healthy). Transport packing shall be removed as soon as possible after receipt of equipment at the work Site.

#### **1.3.6 DISMANTLING, INSTALLATION, TESTING AND COMMISSIONING**

The Contractor shall dismantle the existing equipment's as required under present scope and install all equipment, systems and services to be provided for the scope of Works and shall be responsible for the provision of all construction labour, material and supervisory staff in accordance with the specification.

The Contractor shall submit the detailed dismantling, Installation & commissioning plan and schedule for approval of the employer to enable

minimum outage of the HVDC system capacity during the up-gradation works. The request for shutdown of Pole-1 of the Vizag HVDC system shall be furnished by the Contractor along with day wise activity plan to the Employer, having ensured availability of all required materials and other resource mobilization by the Contractor for carrying out the up gradation works. Shutdown requirement for Pole-2, if any, for interface/integration related works shall be furnished by the contractor along with day wise activity.

The dismantling shall be carried out in a structured manner with all safety precautions as required for the works by the Contractor. The dismantled materials shall be removed and placed at storage areas at site. The contractor shall construct suitable storage sheds as per cl 1.3.5 for the storage of dismantled equipment.

The Contractor shall furnish all slings, special hoisting equipment, tools, jacks, braces, pulling equipment's, cranes and all materials, articles, supplies and constructional equipment necessary for the proper construction, dismantling, installation and erection of the Equipment.

The Contractor shall erect and install the Equipment under ordinary job conditions and not necessarily those which he considers the most desirable. The necessity for moving materials within the Works' area or the Sites during inclement weather and all other circumstances characteristic of construction operations are to be expected and shall not be considered as a basis for claims for extension in time or for extra payment. The Contractor shall be responsible for dismantling of existing equipments, installing, testing, commissioning and putting into commercial operation all material, equipment, services and any other item incorporated in the Scope of Work. The testing, commissioning and putting into commercial operation of the said material, equipment and other systems shall be carried out in accordance with the requirements of the Specification and particularly in accordance with chapter 9.

The Employer shall reserve the right to assign Employer's personnel to the Contractor's testing and commissioning team to participate in and/or witness the testing & commissioning operations at the Site. Employer's personnel may participate in the testing and commissioning of the Supplied items under present scope. The Contractor's obligations and responsibilities under the Specification shall not in any way be diminished, reduced, relieved or otherwise altered due to assignment of Employer's personnel to the commissioning team.

### **1.3.7 SPARE PARTS**

#### **1.3.7.1 GENERAL**

The spare parts and maintenance accessories shall be classified into the following:

- a) Spare parts and maintenance accessories required by the Contractor to meet the guaranteed availability and reliability over the guarantee period as specified further in Chapter 11.
- b) Optional spare parts and maintenance accessories recommended by the Contractor or specified in the relevant section/s of the Specifications, in addition to (a).

c) Spares required by the Contractor during installation, testing & commissioning of the system.

d) The operation & maintenance accessories and tools & tackles as recommended by the Contractor and as specified here & elsewhere in the Specification.

e) Mandatory spares

All spares shall be of the same materials and workmanship as the corresponding parts of the equipment furnished and shall be fully interchangeable with those. Further, all main equipment for which a common spare is provided shall be interchangeable with each other.

A spare part intended for use as a replacement for any one of several identical parts, for example a capacitor unit, shall be a replacement to any one of those parts without resulting in a deterioration in the performance of the equipment / system.

All spares as applicable meant for outdoor use, shall be suitable for prolonged outdoor storage without being energized. The spare equipment shall be supplied complete with accessories etc. as applicable, The spares shall also be packaged in accordance with Clause 1.3.5.1.

Should the Contractor consider it necessary or advisable to maintain any equipment energized during storage he shall be responsible for providing the necessary power supplies complete with all necessary switches and protections and for the connections to the equipment in storage and for all monitoring equipment associated with the energized spare(s). All spare parts shall be scheduled to be at the site before the start of testing/ re-commissioning of the first Pole of the HVDC system.

The Contractor may use the spares of different equipment as per agreed list from Employer's stock during the guarantee period, provided they are duly replaced by him in the most expeditious manner. All contractual spares (Mandatory and Availability spares) shall be handed over to the Employer prior to start of Availability and reliability monitoring period. In case any Mandatory spares is utilized during availability/Reliability monitoring period, the Employer shall release the reliability bank guarantee only after the spares are replenished.

#### 1.3.7.2.1 Availability Spares

The contractor shall supply the spare parts required to meet the specified guaranteed availability and shall include such spare parts in the scope of supply. The spare parts list shall be categorized in two parts i) major components including test equipment, special tools and fixtures & ii) minimum parts required for scheduled inspections and overhaul.

The detailed lists of spare parts to meet the guaranteed reliability & availability requirements shall be part of the contract documents. However, if it is found during detailed engineering or Reliability & Availability prediction calculation that additional spares are required to meet target values, the same shall be made available by the Contractor without any additional cost to the Employer.

#### 1.3.7.2.2 **Mandatory Spares**

As per Annexure-Mandatory Spares

#### 1.3.7.3 **OPTIONAL SPARES(RECOMMENDED SPARES)**

The Contractor shall supply, on the request of the Employer at any time prior to the expiration of the Availability/reliability monitoring period, the spare parts listed below or any part thereof, at unit prices not greater than those quoted by the Contractor in his Bid against mandatory spares.

- Thyristor electronics (PCBs) of each type, Gate cards / TCU/ TE/ Multi Star Coupler / TVM/ RPU as applicable.
- each type of relay supplied under this contract, and / or their circuit cards;
- each type of printed circuit board/cards;
- special tools, materials, instruments or devices required for installation, testing and maintenance.

In the event of utilization of any optional spare(s), which is/are purchased by the Employer, during the guarantee period to keep the down time to a minimum, it shall still be considered as 'NOT AVAILABLE" for the purpose of calculating guaranteed availability.

#### 1.3.7.4 **COMMISSIONING SPARES**

The contractor shall supply additional spares which he expects to consume during installation, testing and commissioning of the systems. The quantity of these spares shall be decided based on his previous experience, such that site work shall not be hampered due to non-availability of these spares. The unused spares may be left at the respective sites for later use by the Employer.

#### 1.3.7.5 **TOOLS & TACKLES**

The Contractor shall also supply at site one set of all special tools & tackles, testing equipment, handling equipment, etc. (under the present scope) which are required by the Employer's maintenance staff to maintain the stations successfully.

The contractor may use these tools & tackles, testing equipment, handling equipment specified by employer at site during commissioning and same shall be handed over to site after successful commissioning. The condition of equipment shall be good at the time of handing over of equipment and the damaged equipment shall be rectified/ repaired to the satisfaction of site engineer or else shall be replaced by the contractor/ bidder.

### **1.4 SERVICES TO BE PROVIDED BY THE CONTRACTOR**

The scope of the Contractor shall include, but not be limited to, the following major items as listed below and described more fully in subsequent clauses and elsewhere in this Specification.

- i) Overall Project Management
- ii) Training of employer's personnel.
- iii) Site supervision
- iv) Interface coordination.
- v) Provision of Guarantees.
- vi) Additional services : Any additional services required to meet the scope of work as per TS.

#### **1.4.1 PROJECT MANAGEMENT**

The Contractor shall be responsible for the overall management and supervision of the Works. The Contractor shall establish a suitable project office in India and facilities at site for this purpose.

For performing the project management functions, the Contractor shall provide experienced and knowledgeable personnel, in this office and other places of execution, for the purposes of Works. The said personnel shall be skilled and competent in all phases of management of the project, the engineering and construction, detailed systems analysis and design engineering for HVDC converter stations including HVDC and HVAC switchyards, as well as building sub and superstructures, mechanical and electrical auxiliary systems, communication systems and all other skills necessary for the proper completion of the Works. The Contractor shall demonstrate to the Employer, as may be required by the Employer, that the Contractor's staff assigned to the Works comply with the above set forth qualifications.

The Contractor shall nominate a coordinator (project manager) for this project who shall be responsible for the complete job. correspondence for all technical/commercial matters shall be addressed to him. The above said staff

Under the general direction of the Project Manager shall be authorized by the contractor.

- a) To act with full authority , on behalf of the contractor , in respect of the works.
- b) To receive and respond to notices , instructions and directions from the employer to the contractor.
- c) To manage control and facilitate the execution of the works in accordance with the key dates set forth in the specification/contract.
- d) To facilitate the provision and exchange of information, data and other communications between the employer and the contractor.
- e) To provide as may be required by the employer , explanations of the detailed design of the various parts and stages of the works and to keep the employer informed as to the progress of the engineering and other works being performed by the contractor.
- f) To provide documentation or information required by the employer and to cooperate with the employer in accordance with the provisions of the specification to complete the proper execution of the project.
- g) To organize training programme(s) for operation, maintenance and engineering personnel of the employer during execution of the project at site at manufacturing works and if agreed , at other place. For smooth execution

of the site works, the Project manager shall nominate Site Manager(s) with whom Employer may interact regularly.

#### **1.4.2 ASSOCIATION AND TRAINING OF EMPLOYER PERSONNEL**

The Contractor shall organize periodic training programs in India for reorientation of Employer's engineers during the execution of the Contract. These training programs shall take place twice in a year and be in the form of one week (5 days) workshop. A total of five (5) nos. of workshops shall be carried out in India. Out of total five (5) nos., three (3) nos. workshops shall be carried out at Manufacturer's works/ offices/ any other place as mutually agreed. Balance Two (2) nos. of workshops shall be organized at sites/ nearest city to site.

The contents, faculty and the course material of these workshops shall be decided along with the Employer. The number of participants from the Employer for these workshops shall be about 25 per occasion. Suitable training material shall be handed over to trainees in soft copy format prior to the start of each workshop.

During training period, the trainees (Employer personnel) shall follow the Contractor's working hours and working procedures. The travel expenses & boarding for Employer staff attending the training program shall be borne by Employer's account.

#### **1.4.3 SITE SUPERVISION**

The Contractor shall, in the execution of all the Works required under the Specification, provide highly skilled and experienced site supervisory personnel to supervise all aspects of the Works to ensure that all the site operations are carried out in such a manner as to provide the Employer with a high quality system and that the operating and maintenance personnel of the Employer are adequately trained to operate the system properly, safely and efficiently over the long term.

Selection and deployment of all the supervisory personnel shall be subject to the Employer's prior approval. The above said supervisory personnel, provided by the Contractor, shall be responsible for proper dismantling of existing old systems equipment, construction, installation, erection, testing and commissioning of the system and training of personnel with regard to the Works as per TS. They shall also provide operating and maintenance assistance during the guarantee period as and when required. In addition to the above, assistance shall be made available, free of cost, to the Employer as per the following details:

- During trial operation, the Contractor shall be fully Responsible for all operations under Employer's supervision. All required qualified manpower for such operation shall be provided by contractor.
- For the first 30 days after start of trial operation of both poles/blocks, there shall be one engineer of the Contractor on a round the clock basis.
- After 30 days and up to the end of the guarantee period there shall be at least one engineer of the Contractor at Converter station site who shall follow the

regular office hours and shall be available at site within one hour if required, during other times.

#### **1.4.4 INTERFACE COORDINATION**

##### **1.4.4.1 GENERAL**

At Vizag the HVDC station shall be connected to the NTPC Simhadri at South Bus and Vizag 400 kV AC Station at East Bus. The 400 kV switchyard of East and South bus is based on one and a half breaker scheme. The buses of the Employer's substation are extended to the HVDC AC switchyard on East Side through bus bars. The scheme is described in detail in Chapter 5.1 and Annexure-SLD of Vizag HVDC and Annexure East-South Side AC Station SLD.

The contractor shall provide all engineering, services and material required to complete the job specified herein. Further, the contractor shall provide any other equipment / services to complete the interface points given below:

##### **1.4.4.2 INTERFACE WITH EMPLOYER'S SERVICES**

###### **1. Site Auxiliaries:**

Station Supply is existing from tertiary of ICT and additionally 33 kV feeder from state electricity board. The existing auxiliary supply and existing cabling from ACDB and DCDB shall be used. In case of non –suitability of the power supply cables the same may also be replaced by the contractor with suitable rating LT cabling without additional cost/time extension implication to POWERGRID. In such case, Contractor shall be responsible for supplying required length of cables including laying, termination of the same and supply of all the cable accessories required for the terminations.

2. Water Supply: The water supply shall be provided by Employer.

###### **3. Earthing Connections:**

Earthing of panels and additional equipment and structures under the present scope is in the scope of the contractor.

###### **4. Low Voltage Connections:**

The Contractor shall utilize existing cables and interface panel to the extent possible with required re-termination/glands, re-ferruling etc. The Contractor shall supply, lay and terminate any additional cables required for the re-commissioning of the HVDC systems in the scope as per TS. The Contractor shall be responsible for the supply and erection of any additional Interface

panels to be installed in the HVDC Control room/Bay controllers as required. All additional cables required between the Interface Panel and the HVDC Control room shall be armored, and shall be supplied, laid and terminated by the Contractor. These cables shall be laid in existing cable trench in the Control room / switchyard wherever available. If tracing of cable from Switchyard to Control room is required then same shall be in the scope of contractor.

#### 5.ACCESS ROAD:

One access road joining the HVDC site with State Highway already exists.

#### 6 .Access to Employer 400 kV Switchyard:

The access to the 400KV AC switchyard shall be provided as required by the Contractor.

#### 7.Construction Power and Water Supplies:

The Contractor shall be entitled to use for the purposes of the facilities such supplies of electricity and water as may be available on the Site and shall provide any apparatus necessary for such use. The Contractor shall pay the Employer at the applicable tariff plus Employer's overheads, if any, for such use. Where such supplies are not available, the Contractor shall make his own arrangement for provision of any supplies he may require.

Contractor shall bear all electricity charges under the present scope of work till the commissioning of the project (DOCO) which includes testing and commissioning of all the equipment's. The metering of the electricity shall be under the scope of contractor.

The Construction power supply shall be drawn from one of the alternative local source available at Vizag HVDC BtB station. The construction power supply shall be provided at 415 Volt at the LT Room and contractor shall have to lay a suitable rating LT cable to take LT supply from existing ACDB of the Employer. The bidder shall intimate the requirements of construction power in KVA in the bid.

The Employer shall endeavor to ensure that the construction power supplies are reasonably reliable, however the Employer shall not be liable for any additional costs nor shall be required to grant any extension of time to the Contractor should the construction power not be available.

#### 8. Protection Interface:

The contractor shall utilize existing CT/CVT inputs from HVDC East and south side AC Switchyard to Employer's old 400 kV switchyard control room and vice versa for use in bus bar differential protections. Necessary arrangement shall be made by the Contractor to integrate these signals in the protection schemes as required.

#### 9.Interface with Remote Terminal Units/SCADA for remote Load Dispatch

Centre of Eastern & Southern Region & NTAMC.

The contractor shall integrate the interface equipment for communicating/SCADA with the Remote Eastern and Southern Region LDC & NTAMC through the communication link to be supplied by the Employer.

The contractor shall have to demonstrate proper functioning of the interface equipment and assist Employer in commissioning of data transfer to remote Load Dispatch Centre of Eastern & Southern Region & NTAMC. The communication link from Vizag HVDC station to Remote LDC shall be through Fibre optic link. End Terminal Communication equipment are existing at Vizag HVDC station.

10. Station Battery: Employer intends to replace 48Volt and 220 Volt Battery system. Details for the existing are provided in Annexure-Existing Battery System. Replacement of Battery and battery chargers (48 Volt and 220 Volt) under present scope of work

#### **1.4.5 PERFORMANCE GUARANTEES**

The Contractor shall design the HVDC system equipment under present scope in such a way that the performance parameters are met for all specified operating conditions and necessary measurements shall be made at the BTB station to prove conformance. If any deficiency is found, the Contractor shall carry out all modifications/ rectifications/ replacements required to meet the required performance, unless specified otherwise, at no extra cost to the Employer. All specified requirements must be fulfilled by the Contractor prior to the Employer accepting the Works or any part thereof.

In addition , the following performance guarantees in respect of equipment being replaced/installed under present scope shall be provided by the contractor, as detailed in the specification and liquidated damages shall be payable by the contractor in the event of shortfall in any of the guaranteed values of :

- i) Energy Availability.
- ii) Reliability
- iii) Station Power rating
- iv) Thyristor failure rate
- v) Relay module /C&P module/Component failure.
- vi) Rate shut down duration.
- vii) Station efficiency(Station loss)

The detailed requirement for various guarantees is given in Chapter 11 of this specification.

#### **1.5 EQUIPMENT MATERIALS AND SERVICES SUPPLIED BY THE EMPLOYER**

The supply of all equipment, materials, and services required for the execution of the Works shall be the responsibility of the Contractor with the specific exception of the items listed herein.

- a) Converter Station Site

The Employer's converter stations already exist.

- b) Access Roads

The Employer shall provide normally maintained one (1) access road joining the site with the State Highway to the site.

The Employer shall not be responsible for any damage to the access roads caused directly or indirectly by the transportation of any load or other use by the Contractor or his agents. The Employer shall not be liable for any extra costs nor shall the Employer be required to grant any extension of time to the Contractor should the access road including those not under direct control of the Employer become unusable for any reason other than lack of normal maintenance by the Employer.

## **1.6**

**Not used**

## **1.7 PRE-COMMISSIONING ,COMMISSIONING ,TRAIL OPERATION AND OPERATIONAL ACCEPTANCE.**

As soon as the Facilities covered by these specifications are physically completed in all respects, the Pre commissioning, Commissioning, Trial-run and Operational Acceptance of the Facilities, as mentioned below, shall be attained in accordance with the procedure given in the Conditions of Contract, Vol.-I of the Bidding Documents.

(i)Pre – commissioning: Testing, checking and other requirements specified in the

Technical Specifications under 9.3.3 Commissioning tests, 9.3.4 Subsystem tests and 9.3.5 Sub-system energization tests.

(ii)Commissioning: Operation of the Facilities or any part thereof, if any, as per GC Sub-Clause 1.1(e), as specified in the Technical Specifications under Sub-Clause 9.3.6 System tests.

(iii)Trial-Operation: Operation of the Facilities or any part thereof by the Contractor

immediately after the Commissioning for a continuous period as specified in the Technical Specifications under Sub-Clause 9.3.7 Trial Operation.

(iv)Operational Acceptance: Upon successful completion of all the Functional guarantees mentioned in section -11 of technical specification.

## **1.8 TECHNICAL REQUIREMENTS**

General:

Bidder shall clearly indicate the manufacturer name and address of works, country of origin, and BOQ in the Bid for the HVDC equipment as mentioned in clause 1.8.1

-In case the bidder proposes to get the civil/erection works executed through sub- contractors, then such sub-contractors must have at least two years experience in executing such works of similar value.

### **1.8.1 Technical Requirement of HVDC Equipment**

1.8.1.1 The following HVDC equipment shall be offered from a regular manufacturer(s) who have been manufacturing such equipment(s) for HVDC system for the last (5) five years or more as on the originally scheduled last date of bid submission (soft copy) specified in Annexure-A(BDS) and should have been in operation for at least two (2) years as on the originally scheduled last date of bid submission (soft copy specified in Annexure-A(BDS)).

a) Thyristor valves (Including Valve Cooling System)

b) HVDC control & protection systems

Notwithstanding the stipulation at 1.8.1.1 above,

i) In case of Thyristor Valves, it is required that manufacture or assembly of 100% thyristor Valve module and its routine testing is to be carried out in India.

The Indian manufacturer should have an association/collaboration with the principal manufacturer/parent / Group Company who meets the requirements of clause 3.1 of QR specified in Section-EQC, Part- I of the Bidding Documents.

The Indian manufacturer and principal manufacturer shall submit a joint deed of undertaking (as per the relevant format specified in Section 4: Forms of the Bidding Documents) along with the bid for the successful performance of the Thyristor Valve.

Components, parts and sub-assemblies required for assembly of the Thyristor Valve Modules will be used from the recommended sources of principal manufacturer.

Type testing is required to be carried out on Thyristor valve modules assembled in India . ii) Notwithstanding above, in case of HVDC Control and Protection Equipment, the manufacturing/assembling/testing can be carried out in India subject to the following

The Indian manufacturer should have an association / collaboration with the parent company/principal/ group who meets the requirements of clause 3.1 of QR specified in Section-EQC, Part- I Annexure-A (BDS, Vol- I) of the Bidding Documents.

The Indian manufacturer and principal manufacturer shall submit a joint deed of undertaking (as per the relevant format specified in Section 4: Forms of the Bidding Documents) along with the bid for the successful performance of the HVDC Control and Protection Equipment.

Components, parts and sub-assemblies required for assembly of the HVDC Control and Protection Equipment will be used from the recommended sources of principal manufacturer.

Bidder to clearly specify the factory/works that shall be used for the above work in the bid.

In case, the Manufacturer offers their latest version of HVDC Control and Protection System, and which is not in operation as on the date of NOA, the same shall also be acceptable however, the defect liability period of the same shall be 05 years from DOCO.

#### 1.8.1.2

The bidders/Contractor shall offer equipment, DC CT, DCVD, CVT/CVD, PLC Filter and DC surge arresters from manufacturers whose similar equipment for similar applications have been in service for at least two years as on the originally scheduled date for the dead line for submission of the bid the and should have been type tested as per relevant standards.

### **1.11 Outage Schedule**

**Refer Annexure Outage Schedule**

### **1.12 Not Used**

### **1.13 Not Used**

### **1.14 Requirement of Cyber Security**

Cyber Security requirement is enclosed at Annexure-Cyber Security.

Detailed Cyber Security Requirements, FAT Checklist & SAT Checklist of Control and Protection IEDs & other components are attached as Annexure-S12 (Annexure-II)- Cyber Security Requirements\_ R0, Annexure-S13 (Annexure-III) -- FAT\_Checklist\_R0 & Annexure-S14 (Annexure-IV) --SAT\_Checklist\_R0 respectively

### **1.15 Procedure for first time charging/Energisation (FTC) by GridIndia**

GRID CONTROLLER OF INDIA LIMITED ( formerly known as Power system operation Corporation limited)is system operation arm of Government of India has published the procedure for first time charging/Energisation (FTC).

Latest guidelines which are available in GRID – INDIA website for first time charging is to be mandatorily complied by the Contractor.

