**AMENDMENT NO 1**

**TO Supply & Installation of Bi-Pole Converter Stations in Pakistan & Tajikistan associated with CASA 1000.**

**ICB NO. CASA/1000/01/HVDC**

**PART I**

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| **Section/**  **Chapter** | **Clause**  **No** | **Existing Provision** | **Amended as** |
| Section II,  BDS | 1.1 | (b) Da Afghanistan Brehsna Sherkat  (DABS),Chaman Houzori, Kabul,  Afghanistan------------------ for repeater stations and PLCC in Afghanistan.  Maintenance support services-------  --in Afghanistan | Deleted |
| Section II BDS | 7.2 | The site visit will be facilitated by the respective countries for the prospective Bidder(s), who wishes to do so, at its own risk and cost. | The site visit will be facilitated by the respective countries for the prospective Bidder(s), who wishes to do so, at its own risk and cost. However, nodal officers have been identified for Pakistan and Tajikistan to assist Site visit. The matter may be taken up directly or alternatively can be taken up with CASA Secretariat for any assistance. The details of the Nodal officers are as under;  **Tajikistan** - Mr Usmonov Furugzod, Tajikistan Country Co-Ordinator for CASA -1000 Prject, Tel +992905004455, Email- donishju@mail.ru . **Pakistan**- Mr Wajahat Saeed Rana, General Manager (GSC). Office Address- Room No 413, WAPDA House, The Mall Lahore, Office No-+92 42 992026992039, Mobile - +92 335 7401901, E mail- gm.gsc@ntdc.com.pk |
| **Se**ction II,  BDS | 16.2 | The period for following completion of plants & services in accordance with the provisions of contract shall be three(3) years**.** | The period for following completion of plants & services in accordance with the provisions of contract shall be forty two (42) months from Notification of Award. |
| Section II,  BDS | 19.1 | The dead line for bid submission is;  Date: February 06, 2017  Time: 15.30 Hrs ( Almaty,  Kazakhstan Time) | The dead line for bid submission is;  Date: April 27, 2017  Time: 14.00 Hrs ( Almaty,  Kazakhstan Time) |
| Section II,  BDS | 21.1 | The bid opening shall take place at:  20A Kazybek Bi, 3rd Floor  Representative Office of Ekodit LLC  In Kazakhstan  CASA – 1000 Secretariat  Tel: +7(727)293-01-20  Date: February 06,2017  Time: 14.00( Almaty,  Kazakhstan Time | The bid opening shall take place at:  20A Kazybek Bi, 3rd Floor  Representative Office of Ekodit LLC  In Kazakhstan  CASA – 1000 Secretariat  Tel: +7(727)293-01-20  Date: April 27,2017  Time: 15.30 Hrs ( Almaty, Kazakhstan Time) |
| **Section/**  **Chapter** | **Clause No** | **Existing Provision** | **Amended as** |
| Section III,  EQC | 2.4,  Alt II | Executed an Engineering, Procurement and Construction ( EPC)----------------------------------------------------------------------------------------- . These firms should meet the requisite experience requirement---------------- which should have in operation for not less than 3 years as on date of bid opening of first stage bid.   1. Design --------------------- | Executed an Engineering, Procurement and Construction ( EPC )----------------------------------------------------------------------------------------- . These firms should meet the requisite experience requirement---------------- which should have in operation for not less than 2 years as on date of bid opening of first stage bid.  i) Design -------------------- |
| Section III,  EQC | 2.4,  Alt II | -------------. The above association /collaboration could be either -----  Or through a joint venture for any or all the items at (i),(ii),(iii) and (iv) above | -------------. The above association /collaboration could be either through a Joint Deed of Undertaking ( with sub-contracting for the respective scope of work) or  through a joint venture for any or all the items at (i),(ii),(iii) and (iv) above. No sub -contractor or joint venture partner for items (i) and/or (ii) above shall be associated with more than one Bidder. Association with more than one Bidder, the Bids shall be rejected. |
| Section III,  EQC | 2.5 | Not Existing | **2.5.1 Technical Requirement of “Associate”**  ‘Associate’ as mentioned in Clause ITB BDS 51.2, should have Erected, Tested and Commissioned at least one substation package of 400 kV or above ( where in scope also included transformers/reactors) or long distance HVDC Converter Station or a Back-to-Back HVDC system of a unit rating of at least 250 MW either on its own or in association with the original HVDC equipment manufacturer and the station must be in Satisfactory Operation as on the date of first stage bid opening.”  **2.5.2 Financial Requirement of ‘Associate(s)’**  a)  Minimum Average Annual Turnover\* (MAAT) for best three (3) years **i.e 36 months** out of last five (5) financial years of the ‘Associate(s)’ should be ***US$ 68 Million .***  b)  Associate shall have liquid assets (L.A.) or/and evidence of access to or availability of credit facilities of not less than ***US$ 9 Million.*** |
| Section III,  EQC | * 1. (d),   Specific additional Criteria | The evaluation of Bids shall not take in to account :  (1)Custom duties--------------- Entry price basis( which are excluisive of custom duties)  (2)Sales and similar taxes---------------------- or delivery of the goods:  (3) the amounts towards Provisional Sum---------------------------- shall remain unaltered. | The following shall not be taken into account for bid evaluation: (i) Sales Tax/VAT and other levies & duties legally payable on the goods & services, if contract is awarded to the bidder, for the transaction between the Employer and the Bidder; and  (ii)Octroi/entry tax as applicable for destination site/state on all items of supply including bought-out finished items, which shall be dispatched directly from the sub-vendor’s works to the Employer’s site (sale-in-transit).  (iii) in the case of Plant manufactured outside the Employer’s Country to be imported, customs duties and other import taxes levied on the imported Plant, sales and other similar taxes (if applicable), which will be payable on the Plant if the Contract is awarded to the Bidder;  (iv) any allowance for price adjustment during the period of execution of the Contract, if provided .  (v) the amount towards Provisional Sum indicated by the Employer (a) For any contingent services by the contractor in Employer’s Country towards occurrences related to security aspects that could not be reasonably foreseen by an experienced contractor and that may cause loss or damage to the Facilities. (b) For Installation of Earth Electrode Stations for smooth operation of HVDC system.  However, the ‘Administrative charges’ quoted (as a percentage of provisional sum provided by the employer) by the bidder shall be added to their bid price and shall be taken for evaluation  Any adjustments in price that result from the above procedures shall be added, for purposes of comparative evaluation only, to arrive at an “Evaluated Bid Price.” Bid prices quoted by bidders shall remain unaltered. |
| Section IV,  Bidding Forms | - | 5. FORM OF JOINT DEED OF UNDERTAKING BY THE BIDDER/CONTRACTOR ALONGWITH  HIS ASSOCIATE/COLLABORATOR FOR SUCCESSFUL PERFORMANCE OF THE SYSTEM | Revised Form attached at **Annexure I**  5. FORM OF JOINT DEED OF UNDERTAKING BY THE BIDDER/CONTRACTOR ALONGWITH  HIS ASSOCIATE/COLLABORATOR FOR SUCCESSFUL PERFORMANCE OF THE SYSTEM |
| Section IV,  Bidding Forms | BOQ, Ist Stage Bid,  Annexure- B | RO1- BOQ-HVDC-CASA - 1000 | Revised attached BOQ  R02-BOQ-HVDC-CASA-1000 at **Annexure II** |
| Section IV,  Bidding Forms | Price Schedules,  2nd Stage Bid | Price Schedules- 1 to 10 | Revised Price Schedules- 1 to 10 attached at **Annexure III** |

**PART II**

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| **Section/**  **Chapter** | **Clause No** | **Existing Provision** | **Amended as** |
| Chapter 1 | 1.2 (1.0) | Last bullet  “ Suitable provisions may be kept  ------- one 3x167 MVA 500/220 kV  , 1x 167 MVA 500/220 kV spare unit of ICT and (3 Nos) 500 kV Bays” | Last bullet  “ Suitable provisions may be kept  ------- one 3x167 MVA 500/220 kV,  and (3 Nos) 500 kV Bays” |
| Chapter 1 | 1.2.1( b) | In case gapped arrestors are----  replaced by the metal oxide Surge arrestors by the contractor. | In case gapped arrestors are in use in the adjacent substations then they shall have to be replaced by the metal oxide Surge arrestors by the contractor. Tentative quantities for 500 kV and 220 kV have been identified in the bill of quantity which shall be assessed by the contractor and shall be replaced as required |
| Chapter 1 | 1.2.3.1(k) | Not Used | Not Used |
| Chapter 1 | 1.2.3.1 (l) | Fibre optic communication system ----- and Section 4.8 . The fibre optic communication system--------  Communication converter station**.** | Fibre optic communication system between the converter stations shall be provided by the Employer. The fibre optic communication system shall be the main communication system between the converter stations and PLCC over HVDC line shall be back communication link for the communication between converter stations. |
| Chapter 1 | 1.2.3.1 (m) | PLCC Repeater stations (if required) ------------ Fire protection, DG set etc. | The total length of the HVDC line is about 750-800 kms traversing three countries viz Tajikistan, Pakistan & Afghanistan. The length of the line wiyhin Tajikistan is about 117 kms and less than 100 kms within Pakistan. PLCC shall be designed in such a manner that repeater station(s) could be avoided within Afghanistan . However, in the event , it is required the same be provided within Tajikistan and/or Pakistan **.** |
| Chapter 1 | 1.2.3.1 (ae) | OPGW repeater station( if required)-----------, DG sets etc. | Deleted |
| **Section/**  **Chapter** | **Clause No** | **Existing Provision** | **Amended as** |
| Chapter 1 | 1.2.3.4 | For the tele control-------  Responsibility of respective countries. | For the tele control and telecommunication link between converter stations, the employer shall provide OPGW on 500 kV DC line from Tajikistan to Pakistan, the telecommunication equipment including necessary repeater stations for satisfactory operation, control, data transfer & speech communication. The Bidder shall indicate channel /Band width requirement in their First Stage Bid for employer to make necessary arrangement.  The Contractor shall provide all required interfacing equipment, accessories, routers, multiplexers, modems and facilities etc., as required, for successful use of the communication channel.  The back-up communication between the two converter stations will be provided through PLCC on the HVDC line and contractor will supply all the necessary equipment for the two converter stations, repeater stations if required and will commission the system.  At a time only one of them ie. either the fibre-optic communication channel or PLCC communication channels, shall be in active-service and the other in hot-standby. Automatic monitoring facility shall be provided for the telecom links. Automatic changeover facility shall be provided for telecom links to changeover the active telecom link from faulty to healthy link. It should be possible to operate the HVDC system without any data communication link between the converter terminals.  However, Contractor shall be responsible for establishing communication from the respective converter stations to its load dispatch centres in Pakistan, Tajikistan and Kyrgyzstan. Providing the communication link from each converter station to its load dispatch centre will be the responsibility of respective countries. The Contractor shall provide all required interfacing equipment, accessories, routers, multiplexers, modems and facilities etc., as required, for successful use of the communication channel. The detail arrangements shall be finalized during detail engineering. |
| **Section/**  **Chapter** | **Clause No** | **Existing Provision** | **Amended as** |
| Chapter 1 | 1.4 (e**)** | OPGW Communication  The Employer------ SDH equipment**.** | The employer shall provide OPGW on 500 kV DC line from Tajikistan to Pakistan, the telecommunication equipment including necessary repeater stations for satisfactory operation, control, data transfer & speech communication. The Bidder shall indicate channel /Band width requirement at Sangtuda and Nowshera in their First Stage Bid for the Employer to make necessary arrangement. |
| Chapter 2 | 2.3.1.1 | Soil Information  Bearing capacity is 13 kg/cm2 at 2 meter depth. | Soil Information  Soil Investigation report for Sangtuda has given along with clarification minutes . This is only for indicative purpose. The Contractor shall carry out detail soil investigation as required of its own and design the HVDC facilities at no additional cost to the Employer. |
| Chapter 2 | 2.4.16 | The duration of solar duration per year in the area Dangara ( Sangtuda is a part of this area) is 4462 hours. Average annual duration is 372 hours Sangtuda. | The duration of solar duration per year in the area Dangara ( Sangtuda is a part of this area) is 4462 hours. Average annual duration is 372 hours Sangtuda. Solar radiation in July ( Max in any month of a Year) is 83.7 x 106Wh/ Sq.M  Nowshera solar radiation is about 6 kWh/ m2 |
| Chapter 2 | 2.4.1.9 | Seismic Coefficient  Sangtuda Third Category 7  Nowshera 0.16g to 0.25g | Seismic Coefficient  Sangtuda 0.25 g  Must withstand earthquake  Up to 9 Richter scale  Nowshera 4 m/s2( 0.4 g)  Must withstand earthquake  Richter scale 7 |
| Chapter 2 | 2.4.1.10 | COOLING WATER TEMPERATURE  The cooling water temperature ( raw water) for the converter stations shall be intimated to the contractor during detail engineering. | COOLING WATER TEMPERATURE  The exact cooling water temperature ( raw water) for the converter stations shall be intimated to the contractor/ finalised during detail engineering. However, for indicative purpose, the following may be considered;  Sangtuda: 40C to 90C  Nowshera: Shall be indicated during detail engineering |
| **Section/**  **Chapter** | **Clause No** | **Existing Provision** | **Amended as** |
| Chapter 2 | 2.4.3 | Reactive power capability of the AC system  3rd Para,  In addition , during operation------  -------- available equipment in HVDC station. | In addition, during operation of the HVDC scheme it shall be possible to achieve preset and operator adjustable target reactive power interchange with the ac system within the range of ±500 MVAR settable in the steps of 10 MVAR for Sangtuda and Nowshera. The reactive power exchange limits with the ac system shall be settable over the complete range between minimum to maximum continuous DC power. In order to meet the Operator preset reactive exchange limits, no additional equipment shall be supplied i.e. these requirements may be viewed as a desired value which may be met by the Reactive power controller within the capability of the available equipment in the HVDC station unless otherwise required based on studies as brought at Clause No 1.2.3.2 |
| Chapter 2 | 2.4.8 | Not Existing | Add a new clause,  HVDC and Electrode Lines  The contractor shall determine the line impedances or other parameters and include skin and temperature effects for all loading and ambient conditions.  The length of the line shall be approximately 750-800 km. The length of the electrode line shall be approximately 30 km from the respective terminals.  The contractor shall design and rate all equipment within his scope of supply to meet the requirements of the specification .  The HVDC and electrode lines may cross and run parallel to each other and to HVAC lines. The contractor shall take in to account any possible inductive and capacitive coupling between these lines. |
| **Section/**  **Chapter** | **Clause No** | **Existing Provision** | **Amended as** |
| Chapter 2 | 2.4.9 | Not Existing | Add a new clause;  The earth electrodes shall be designed and installed by the contractor.  The electrodes shall be rated to carry maximum current equal to the nominal rating and over load specified in the Bid Document. |
| Chapter 3 | 3.2 | STANDARDS  All equipment and materials, unless otherwise specifically required in the Specification, shall conform to latest revisions of the standards listed in the Specification, in force at the time of signing of the contract for this project . | STANDARDS  All equipment and materials, unless otherwise specifically required in the Specification, shall conform to latest revisions of the standards listed in the Specification, in force 15 days before the deadline for submission of second stage price bid for this project. |
| Chapter 3 | 3.2.3 | CIRCUIT BREAKERS | Pl add at end  IEC 62271-300 Seismic Qualification of  Alternating Current Circuit  Breakers |
| Chapter 3 | 3.2.6 | IEC-99,99-1 Non- linear resistor type Arrestors for AC systems. | IEC-60099, 99-1,99-4 Non- linear resistor type Arrestors for AC systems |
| Chapter 4 | 4.1.1 | The Power Transmission rating is defined as 1300 MW at Nowshera. Accordingly , Sangtuda converter station shall be suitably rated. | The Power Transmission rating is defined as 1300 MW at Nowshera. Accordingly , Sangtuda converter station shall be suitably rated. The Power transmission capability shall be determined by measurement using metering accuracy instrumentation at the DC bus of the Inverter Converter Stations. |
| **Section/**  **Chapter** | **Clause No** | **Existing Provision** | **Amended as** |
| Chapter 4 | 4.1.3 | The equipment shall be --------------  --------------- direction mode ( At Nowshera 1300 MW ,+/- 500 kV). | Power flow shall be possible in both directions but the equipment shall be designed for rated power flow only from Sangtuda to Nowshera. The rating of the transmission system is defined at Inverter Station in normal power direction mode i.e. Sangtuda to Nowshera ( At Nowshera 1300 MW). The rating of the primary equipment shall not be increased for the purpose of reversed power flow operation. The power transmission capability in the reverse direction shall not be less than the maximum possible within capability of equipment. The contractor shall declare the value of reverse power in it’s first stage bid along with main circuit report. . |
| Chapter 4 | 4.1.5 | ----- Lower power than 65 MW----  Power rating at voltages between +/- 5%. | Lower power than 65 MW in monopolar mode may be required for start up of HVDC. Redundant coolers are the cooler groups (for thyristor valves and converter transformer) required for operation beyond 1.0 pu of HVDC power rating at voltages between +/- 5% . However, for the first 2 hrs of operation above 1.0 pu up to 1.15 pu, the redundant coolers shall not be available.  Also, in order to meet the overload conditions that are in excess of 1.0 pu power rating of the converter, DC voltage shall remain at levels specified in clause 4.1.2. The overload capability shall be available during reduced dc voltage operation |
| Chapter 4 | 4.1.5.1 | 4 4.1.5.1 FIVE SECOND OVERLOAD | 4.1.5.1 FIVE SECOND OVERLOAD |
| Chapter 4 | 4.5.2.3 | Emergency Control Actions  1. AC protection for Sangtuda- Datka 500 kV line shall be provided with FTL at Sangtuda end | Emergency Control Actions  1. AC protection for Sangtuda- Regar 500 kV line shall be provided with FTL at Sangtuda end |
| Chapter 4 | 4.6.1.6 | Energy Metering  ---------.Bidder/contractor shall keep provision of space for installing energy meters and assist the employer in commissioning of these energy meters.------------ | Delete this line from the clause 4.6.1.6 |
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| **Section/**  **Chapter** | **Clause No** | **Existing Provision** | **Amended as** |
| Chapter 4 | 4.6.4.11  ( c ) | Performance Management System  The operator interface station-------  ------- as per Cigre annual protocol 14-89 (WG 04) formats.---------- | The operator interface station shall provide facility for generation of station performance reports as per CIGRE Brochure 346 (Cigre protocol 14-97 (WG04)) formats. The program shall be menu based on RDBMS package. The interactive facility shall be provided on VDU to enter data of various outages by the operator to generate these reports. This function along with maintenance management system and operator trainee facility could be integrated with station operation and control system or provided on standalone system |
| Chapter 4 | 4.10.3.2 | Performance Parameters | Revised Performance Parameters is attached with **Annexure IV** |
| Chapter 5 | 5.1 | The Employer shall make available to the contractor rough graded sites--------- electrode stations. The contractor shall ------ respectively. | The Employer shall make available to the contractor leveled sites--------- electrode stations. The details shall be co-ordinated with the employer during detail engineering stage. The contractor shall ------ respectively. |
| Chapter 5 | 5.6.2 | VALVE HALLS AND OTHER BUILDINGS  2nd Para.  The contractor --------------  lightning protection. The design shall be | VALVE HALLS AND OTHER BUILDINGs  2nd Para  The contractor --------- lightning protection.  The design shall be as per IS-2309, Code of Practice for the Protection of Building and allied Structures against Lightning. |
| Chapter 6 | 6.4.2.2 a | The cooling system of the transformer with oil directed and air forced (ODAF) cooling shall be so designed that during total failure of power supply to cooling fans and oil pumps, the transformer shall be able to operate at full rated load for at least ten (10) minutes and the Hot spot temperature (calculated) shall not exceed the calculated hot spot temperature. | The cooling system of the transformer with oil directed and air forced (ODAF) cooling shall be so designed that during total failure of power supply to cooling fans and oil pumps, the transformer shall be able to operate at full rated load for at least ten (10) minutes and the emergency case value of the Hot spot temperature according IEC 60076-7 shall be applicable. |
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| **Section/**  **Chapter** | **Clause No** | **Existing Provision** | **Amended as** |
| Chapter 6 | 6.4.6.10  (a) ii | Prior to energization-------- and acceptance norms;   |  |  |  | | --- | --- | --- | | 1) | BDV, KV rms (min) | 60 | | 2) | Moisture content (Max) | 15 ppm | | 3) | Tan Delta at 90 degC (Max) | 0.005 | | 4) | Resistivity at 90 deg C (Min) | 1x1012  Ohm cm | | 5) | Interfacial Tension (Min) | 0.03 N/m | | Prior to energization-------- and acceptance norms;   |  |  |  | | --- | --- | --- | | 1) | BDV, KV rms (min) | 70 | | 2) | Moisture content (Max) | 05  Ppm | | 3) | Tan Delta at 90 degC (Max) | 0.005 | | 4) | Resistivity at 90 deg C (Min) | 1x1012  Ohm cm | | 5) | Interfacial Tension (Min) | 0.04 N/m | |
| Chapter 6 | 6.15.3.1 | The Insulators for suspension & tension strings and insulator hardware shall confirm to relevant IEC mentioned at Chapter 3.  The insulation levels shall be determined by the Contractor in accordance with Section 4 of this specification and the minimum performance characteristic shall be as specified in Clause 6.15.3.3. | The Insulators for suspension & tension strings and insulator hardware shall confirm to relevant IEC mentioned at Chapter 3.  The insulation levels shall be determined by the Contractor in accordance with Chapter 4 of this specification. |
| Chapter 6 | 6.15.3.3 | Not in Use | Not in Use |
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| **Section/**  **Chapter** | **Clause No** | **Existing Provision** | **Amended as** |
| Chapter 6 | 6.22 | Not Existing | Add a new Clause;  **6.22 Ground Electrode System**  **6.22.1 GENERAL**  These specifications cover the design , manufacturing, supply of materials, installation, testing and satisfactory operation of the ground electrode stations.  The ground electrode stations shall be designed for continuous operation at 1500 Amps for Sangtuda and Nowshera. 5 seconds overlaod current shall determine the step & touch potential.  The contractor shall include in the scope of supply all necessary equipment and systems for all the ground electrode stations. The Contractor shall be responsible for conformance with existing countries regulations and for any adverse effect on HVDC system or other facilities due to the electrode.  **6.22.2. Scope Of Work**  The Employer shall select the ground electrode site ( approximately 500x500 Meters) for Sangtuda and Nowshera substation and shall also provide fence all around the periphery of the electrode site. The Bidder/Contractor shall include in his scope of work the following;  -Studies of soil and geophysical properties of prospective site(s) identified by the Employer. The Contractor shall be required to investigate using deep resistivity sounding ,natural source and controlled source magneto telluric or any other proven method to evaluate their suitability as electrode sites.  -The Bidder/Contractor shall include in his work studies of electrode effects on other facilities. These studies shall include:  **a)** Studies including collection of data to assess the influence of grounding electrodes on the corrosion of pipe lines, buried cables, other buried metallic structures.  **b)** Studies shall also be carried out for necessary mitigation measures against the corrosion of near by pipelines due to ground return.  **c)** Studies including collection of data to assess the influence of ground potential rises caused by grounding electrodes on grounded neutrals of power transformers, communications systems and other facilities  **d)** Measurements to determine soil properties for the electrode design.  **e)** Assessment of the influence of Ground Electrode, for nominal rating of 1300 Amp (for Sangtuda and Nowshera), and overload of 1500 Amp (for Sangtuda and Nowshera) of ground current on other facilities mentioned above within radial distance from the electrode station to the converter terminal at all the converter stations. However in case, the electrode’s influence exists beyond the above distances , the ground current shall be limited to a mutually agreed value between Contractor and Employer based on the measurements carried out at site.  **f)** The design, manufacture, supply, installation and commissioning of the following:   * Electrodes for Converter stations. * Cables connecting to earth electrode lines. * Electrode line monitoring system. * Electrode monitoring and control devices   **g)** Connection of ground electrode stations to the electrode line.  The cable used for the connection shall be enclosed in a masonary  wall to prevent theft/damage.  **h)** Assessment of the influence of grounding electrode currents on the corrosion of underwater and buried metal structures. The contractor shall also prepare a maintenance procedures manual for the ground electrodes including maintenance tests on ground electrode stations.  **i)** The Contractor shall design, supply and install complete arrangement for the watering of the electrodes through a suitable drip irrigation scheme including the supply of duplicate water  pumps with diesel engine as prime-mover.  **j)** Development of a testing program. Study results shall be  substantiated by calculations and/or tests conducted by the  Contractor. If the specified guaranteed performance parameters are not met, the Contractor shall undertake additional works/tests to correct design deficiencies and/or equipment defects.   * + 1. **REQUIREMENTS**   **6.22.3.1 Operation Mode**  Each electrode shall be suitable for continuous mode of operation  as an anode as well as a cathode   * + - 1. **RATING**   The current rating shall be ;   * Continuous operation rating at nominal rating * 2 hours , overloads rating operation   The ampere hour rating of the earth electrode shall be Forty (40) Million Ampere Hours.  **6.22.3.3 SERVICE LIFE**  The design and material used in the construction of the ground  electrode stations shall provide a service life of not less than as specified in Clause 6.22.3.2 above or 40 years whichever occurs first.  **6.22.3.4 ELECTRODE RESISTANCE**  The each ground electrode station shall have a resistance ohm as per IEC 62344-2013 including worst measurement tolerances  (both as an anode and cathode) at respective ambient temperature.  **6.22.3.5 SAFETY REQUIREMENTS**  **Touch Voltage (Vt);**  The touch voltage between any grounded metallic object in the electrode station (including the connection to the overhead  electrode line) and at any point in the soil which can be touched  by a person simultaneously shall not exceed 40 V when the  electrode is operating at 5 Second overload.  **Step Voltage( Ve);**  The step voltage at ground level above the ground electrode when  the electrode is operating at 1500 Amperes ( at Sangtuda  and Nowshera)shall not exceed (Vs) = 5.0+ 0.03ρs .  Where ρs is the minimum local soil surface resistivity in ohm-m.  **6.22.3.6 INFLUENCE OF GROUND ELECTRODE CURRENT ON HVDC CONVERTER TRANSFORMERS**  The Contractor shall develop a method to estimate the influence  of the ground current on the converter transformers and other  power transformer in the vicinity of the converter stations and  electrode stations. The permissible DC Current to  the converter Transformers shall not be more than permissible  values specified for the design of the transformer.  **6.22.4 ELECTRODE DESIGN**  **6.22.4.1 ELECTRODE TYPE AND MATERIAL**  The ground electrode shall be a ring type electrode with iron electrode elements embedded in coke. The Contractor shall  specify and substantiate the following coke parameters:  -Coke type.  -Electrical resistivity.  -Thermal conductivity.  -Rate of consumption of the steel rod as well as coke during usage as an anode.  -Grain size  -Coke bed dimensions  **6.22.4.2 NUMBER OF SUB**  **ELECTRODE**  The ground electrode station shall  consist of at least 8 sub electrodes. The number of sub-electrodes shall be chosen to obtain specified current density on the boundary between the electrode material and the backfill (coke) and the boundary between the backfill (coke) and the soil, considering that 30% of the sub-electrodes can be out of  service. For the electrode station site which may has high resistivity near the surface. the contractor may have to make provisions for driving a number of spikes, each  having a length of approximately 15 m that shall penetrate the  thin resistive bed and facilitate good contact of the earth electrode ring with the underlying conductive layer.  **6.22.4.3 CURRENT DENSITY/SUB-ELECTRODE LOADING**  The maximum anodic current density at the sub-electrode  surface, i.e., the boundary backfill (coke) and soil shall not exceed 0.5 A/m2 in clay soils. The temperature on the surface of the sub-electrode shall not be higher than 90°C for rated operation when operating at ambient temperature. The maximum seasonal ambient temperature of the soil at the depth of the electrode subtracted from 90°C shall be used for the design temperature rise of the electrode. The Contractor shall calculate the  ratio of the maximum and minimum current densities  at the working surface of the sub-electrode. The calculations  shall include both the boundary between the electrode material  and the backfill (coke) and the boundary between the backfill  (coke) and the soil.  **6.22.5. DESIGN DATA**  The Contractor shall carry out measurements to obtain the following sit data for the design of  the electrode:  -Soil thermal conductivity  -Soil thermal capacity.  -Soil temperature during various seasons of the year.  -Soil moisture during various seasons of the year  -Electro-osmosis coefficient.  -Ground water level  -Deep resistivity sounding and Natural & controlled source magnetic telluric or any other proven technology to get soil resistivity values up to 20 km depth  **6.22.6. MONITORING AND**  **CONTROL**  The Contractor shall develop methods and supply devices for  supervision, control and maintenance of the ground  Electrode Station(s). The monitoring and control shall be carried out with “portable control- box system” and shall include the following:   1. Soil temperature and humidity(minimum 8x2 sensors of each type) 2. Measurements of current going out from/in to the Converter Stations. 3. Any other equipment required for monitoring of electrode stations   **6.22.7. TESTING**  The Contractor shall carry out at least following tests for commissioning of Electrode station:   1. Measurement of step and Touch potential. 2. Current distribution in sub - electrodes. 3. Neutral DC current measurement in nearby power transformers (66 kV and above),generator neutrals & Converter transformers during unbalance and ground return mode of operation. 4. Electric field measurement |
| **Section/**  **Chapter** | **Clause No** | **Existing Provision** | **Amended as** |
| Annexure C |  | Annexure C | Replaced the Existing Annexure with the revised attached at **Annexure V** |
| Annexure E |  | Existing table   |  |  |  |  | | --- | --- | --- | --- | | S. No | AC System Voltage | 500 kV | 220 kV | | 7 | Short time (one second) thermal current rating (1th) kA, rms | 70 | 40 | | 8 | Short time dynamic current rating ( 1dyn= 2.5 (1th)). | 175 | 100 | | Revise the table   |  |  |  |  | | --- | --- | --- | --- | | S. No | AC System Voltage | 500 kV | 220 kV | | 7 | Short time (one second) thermal current rating (1th) kA, rms | 40 | 40 | | 8 | Short time dynamic current rating ( 1dyn= 2.5 (1th)). | 100 | 100 | |
| Annexure E | Clause No 12.2.4.1 & 12.2.6.1 | Clauses are mentioned against the tests | Clause references are deleted against the tests |
|  |  |  |  |
|  |  |  |  |
| **Section/**  **Chapter** | **Clause No** | **Existing provision** | **Amended as** |
| Annexure E | Current Transformer | |  |  |  |  | | --- | --- | --- | --- | | 9 | Rated Primary Current ,A, rms | 3000 | 2400 | | |  |  |  |  | | --- | --- | --- | --- | | 9 | Rated Primary Current ,A, rms | 3000 | 1600/  2500 | |
| Annexure Q Rev 01 | Unused inhibited insulating oil (C) | Prior to energization ----------- in line with IS 1866/IEC60422.   |  |  |  | | --- | --- | --- | | 1 | Break Down Voltage (BDV) | 70 kV (min) | | 2 | Moisture content | 10 ppm  (max) | | 3 | Tan-delta at 900C | 0.01 (max) | | 4 | Resistivity at 900C | 6x1012  ohm-cm (min) | | 5 | Interfacial Tension | 0.035 N/m  (min) | | Prior to energization ----------- in line with IEC60422.   |  |  |  | | --- | --- | --- | | 1 | Break Down Voltage (BDV) | 70 kV (min) | | 2 | Moisture content | 05 ppm (max) | | 3 | Tan-delta at 900C | 0.005  ( max) | | 4 | Resistivity at 900C | 1x 1012 ohm-cm (min) | | 5 | Interfacial Tension | 0.04 N/m (min) | |

**PART III**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Section/**  **Chapter** | | **Clause No** | | **Existing Provision** | | **Amended as** | |
| Section-  VIII | | PC 1 | | Definitions of The Employer is :  NTDC Pakistan, DABS Afghanistan, Barki Tojik Tajikistan  The Bank is: International-----(Here in after called “the Bank “)  The Employer is : NTDC Pakistan, DABS Afghanistan and Barki Tojik Tajikistan | | Definations of The Employer is :  NTDC Pakistan & Barki Tojik Tajikistan.  The Bank is: International-----(Here in after called “the Bank “).  The Employer is : NTDC Pakistan and Barki Tojik Tajikistan | |
| **Section/**  **Chapter** | | **Clause**  **No** | | **Existing Provision** | | **Amended as** | |
| **Section-**  **VIII, PC** | | **PC 28**  **GC 28.3 (b)** | | |  |  |  | | --- | --- | --- | | **Sr. No** | Parameter to be taken for levy of liquidated damages on failure of the Guarantees | Rate of Liquidated Damages | | **04** | **(a)**Converter Station Power Rating Guarantee  ***(*b)**USD 1500 for each kW  or part there of in short fall in the total power transfer capability of each pole (p1/p2) | USD 3,000 for each kW or part there of in short fall in total power transfer capability of HVDC bi-pole capacity of 1300 MW at Nowshera  2 hour overload condition ( each pole 750 MW at Nowshera) | | | |  |  |  | | --- | --- | --- | | **Sr. No** | Parameter to be taken for levy of liquidated damages on failure of the Guarantees | Rate of Liquidated Damages | | **04** | **(a)**  Converter Station Power Rating Guarantee  **(b**)  USD 1500 for each kW  or part there of in short fall in the total power transfer capability of each pole (p1/p2) | USD 3,000 for each kW or part there of in short fall in total power transfer capability of HVDC bi-pole capacity of 1300 MW at Nowshera\*\*\*  2 hour over load condition ( each pole 750 MW at Nowshera)\*\*\* | | |
|  | |  | |  | |  | |
| **Section/**  **Chapter** | **Clause**  **No** | | **Existing Provision** | | **Amended as** | |
| **PC**  **PC** | **14.1**  **14.2 (b)** | | Existing provision.  Other domestic taxes---------  ------------ where the site is located | | **The following is added to GCC Sub-Clause 14.1;**  The employer does not take any responsibility whatsoever regarding taxes under Income Tax Act / Any other applicable Tax, for the contractor or his personnel. If it is obligatory under the provision of the Income Tax Act/ Any other Tax, deduction of Income/Any other Tax at source shall be made by the employer.  **The following line is added at Sub-Clause GCC 14.2 (b);**  Other domestic taxes---------  ------------ where the site is located except for the bought out items . | |
| **PC** | **14.4** | | For the purpose of contract------  ----------------------- will be assessed on the contractor, sub-contractor or their employees in connection ---  ----------------- Clause 36 here of. | | For the purpose of contract------  ----------------------- will be assessed on the contractor in connection---  ----------------- Clause 36 hereof. However, these adjustments shall not be applicable on procurement of raw materials, intermediary components etc. by the Contractor and also not applicable on the bought out items dispatched directly from sub-vendor’s works to site | |