

## SECTION -PROJECT

### Table of Contents

|     |                                                    |
|-----|----------------------------------------------------|
| 1.0 | GENERAL .....                                      |
| 2.0 | SCOPE.....                                         |
| 3.0 | SPECIFIC EXCLUSIONS .....                          |
| 4.0 | PHYSICAL AND OTHER PARAMETERS .....                |
| 5.0 | SCHEDULE OF QUANTITIES.....                        |
| 6.0 | BASIC REFERENCE DRAWINGS.....                      |
| 7.0 | DIFFERENT SECTIONS OF TECHNICAL SPECIFICATION..... |
| 8.0 | MANDATORY SPARES.....                              |
| 9.0 | SPECIFIC REQUIREMENT.....                          |

|              |                                                                            |
|--------------|----------------------------------------------------------------------------|
| ANNEXURE-I   | BREAK UP FOR MANDATORY SPARES                                              |
| ANNEXURE-II  | METHODOLOGY FOR SUPPLY, INSTALLATION & SIZING<br>OF CABLES                 |
| ANNEXURE-III | SECTION GTR : CLAUSE NO 24.1                                               |
| ANNEXURE-IV  | SHORT CIRCUIT FORCES AND SPACER SPAN FOR 765KV<br>& 400KV GANTRY STRUCTURE |

## **SECTION -PROJECT**

### **1.0 GENERAL**

**1.1** Khandukhal – Rampura Transmission Limited is establishing the project “Construction of “400kV Khandukhal (Srinagar)- Rampura (Kashipur) D/c line” – 194 Km with Twin HTLS conductor along with associated 400kV AIS S/S Extension Package SS01 for (i) Extn. of 400kV Rampura (Kashipur) S/S including 400kV class Line Reactor and (ii) Extn. of 400kV Khandukhal (Srinagar) S/S” under Turnkey basis – Bids invited by M/s. Khandukhal –Rampura Transmission Limited (hereafter referred as KRTL)” inviting bids to implement the project on **turnkey basis.**

- a. Inspiring, nurturing and empowering the next generation of professionals.
- b. Achieving continuous improvements through innovation and state of the art technology.
- c. Committing to highest standards in health, safety, security and environment.” as its mission.

**1.2** The following transmission system is envisaged under “**400 kV Khandukhal (Srinagar)- Rampura (Kashipur) D/c line**” through TBCB route.

**a. Transmission lines:**

- 400 kV Khandukhal (Srinagar)-Rampura (Kashipur) D/c line (TWIN HTLS).

**b. Substations:**

**Extension of Rampura (Kashipur Substation)**

- 1x80MVar switchable line reactor at Rampura (Kashipur) end on each circuit of Khandukhal(Srinagar) - Rampura (Kashipur) line.
- 1 no. of 400 kV line bay at Rampura (Kashipur) S/s.
- Upgradation of existing 1 no. of 400 kV diameter comprising line bay (Srinagar) and ICT bay alongwith associated Tie bay at Rampura (Kashipur).

**Extension of Khandukhal (Srinagar Substation)**

- Upgradation of existing 400kV bays at Khandukhal (Srinagar)

**1.3** It is the intent of this specification to describe primary features, materials, and design & performance requirements and to establish minimum standards for the work. The specification is not intended to specify the complete details of various practices of manufactures/ bidders, but to specify the requirements with regard to performance, durability and satisfactory operation under the specified site conditions.

## **SECTION -PROJECT**

- 1.4** The work to be done under this specification shall include all labour, plant, equipment, material and performance of all work necessary for the complete installation and commissioning of switchyard. All apparatus, appliances, material and labour etc. not specifically mentioned or included, but are necessary to complete the entire work or any portion of the work in compliance with the requirements implied in this specification is deemed to be included in the scope of contractor.
- 1.5** Before proceeding with the construction work the Contractor shall fully familiarize himself with the site conditions and General arrangements & scheme etc. Though the Employer shall endeavor to provide the information, it shall not be binding for the Employer to provide the same. The bidders are advised to visit the substation sites and acquaint themselves with the topography, infrastructure and also the design philosophy. The bidder shall be fully responsible for providing all equipment, materials, system and services specified or otherwise which are required to complete the construction and successful commissioning, operation & maintenance of the substation in all respects. All materials required for the Civil and construction/installation work including cement and steel shall be supplied by the Contractor. Complete design (unless specified otherwise in specification elsewhere) and detailed engineering shall be done by the Contractor.

### **2.0 SCOPE:**

#### **2.1 The broad scope of this specification shall cover following:**

|                                                             |                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Station Name</b>                                         | <b>Extension of Rampura(Kashipur) S/s</b>                                                                                                                                                                                                                      |
| <b>Voltage Level</b>                                        | <b>400kV</b>                                                                                                                                                                                                                                                   |
| <b>Bus-Switching Scheme</b>                                 | <b>One and a Half Breaker Scheme</b>                                                                                                                                                                                                                           |
| <b>Fault level</b>                                          | <b>63kA/1sec</b>                                                                                                                                                                                                                                               |
| Reactors                                                    | <ul style="list-style-type: none"><li>• 2x80 MVAR, 420kV, 3-Phase Line Reactor</li></ul>                                                                                                                                                                       |
| Line Bays                                                   | <ul style="list-style-type: none"><li>• 1 no. of 400 kV line bay at Rampura(Kashipur) S/s.</li><li>• Upgradation of existing 1 no. of 400 kV diameter comprising line bay (Srinagar) and ICT bay alongwith associated Tie bay at Rampura (Kashipur).</li></ul> |
| Tie Bays                                                    | <ul style="list-style-type: none"><li>• 1 Nos.</li></ul>                                                                                                                                                                                                       |
| Switchable Line Reactor Bays                                | <ul style="list-style-type: none"><li>• 2 Nos</li></ul>                                                                                                                                                                                                        |
|                                                             |                                                                                                                                                                                                                                                                |
| <b>Station Name</b>                                         | <b>Extension of Khandukhal (Srinagar Substation)</b>                                                                                                                                                                                                           |
| <b>Voltage Level</b>                                        | <b>400kV</b>                                                                                                                                                                                                                                                   |
| <b>Bus-Switching Scheme</b>                                 | <b>Double Main &amp; transfer</b>                                                                                                                                                                                                                              |
| <b>Fault level</b>                                          | <ul style="list-style-type: none"><li>• 40kA/1sec</li></ul>                                                                                                                                                                                                    |
| Upgradation of existing 400kV bays at Khandukhal (Srinagar) | <ul style="list-style-type: none"><li>• Upgradation of full 2nos of line bays [for termination of <b>400 kV Khandukhal (Srinagar)-Rampura (Kashipur) D/c line</b>]</li></ul>                                                                                   |

Specification No. :KRTL/TBCB/400kV/ Khandukhal & Rampura/G1

Dated:-----

Construction of "400kV Khandukhal (Srinagar)- Rampura (Kashipur) D/c line" – 194 Km with Twin HTLS conductor along with associated 400kV AIS S/S Extension Package SS01 for (i) Extn. of 400kV Rampura (Kashipur) S/S including 400kV class Line Reactor and (ii) Extn. of 400kV Khandukhal (Srinagar) S/S" under Turnkey basis – Bids invited by M/s. Khandukhal –Rampura Transmission Limited (hereafter referred as KRTL)"

## SECTION -PROJECT

2.2 The detailed scope of work of the substation package is brought out in subsequent clauses of this section.

### **2.2.1 Extension of 400kV Rampura(Kashipur) S/S**

2.2.1.1 Design, engineering, manufacture, testing at manufacture's work, supply including transportation & insurance, unloading, storage, erection, testing and commissioning of following equipment and items complete in all respect:

#### **A) REACTORS:**

- a. 2x80MVAR, 420kV, 3-Phase Switchable Line Reactors along with 145kV Neutral Grounding Reactor (impedance value of each NGR is 450 Ohm (approximately); however actual impedance values shall be decided during detailed engineering) and 120kV Surge arresters including all materials/fittings/accessories including on-line insulating oil drying system (Cartridge type). MB, Cables including special cable etc.

#### **B) AIR INSULATED SWITCHGEAR & OTHER EQUIPMENTS:**

- a. **420kV VOLTAGE CLASS AIS EQUIPMENT (As per BPS):** Circuit Breakers, Isolators, Current Transformers, Capacitor Voltage Transformers, Bus Post Insulators and Surge Arresters, Wave Traps (to be pedestal mounted).
- b. Controlled Switching Device for 400kV Circuit breakers as per BPS.
- c. **CONTROL, RELAY & PROTECTION SYSTEM:** Complete relay and protection system as per section–Control and Relay panels for the bays covered under present scope.

For augmentation of bus bar protection scheme for the bays under present scope. The existing busbar protection scheme at 400kV Kashipur (PTCUL) substation is 7SS52 (Distributed type) of M/s Siemens make and necessary bay units, trip relays, auxiliary relays etc. is under present scope for bays under present scope of work.

Kashipur Substation is equipped with substation automation system (through upgradation of conventional S/s) based on IEC-61850 (Schneider make SAS system). ***Augmentation of Substation Automation System by providing associated equipment for 400kV bays under present scope shall be carried out by the contractor under Control Panel with BCU item head.***

The scope of work shall include but not limited to integration of IEDs under present scope of augmentation with substation automation (which is based on IEC-61850) and capability enhancement of same as required including up-dating of system database, displays, development additional displays and reports as per

## **SECTION -PROJECT**

requirement.

All Control, protection & relay panels, PLCC panels being supplied under present scope are proposed to be placed in the switchyard panel room, which shall be suitably located inside the yard by the contractor.

**d. FIRE PROTECTION SYSTEM**

- i. HVWS & Hydrant system for Reactors including NGR.
- ii. Switchyard panel Room

**e. AIR CONDITIONING:** Air Conditioning System for Switchyard Panel Rooms.

**f. LT SWITCHGEAR:** Extension of 415 Volt ACDB, 220 Volt DCDB and 48 volt DCDB for the following feeder requirement:

Extension of both sections of 415 Volt ACDB panel by providing new extension board for one number incoming feeder (100Amp, 4P MCCB) and four numbers outgoing feeders (32Amp, 4P MCCB) **for each section**. The new extension board shall be located in the switchyard panel room to be constructed under the present scope and 3.5Cx70 sq mm size PVC cables (1.1 kV grade) shall be used for connecting new board with the existing ACDB located in the control room.

Extension of 220 DCDB-1 & 220 DCDB-2 for by providing new extension board for one number incoming feeder (63Amp, 2P MCB) and Six numbers outgoing feeders (16Amp, 2P MCB) **for each DCDB**. The new extension board shall be located in the switchyard panel room to be constructed under the present scope and 4Cx16 sq mm size PVC cables (1.1 kV grade) shall be used for connecting new board with the existing DCDBs located in the control room

Extension of 48 DCDB-1 & 48 DCDB-2 for by providing new extension board for one number incoming feeder (63Amp, 2P MCB) and Six numbers outgoing feeders (16Amp, 2P MCB) **for each DCDB**. The new extension board shall be located in the switchyard panel room to be constructed under the present scope and 4Cx16 sq mm size PVC cables (1.1 kV grade) shall be used for connecting new board with the existing DCDBs located in the control room.

The cable sizes indicated above are the minimum and adequacy of the same shall be checked by the contractor during detailed engineering and if required higher sizes shall be provided without any extra cost.

**g. CABLES:** 1.1kV grade Power & Control cables (and special cables, if any) along with complete accessories including cabling works for Employer supplied equipment specified above for subject station. Methodology for supply, installation & sizing of 1.1kV Power & Control cables shall be as per Annexure- IV.

**h. ILLUMINATION SYSTEM :**

LED based Indoor switchyard panel room and Outdoor Illumination (As per BPS).

**i. ERECTION HARDWARE (EXCL INSULATOR STRINGS AND**

Specification No. :KRTL/TBCB/400kV/ Khandhukhal & Rampura/G1

Dated:-----

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## **SECTION -PROJECT**

### **ASSOCIATED HARDWARE):**

Erection hardware as per TS

Conductor(s), Al tube, bus-bar materials, cable trays & covers, Bay MB, spacers, clamps & connectors, junction box, earthwire, earthing material risers, auxiliary earthmat (excluding main earth mat), buried cable trenches/pipes for equipment & lighting, cable supporting angles/channels, Insulating mats, cable sealing arrangement, Cable Pull pit, all accessories etc. as required for bays.

Upgradation of existing twin moose Jack bus & droppers (including associated hardware like clamps, connectors, terminal connectors, etc. ) to quad moose for existing diameter and up gradation of existing 420kV, 2000A rated Isolators to 3150A current rating by replacing the current carrying parts etc.: The 400kV D/C Kashipur-Khundalkhal TL shall have current rating of 3150A, whereas existing diameter (404-405-406) (alongwith existing equipments and hardware items, etc.), where these Line shall be terminated are of 2000A current. These diameters are therefore to be upgraded and uprated to 3150A Current Rating. The following works are included in present scope, in the aforementioned diameters.

- a. Replacement of existing 420kV, 2000A, 40kA, CTs with 420kV, 3000A, 63kA, CTs.
- b. Upgradation of existing 420kV, 2000A, 40kA DB Isolators to 3150A Current Rating by replacing the current carrying parts, etc., as per requirements.
- c. Upgradation of the existing twin moose ACSR Jack Bus (jack bus for Line terminal bay & transformer bay) and droppers (including associated hardware, clamps and connectors), over the 420kV Main Bus, to Quad Moose ACSR.
- d. Replacement, upgrading, uprating of any other item and hardware, as may be required, for 3150A nominal power flow rating.
- e. The removed / replaced equipments and items, etc., will be shifted to KRTL site store

### **j. INSULATOR STRINGS AND ASSOCIATED HARDWARE:**

Insulator strings and associated hardware fittings under present scope shall be provided by the contractor as per Bid Price Schedule (BPS).

### **k. Main Earthmat :**

Main earthmat in the switchyard extension area under present scope is already existing. All the equipments, structures, cable trenches, auxiliary earthmat for isolatoretc. being provided under the present scope shall be earthed by connecting them to the main earthmat under the present scope.

## **SECTION -PROJECT**

**l. LIGHTNING PROTECTION (DSLPP):-** The lightning protection (DSLPP) for complete switchyard is to be provided by the contractor. The contractor shall design the lightning protection by utilizing the structures being provided under present scope. The civil works shall be payable as per relevant item of BPS.

**m. PLCC EQUIPMENT:** PLCC equipment including Analog protection coupler, Digital Protection Coupler (suitable for interfacing with E1 port of SDH equipment), FODP on gantry, signal converters (if required), communication cables, associated power cables etc. for both ends of following transmission lines:

**400 kV Khandukhal (Srinagar)-Rampura (Kashipur) D/c line (TWIN HTLS).**

**n. LATTICE AND PIPE STRUCTURES (GALVANIZED):**

Design, engineering, fabrication, proto-assembly, supply including transportation & insurance, unloading, storage, erection and commissioning of following structures complete in all respect:

Towers, Beams, LM (if required) and all Equipment support structures except support structure for circuit breaker. The Support structure for Circuit Breaker shall be as per manufacturer's design.

In the bid price schedule, the structures including foundation bolts and fasteners are indicated in the form of sets. In case of 400kV switchyard, the Gantry structures are required to be quoted per diameter wise. In each diameter, the bidder shall consider all required structures..

For diameter/bays where transformer is to be terminated, the structure must also consider the load and deviation which is arising due to the interconnection with other side. Further, for the last diameter/bay, the end towers must be extendable type for connecting future beams. Bus work(s) may be optimized by the contractor by suitably considering the number of diameters/bays in a bus work section.

For design of Gantry structures, the conductor tension shall be as per Annexure-VI. For design of gantry structure with spans, wind speed or conductor configurations other than that specified in Annexure-VI, conductor tension shall be considered based on actual requirement of present & future scope of work. Relevant design calculations for such cases shall be submitted by the contractor for employer's approval during detailed engineering.

Factor of safety for design of tower, equipment structures shall be 1.5 under normal condition and 1.2 under short-circuit condition.

## **SECTION -PROJECT**

### **C) TELECOMMUNICATION EQUIPMENT & PMU: QUANTITY AS PER BPS**

- a. The broad Scope of the procurement of FO based Communication Equipment shall include planning, designing, engineering, supply, transportation, insurance, delivery at site, unloading handling, storage, installation, termination, testing, training and demonstration for acceptance, commissioning and documentation for following:
- i. SDH Equipment along with suitable interfaces and line cards.
  - ii. All cabling, wiring, Digital Distribution frame patch facilities and interconnection to the supplied equipment at the defined interfaces,
  - iii. System integration of all supplied subsystem
  - iv. Integration with the existing communication system based on SDH and PDH of employer
  - v. Integration of supplied subsystem with SCADA system, PLCC equipment, PABX of RLDC/SLDC, VOIP (SIP compliant) for voice.
  - vi. Fibre Optic Approach Cable (FOAC) along with duct and Fibre Optic Distribution Panel (FODP)
  - vii. Integration of new Communication equipment in the existing regional NMS. All required support to existing NMS vendor for integration of new Communication equipment.
- b. The broad Scope of the procurement of PMU shall include planning, designing, engineering, supply, transportation, insurance, delivery at site, unloading handling, storage, installation, termination, testing and demonstration for acceptance, commissioning and documentation for PMU as per BPS and these PMU shall support IEEE C 37.118 protocols. These PMUs shall be integrated with Phasor data Concentrator (PDC) at RLDC/SLDC for the subject project.

Any other item/design/drawing for completion of scope of works.

## **SECTION -PROJECT**

**2.2.1.2** Design, engineering, manufacture, testing and supply including transportation & insurance, storage and testing at site of mandatory spares as per Bid Price Schedule (BPS). The Break-up of Mandatory Spares shall be as per Annexure-III.

### **2.2.1.3 Civil works –**

- A. The bidders are advised to visit the substation sites and acquaint themselves with the topography, infrastructure, Site climatic data/ technical data, foundation depth, type of foundation etc. by conducting necessary preliminary soil investigation before quoting for the work.**
- B. Before proceeding with the construction work of the substation, the Contractor shall fully familiarize himself with the site conditions and General arrangements & scheme etc. All materials & labour required for the civil and construction/installation work shall be supplied by the Contractor. The complete design and detailed engineering (unless specified otherwise in specification elsewhere) shall be in the scope of the bidder**
- C. Wind and seismic data shall be considered as per latest NBC 2016.**
- D. All RCC shall be of Design mix with M-25 grade unless specified otherwise.**

## SECTION -PROJECT

**E. The scope of civil work shall include but not limited to the following based on KRTL supplied drawings:**

**1. Bituminous Road**

- a. Bituminous Road shall be constructed as per KRTL standard drawings provided in tender. However, Road layout shall be prepared by vendor for approval.
- b. Mode of measurement of this item is in SQM as per BOQ. Finished surface of bitumen is measured in sqm for payment purpose. The items Excavation, WBM/WMM, kerb stone (if any) etc. and all other civil works required as per technical specification and drawings for successful completion of the works are deemed to be included in quoted rates.

**2. Cable Trenches**

- a. Cable trenches shall be constructed as per KRTL standard drawings provided in tender. However, Cable trench layout shall be prepared by vendor for approval of KRTL based on the standard sections.
- b. Mode of measurement of this item is in RM as per BOQ. The items Excavation, PCC, RCC, Reinforcement, Misc. structural steel, cable trench crossings, sumps etc. wherever required and all other civil works required as per technical specification and drawings for successful completion of the works are deemed to be included in quoted rates.

**3. Drains**

- a. Drain layout including peripheral drains if any required along the boundary shall be prepared by contractor and to be submitted for approval of KRTL based on the standard sections.
- b. Mode of measurement of this item is in RM as per BOQ. The items Excavation, PCC, RCC, Reinforcement, Misc. structural steel and all other civil works required as per technical specification and drawings for successful completion of the works are deemed to be included in quoted rates.

**F. The scope of civil work shall include but not limited to the following based on designs, architectural, structural, foundation drawings to be developed by the contractor:**

**(1) Soil investigation:**

- (a) Soil investigation needs to be conducted as per the technical specification. The necessary soil investigation layout and final soil report shall be proposed by vendor for approval of KRTL. It is suggested to consider the filling if any as per site condition while proposing the SBC, foundation type and foundation depth.
- (b) Mode of measurement of this item is Lumpsum as per BOQ.

## **SECTION -PROJECT**

### **(2) 420kV Reactor Foundation:**

- (a) The reactor foundation along with the rail cum road, jacking pad on the rail cum road, unloading platform, rail walls, oil tank, pulling block shall be designed based on the approved equipment manufacturer data and as per the technical specification.
- (b) Each foundation shall have self sufficient oil collection pit with grating
- (c) Mode of measurement of this item is in Numbers as per BOQ. The items Excavation, PCC, RCC, Reinforcement, Misc. structural steel, gravel filling and all other civil works required as per technical specification and drawings for successful completion of the works are deemed to be included in quoted rates.

### **(3) 420kV Reactor Firewall:**

- (a) The reactor fire walls shall be designed based on the approved equipment manufacturer data and as per the technical specification.
- (b) Fire walls size shall be decided during detailed engineering based on the approved equipment data and as per specification.
- (c) Mode of measurement of this item is in Numbers as per BOQ. The items Excavation, PCC, RCC, Reinforcement, Misc. structural steel, painting and all other civil works required as per technical specification and drawings for successful completion of the works are deemed to be included in quoted rates.

## **SECTION -PROJECT**

**(4) Equipment/Gantry Foundation:**

- (a) The equipment/gantry foundations shall be including embedment/grouting of foundation bolts.
- (b) Mode of measurement of this item shall be as per BOQ. The items Excavation, PCC, RCC, Reinforcement, Misc. structural steel and all other civil works required as per technical specification and drawings for successful completion of the works are deemed to be included in quoted rates.
- (c) Factor of safety for design of equipment/gantry foundations shall be 1.5 in both normal and short circuit condition as per IS 456.
- (d) Factor of safety for stability of equipment/gantry foundations like overturning shall be 2 (without wind or seismic), 1.5 (with wind or seismic) for normal and short circuit condition as per IS 1904.

**(5) Switchyard Panel Room:**

- (a) The Switchyard panel rooms can be Single or Multiple. The dimensions of these building shall be decided during detailed engineering based on the technical requirements.
- (b) The drawing of Switchyard Panel Room is attached as a part of tender drawings. The drawing is for reference only
- (c) Mode of measurement of this item is in SQM of plinth area as per BPS. The calculation of plinth area shall be as per IS:3861-2002. The items Excavation, PCC, RCC, Reinforcement, Misc. Structural steel and all other civil works, electrical works required as per technical specification and drawings for successful completion of the works are deemed to be included in quoted rates.
- (d) All doors, windows, glazed partitions shall be of UPVC type.

**(6) Stone spreading and anti-weed treatment including PCC in the switchyard. Layout for the same shall be developed by the contractor.**

**(7) Other miscellaneous requirements & scope:**

- (a) Foundation for lighting poles, bay marshalling boxes, panels and control cubicles wherever required. The cost of these foundations shall deemed to be included in erection/installation of corresponding item/ equipment of BPS.

Any other item/design/drawing required for successful completion of the scope of works

## SECTION -PROJECT

### **2.2.2 EXTENSION OF KHANDULKHAL (Srinagar Substation) S/S**

2.2.2.1 Design, engineering, manufacture, testing at manufacture's work, supply including transportation & insurance, unloading, storage, erection, testing and commissioning of following equipment and items complete in all respect:

#### **A) AIR INSULATED SWITCHGEAR & OTHER EQUIPMENTS:**

- a. **420kV VOLTAGE CLASS AIS EQUIPMENT (As per BPS):** Circuit Breakers, upgradation of Isolators, Current Transformers, Surge arrestor, CVT, Wave Traps (to be pedestal mounted).
- b. **CABLES:** 1.1kV grade Power & Control cables (and special cables, if any) along with complete accessories including cabling works for Employer supplied equipment specified above for subject station. Methodology for supply, installation & sizing of 1.1kV Power & Control cables shall be as per Annexure-IV.
- c. **ERECTION HARDWARE (EXCL. INSULATOR STRINGS AND ASSOCIATED HARDWARE):**
  - i. UPGRADATION OF EXISTING DMT 400kV LINE BAY (INCLUDING ASSOCIATED HARDWARE LIKE IPS TUBE, CLAMPS, CONNECTORS, TERMINAL CONNECTORS, DROPPERS ETC.) UNDER PRESENT SCOPE FOR 3150A RATING. This shall also include removed / replaced equipment's and items, etc., shifting to KRTL site store
  - ii. UPGRADATION OF EXISTING DMT 400kV TBC BAY (INCLUDING ASSOCIATED HARDWARE LIKE IPS TUBE, CLAMPS, CONNECTORS, TERMINAL CONNECTORS, DROPPERS ETC.) UNDER PRESENT SCOPE FOR 3150A RATING. Conductor of transfer bus shall be twin HTLS (Suitable for 3150A rating), accordingly dropper shall be twin HTLS and associated terminal connectors shall be suitable for HTLS. This shall also include removed / replaced equipment's and items, etc., shifting to KRTL site store.

## **SECTION -PROJECT**

### iii. RECONDUCTORING OF 400kV TRANSFER BUS AS PER TECHNICAL SPECIFICATION:-

The following works are included in above mentioned item:-

- a. Replacement of existing TWIN Moose conductor to Twin HTLS Conductor for 6nos of 400kV bays (i.e. 3 spans) and necessary changes or replacement of associated hardware. Further required changes in droppers from transfer bus HTLS conductors to associated bays is also included under above mentioned item.
- b. The removed / replaced equipment's and items, etc., will be shifted to KRTL site store.

### d. INSULATOR STRINGS AND ASSOCIATED HARDWARE:

Insulator strings and associated hardware fittings under present scope shall be provided by the contractor as per Bid Price Schedule (BPS).

### e. Main Earthmat :

Main earthmat in the switchyard extension area under present scope is already existing. All the equipments, structures, cable trenches, auxiliary earthmat for isolatoretc. are already earthed by connecting them to the main earthmat, however minor modification in earthing during upgradation of equipment's is under present scope of work.

- f. **PLCC EQUIPMENT:** PLCC equipment including Analog protection coupler, Digital Protection Coupler (suitable for interfacing with E1 port of SDH equipment), FODP on gantry, signal converters (if required), communication cables, associated power cables etc. for both ends of following transmission lines:

400 kV Khandukhal (Srinagar)-Rampura (Kashipur) D/c line (TWIN HTLS).

### g. LATTICE AND PIPE STRUCTURES (GALVANIZED):

Design, engineering, fabrication, proto-assembly, supply including transportation & insurance, unloading, storage, erection and commissioning of following structures complete in all respect:

All Equipment support structures except support structure for circuit breaker. The Support structure for Circuit Breaker shall be as per manufacturer's design.

Factor of safety for design of tower, equipment structures shall be 1.5 under normal condition and 1.2 under short-circuit condition.

## **B) TELECOMMUNICATION EQUIPMENT & PMU: QUANTITY AS PER BPS**

- a. The broad Scope of the procurement of FO based Communication Equipment shall include planning, designing, engineering, supply, transportation, insurance, delivery at site, unloading handling, storage, installation, termination, testing, training and demonstration for acceptance, commissioning and documentation for following:

- i. SDH Equipment along with suitable interfaces and line cards.

Specification No. :KRTL/TBCB/400kV/ Khandukhal & Rampura/G1

Dated:-----

*Construction of "400kV Khandukhal (Srinagar)- Rampura (Kashipur) D/c line" - 194 Km with Twin HTLS conductor along with associated 400kV AIS S/S Extension Package SS01 for (i) Extn. of 400kV Rampura (Kashipur) S/S including 400kV class Line Reactor and (ii) Extn. of 400kV Khandukhal (Srinagar) S/S" under Turnkey basis - Bids invited by M/s. Khandukhal -Rampura Transmission Limited (hereafter referred as KRTL)"*

## **SECTION -PROJECT**

- ii. All cabling, wiring, Digital Distribution frame patch facilities and interconnection to the supplied equipment at the defined interfaces,
  - iii. System integration of all supplied subsystem
  - iv. Integration with the existing communication system based on SDH and PDH of employer
  - v. Integration of supplied subsystem with SCADA system, PLCC equipment, PABX of RLDC/SLDC, VOIP (SIP compliant) for voice.
  - vi. Fibre Optic Approach Cable (FOAC) along with duct and Fibre Optic Distribution Panel (FODP)
  - vii. Integration of new Communication equipment in the existing regional NMS. All required support to existing NMS vendor for integration of new Communication equipment.
- b. The broad Scope of the procurement of PMU shall include planning, designing, engineering, supply, transportation, insurance, delivery at site, unloading handling, storage, installation, termination, testing and demonstration for acceptance, commissioning and documentation for PMU as per BPS and these PMU shall support IEEE C 37.118 protocols. These PMUs shall be integrated with Phasor data Concentrator (PDC) at RLDC/SLDC for the subject project.

Any other item/design/drawing for completion of scope of works.

**2.2.1.2** Design, engineering, manufacture, testing and supply including transportation & insurance, storage and testing at site of mandatory spares as per Bid Price Schedule (BPS). The Break-up of Mandatory Spares shall be as per Annexure-III.

- 2.3** Design of substation and its associated electrical & mechanical auxiliaries systems includes preparation of single line diagram, electrical layout, foundation & cable trench layouts (including invert levels), erection key diagrams, direct stroke lightning protection, electrical and physical clearance diagrams, Control and protection schematics, wiring and termination schedules, design of firefighting system, outdoor lighting/illumination and other relevant drawings & documents required for engineering of all facilities within the fencing to be provided under this contract, are covered under the scope of the Contractor.
- 2.4** Any other items not specifically mentioned in the specification but which are required for erection, testing and commissioning and satisfactory operation of the substation are deemed to be included in the scope of the specification unless specifically excluded.
- 2.5** Employer has standardized its technical specification for various equipment and works for different voltage levels. Items, which are not applicable for the scope of this package as per schedule of quantities described in BPS, the technical specification for the items should not be referred to.

## SECTION -PROJECT

### 3 SPECIFIC EXCLUSIONS

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

400/220kV Kashipur & Srinagar Substation: -

- a. Employer's site office.
- b. Transit camp.
- c. Site levelling
- d. Approach Road
- e. Store building
- f. Integration of online dying system with SAS and associated Ethernet switch, LIU, Patch cards etc.

### 4 PHYSICAL AND OTHER PARAMETERS

**4.1 Location of the Substation** – The location of substation is indicated below:

| Sr. No | Name of Substation        | Name of State | Nearest Rail Head |
|--------|---------------------------|---------------|-------------------|
| 1.     | Rampura (Kashipur) S/s    | Uttarakhand   | Kashipur /        |
| 2.     | Khandukhal (Srinagar) S/s | Uttarakhand   | Rishikesh         |

**4.2 Meteorological data**

The meteorological data are as below

| Station Name                  | 400/220kV Rampura (Kashipur) S/s                | 400/220kV Khandukhal (Srinagar) S/s             |
|-------------------------------|-------------------------------------------------|-------------------------------------------------|
| Altitude                      | Less than 1000 meter above mean sea level (MSL) | Less than 1000 meter above mean sea level (MSL) |
| Snow fall                     | NIL                                             | NIL                                             |
| Seismic Zone                  | IS 1893                                         | IS 1893                                         |
| Wind Zone                     | NBC 2016                                        | NBC 2016                                        |
| Min./Max. Ambient Temperature | 0 / 50 degree centigrade                        | 0 / 50 degree centigrade                        |
| Coastal Area consideration    | No                                              | No                                              |

### 5 SCHEDULE OF QUANTITIES

The requirement of various items/equipment and civil works are indicated in Bid price Schedules.

Specification No. :KRTL/TBCB/400kV/ Khandukhal & Rampura/G1

Dated:-----

Construction of "400kV Khandukhal (Srinagar)- Rampura (Kashipur) D/c line" – 194 Km with Twin HTLS conductor along with associated 400kV AIS S/S Extension Package SS01 for (i) Extn. of 400kV Rampura (Kashipur) S/S including 400kV class Line Reactor and (ii) Extn. of 400kV Khandukhal (Srinagar) S/S" under Turnkey basis – Bids invited by M/s. Khandukhal –Rampura Transmission Limited (hereafter referred as KRTL)"

## **SECTION -PROJECT**

All equipment payable on unit rate basis. During actual execution, any variation in such quantities shall be paid based on the unit rate under each item incorporated in Letter of award.

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

No cost compensation shall be considered on account of “Set/LOT/LS” items in any case of number of bays specified in section project remains unchanged.

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

## SECTION -PROJECT

### 6 BASIC REFERENCE DRAWINGS

6.1 The substation shall be designed considering current ratings as indicated below-

| Sl. No | Description of bay | 400/220kV Kashipur S/S | 400/220kV Srinagar S/S |
|--------|--------------------|------------------------|------------------------|
|        |                    | 400kV                  | 400kV                  |
| 1.     | Line bay           | 3150A                  | 3150A                  |
| 2.     | ICT bay            | 3150A                  | --                     |
| 3.     | Line Reactor bay   | 3150A                  | --                     |

6.2 The reference drawings, which form a part of the specifications, are given at Annexure-I. The bidder shall maintain the phase to earth clearance, phase to phase clearance and sectional clearances, clearances between buses, busheights but may alter the locations of equipment to obtain the statutory electrical clearances required for the substation.

6.3 It is responsibility of contractor to develop single line drawing, general arrangement drawing, layout drawings, foundation & cable trench layout, erection key diagram & all other layout drawings for present scope of work. Layout drawings shall be finalized during detailed engineering based on best engineering practices and meeting the requirements of bidding documents.

### 7 DIFFERENT SECTIONS OF TECHNICAL SPECIFICATION

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

Specification No. :KRTL/TBCB/400kV/ Khandukhal & Rampura/G1

Dated:-----

*Construction of "400kV Khandukhal (Srinagar)- Rampura (Kashipur) D/c line" – 194 Km with Twin HTLS conductor along with associated 400kV AIS S/S Extension Package SS01 for (i) Extn. of 400kV Rampura (Kashipur) S/S including 400kV class Line Reactor and (ii) Extn. of 400kV Khandukhal (Srinagar) S/S" under Turnkey basis – Bids invited by M/s. Khandukhal –Rampura Transmission Limited (hereafter referred as KRTL)"*

## **SECTION -PROJECT**

|     |                                                                                 |                         |
|-----|---------------------------------------------------------------------------------|-------------------------|
| 1   | Section-Project                                                                 | Rev 00                  |
| 2   | Section-General Technical Requirement (GTR)                                     | Rev 15                  |
| 3   | Section-Shunt Reactor upto 400kV, Neutral Grounding Reactor and Surge Arrester: | Rev 11                  |
| 4   | Section-Switchgear- CB                                                          | Rev 11                  |
| 5   | Section-Switchgear- ISO                                                         | Rev 11B                 |
| 6   | Section-Switchgear- Instrument Transformer                                      | Rev 11                  |
| 7   | Section-Switchgear- Surge Arrester                                              | Rev 12                  |
| 8   | Section-Power and Control Cables                                                | Rev 06                  |
| 9   | Section-Lighting System                                                         | Rev 07                  |
| 10  | Section-Fire Protection System                                                  | Rev 06                  |
| 11  | Section – LT Switchgear                                                         | Rev 05                  |
| 12  | Section-Air Conditioning System                                                 | Rev 04                  |
| 13  | Section-Switchyard Erection                                                     | Rev 10                  |
| 14  | Section- Structures                                                             | Rev 06                  |
| 15  | Section-Civil Works                                                             | Rev 11A,<br>cor. Slip-1 |
| 16  | Section-Control and Relay Panels                                                | Rev 09                  |
| 17  | Section-Substation Automation System                                            | Rev 04                  |
| 18  | Section-PLCC                                                                    | Rev 05                  |
| 19  | Section-Telecommunication Systems                                               | Rev 02                  |
| 20. | Section – PMU                                                                   | Rev 00                  |

In case of any discrepancy between Section-PROJECT and Section-GTR and other technical specifications on scope of works, Section-PROJECT shall prevail over all other sections.

In case of any discrepancy between Section-GTR and individual sections for various equipment, requirement of individual equipment section shall prevail.

## **8 MANDATORY SPARES**

The prices of mandatory spares shall be given by the Bidder in the relevant schedule of BPS and shall be considered for evaluation of bid. It shall not be binding on the Employer to procure all of these mandatory spares. The bidder is clarified that no mandatory spares shall be used during the commissioning of the equipment. Any spares required for commissioning purpose shall be arranged by the Contractor. The unutilized spares if any brought for commissioning purpose shall be taken back by the contractor.

Wherever spares in BPS/Technical Specification has been specified as “each type/each rating/each type & rating”: If the offered spare/spares are sufficient to replace the respective main equipment of all types/ratings, then such offered spare/spares shall be acceptable. It implies that common spare/spare set fulfilling the spare requirement of all types/ratings shall also be acceptable, provided it is configurable at site itself without special assistance of OEM. Mandatory Spares, wherever mentioned, are envisaged for the equipment/items being

**Specification No. :KRTL/TBCB/400kV/ Khandukhal & Rampura/G1**

**Dated:-----**

*Construction of “400kV Khandukhal (Srinagar)- Rampura (Kashipur) D/c line” – 194 Km with Twin HTLS conductor along with associated 400kV AIS S/S Extension Package SS01 for (i) Extn. of 400kV Rampura (Kashipur) S/S including 400kV class Line Reactor and (ii) Extn. of 400kV Khandukhal (Srinagar) S/S” under Turnkey basis – Bids invited by M/s. Khandukhal –Rampura Transmission Limited (hereafter referred as KRTL)”*

## **SECTION -PROJECT**

supplied under the main equipment heads under present scope meeting the requirements of Technical Specifications. The component/sub-component of an equipment/item specified in BPS under Mandatory Spare, which is not applicable as per the offered design of respective main equipment, shall not be referred to.

### **9 SPECIFIC REQUIREMENT**

- 9.1** The specific requirements as mentioned at C/ENGG/SPEC/SEC- PROJECT/SPECIFIC REQUIREMENT Rev. No 06 shall also be referred for specified scope of work.
- 9.2** Clause No. 24.1 of Section GTR Rev 15 is amended as Annexure-V.
- 9.3** Under the various sub-clauses of clause no. 24 of Section-GTR Rev-15, the value of performance guarantee indicated as "**10% of the ex-works cost of the equipment**" shall be read as "**3% of the ex-works cost of the equipment**"
- 9.4** Clause no. 19.1. (a), (b) and (d) of Section-CRP Rev-09 are amended as follows:
- a) have single phase & 3 phase reclosing facilities.
  - b) have a continuously variable dead time range of 0.1-2 seconds.
  - d) incorporate a four-position selector switch, from which single phase/three phase/single and three phase auto-reclosure and non-auto reclosure mode can be selected. Alternatively, the mode of auto reclosing can be selected through HMI of the relay or BCU & SAS
- 9.5** Each circuit of a double circuit transmission line shall be terminated in different diameters.
- 9.6** Transformers of same HV rating shall be placed in different diameters.
- 9.7** Bus reactors of same HV rating shall be placed in different diameters.
- 9.8** All CB relay panels shall be supplied with Auto reclose function however as per Scheme requirement Auto reclose function shall be enabled/disabled.
- 9.9** Section Civil Works Rev 11A, and Section Structures Rev 06

### **COPYRIGHT**

- a. The copyright in all drawings, documents and other materials containing data and information for such design(s) to be developed by the Contractor or through any third party under this Contract shall remain vested in the Employer for a period of 5 years from the date of Completion of the Contract. In case the Contractor intends to use these design(s) for any purpose other than for project(s) to be executed by KRTL prior to the period of 5 years as above, the Contractor shall obtain a written permission from KRTL to this effect. The permission shall be granted or otherwise by KRTL keeping in view the specifics of the case and KRTL shall be sole judge in this regard.

In case any breach of the aforesaid provisions of copyright during the copyright retention period

**Specification No. :KRTL/TBCB/400kV/ Khandukhal & Rampura/G1**

**Dated:-----**

*Construction of "400kV Khandukhal (Srinagar)- Rampura (Kashipur) D/c line" - 194 Km with Twin HTLS conductor along with associated 400kV AIS S/S Extension Package SS01 for (i) Extn. of 400kV Rampura (Kashipur) S/S including 400kV class Line Reactor and (ii) Extn. of 400kV Khandukhal (Srinagar) S/S" under Turnkey basis - Bids invited by M/s. Khandukhal -Rampura Transmission Limited (hereafter referred as KRTL)"*

## **SECTION -PROJECT**

comes to the alia under the provisions of the Integrity Pact.

- b. The Contractor may also use previous structure designs and associated foundation designs meeting specification requirements, which have been designed by them for any other project of KRTL, having copyright retained thereof with KRTL, without any financial implication and without any written permission from KRTL as per para (a) above.
- c. In case the Contractor uses previously designed structure and associated foundation designs meeting specification requirements, developed by the Contractor for any other utility/developer, KRTL shall be free to use designs and reproduce all drawings, documents and other material for the purpose of the Contract including, if required, in its any other project and for operation and maintenance, without any financial implication. The contractor shall ensure to submit only those documents for which they hold copyright.
- d. Also, all the drawings indicated at (a) & (b) above shall carry the following statement and shall be displayed conspicuously on the drawing:

**WARNING: THIS IS PROPRIETARY ITEM AND DESIGN RIGHT IS STRICTLY RESERVED WITH KRTL UNDER NO CIRCUMSTANCES THIS DRAWING SHALL BE USED BY ANYBODY WITHOUT PRIOR PERMISSION FROM KRTL IN WRITING.”**

**Specification No. :KRTL/TBCB/400kV/ Khandhukhal & Rampura/G1**

**Dated:-----**

*Construction of “400kV Khandukhal (Srinagar)- Rampura (Kashipur) D/c line” – 194 Km with Twin HTLS conductor along with associated 400kV AIS S/S Extension Package SS01 for (i) Extn. of 400kV Rampura (Kashipur) S/S including 400kV class Line Reactor and (ii) Extn. of 400kV Khandukhal (Srinagar) S/S” under Turnkey basis – Bids invited by M/s. Khandukhal –Rampura Transmission Limited (hereafter referred as KRTL)”*

## SECTION -PROJECT

**9.10** Clause 2.1 (a) of Section GTR, Rev-15 is amended as below:

"All equipment/materials/items, as per Annexure-K (Rev 01), as applicable under present scope of works, shall be procured and supplied from domestic manufacturers only with Minimum Local Content for individual items as listed in the above annexure.

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

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

**9.11** Clause No. 7.5.1 of Section-400kV Shunt Reactor, Rev.11 is amended as below:

*"Conservator shall have air cell type constant oil pressure system to prevent oxidation and contamination of oil due to contact with moisture.*

*Conservator Protection Relay (CPR)/Air cell puncture detection relay shall be installed to give alarm in the event of lowering of oil in the conservator due to puncture of air cell in service.*

*Conservator shall be fitted with magnetic oil level gauge (Plug & socket type arrangement) with potential free high and low oil level alarm contacts and prismatic oil level gauge and Conservator Protection Relay.*

*Plug & socket type arrangement with factory fitted cable of adequate length shall be supplied by OEM. Connection of plug and socket with cable at site is not acceptable."*

## **SECTION -PROJECT**

- 9.12** Standard Technical Data Sheet (1.1kV Grade XLPE Power Cables), Standard Technical Data Sheet (1.1kV Grade PVC Power Cables) and Standard Technical Data Sheet (1.1kV PVC Control Cables) of Annexure-I of Section-400kV Shunt Reactor, Rev. 11 stands VOID i.e. Parameters of said Standard Technical Data Sheets shall not be referred to.
- 9.13** In Section-GTR and other technical specifications, the term ‘Owner and/or ‘Purchaser/Customer’ may be read as Employer.

**Specification No. :KRTL/TBCB/400kV/ Khandukhal & Rampura/G1**

**Dated:-----**

*Construction of “400kV Khandukhal (Srinagar)- Rampura (Kashipur) D/c line” – 194 Km with Twin HTLS conductor along with associated 400kV AIS S/S Extension Package SS01 for (i) Extn. of 400kV Rampura (Kashipur) S/S including 400kV class Line Reactor and (ii) Extn. of 400kV Khandukhal (Srinagar) S/S” under Turnkey basis – Bids invited by M/s. Khandukhal –Rampura Transmission Limited (hereafter referred as KRTL)”*