SCOPE OF WORK (SOW)

Implementation of 1 no. 400kV line bay at Ishanagar S/s for RE Interconnection of 630 MW Barethi Solar Park of M/s. NTPC Renewable Energy Limited

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1. GENERAL

Ishanagar Power Transmission Ltd ("IPTL") is implementing 1 No. of 400 KV Line Bay at 765/400/220KV AIS Substation Ishanagar for RE interconnection of 630 MW Barethi Solar Park of M/s. NTPC Renewable Energy Limited.

1.1. Associated Transmission System:

The following transmission system is envisaged under the scheme:

- 400 kV line bay including associated Tie Bay with future LR Provision – 1 No. at Ishanagar SS

2. SCOPE OF WORK

The scope of work shall cover following:

Design, engineering, supply, testing at manufacturer's works, transportation, unloading and delivery at site including insurance & storage, associated civil works, erection, testing and commissioning at site along with all equipment's, fittings, accessories, foundation bolts (if any), cables and Mandatory Spare Parts at Ishanagar substation on LSTK basis as per the details given below:

- 400 kV line bay including associated Tie Bay with future LR Provision – 1 No. at Ishanagar SS

3. BID PRICE SCHEDULE:

The Bid Price Schedule is attached separately in Volume-III.

4. PHYSICAL AND OTHER PARAMETERS

4.1. Location of the substation - The location of substation is indicated below:

Name of Substation	Tentative Co-ordinates	Name of State	Address
765/400/220KV AIS Substation – Ishanagar	AS PER LAYOUT	Madhya Pradesh	Ishanagar, Madhya Pradesh

4.2. Access to Site -

IPTL shall provide land for the said augmentation work at Ishanagar ("Site") with non-exclusive access and handover such portion of the Site to Contractor on as is basis to commence the services under the Contract.

The Contractor shall (and shall cause all its sub-contractors) use only the entrance(s) to the Site specified by IPTL for ingress and progress of all Contractor's and its Subcontractors' personnel, the Services, Contractor's Equipment, vehicles and the like.

The Contractor shall be responsible for planning and conducting its operations and those of its sub-contractors so that neither the Contractor nor any of its sub-contractor shall (a) enter upon lands (other than the designated Site) or waterbodies in their natural state unless authorized by the Project Manager and or appropriate person; (b) close or obstruct any utility installation, highway, waterway, harbor, road or other property unless applicable permits are obtained and authorized by the Project Manager and or appropriate person; or (c) disrupt or otherwise interfere with the operation of any portion of any pipeline, telephone, conduit or electric transmission line, ditch, navigational aid, dock or structure unless otherwise specifically authorized by the appropriate Person.

4.3. Meteorological data - For design purposes, meteorological data are as below:

Altitude	Less than 1000 meters above mean sea level (MSL)
Snow Fall	NIL
Seismic Zone	As per IS 1893-2002
Wind Zone	47 m/sec, Wind Zone-4, Wind map as per National Building Code – 2016 (Volume-I)
Min./Max. Design Ambient Temperature	0°C to +50°C
Creepage Requirement	As per Technical Specification

4.4. Fault Level- The system fault level is as mentioned below:

Sl. No	**Substation**	**400 kV**
1	Ishanagar SS	63kA for 1 second

5. SCHEDULE OF QUANTITIES

This work is to be awarded on LSTK basis including design, engineering, supply, testing at manufacturer's works, transportation, unloading and delivery at site including insurance & storage, associated civil works, erection, testing and commissioning at site along with all equipment's, fittings, accessories, foundation bolts (if any) cables and Mandatory Spare Parts.

The Contractor shall submit a detailed BOQ/ Billing Breakup, for Employer's review and approval, within 15 days of the Effective Date for billing and invoicing purpose, however the total price shall be restricted to the Contract Price.

The bidder is required to estimate the quantities required for entire execution and completion of works and incorporate their price in respective Bid Price Schedule. The bidder shall include all such items in the BOQ / Billing Breakup, which are not specifically mentioned but are essential for the execution of the contract. Items which are not mentioned in the BOQ/ Billing Breakup and required for successful commissioning of the Facilities

shall be included in the Bid Price quoted by the bidder and shall be provided at no extra cost to the Employer.

The Format for BOQ/ Billing Breakup has been annexed as Annexure- A(SOW).

6. REFERENCE DRAWINGS

The following drawings are enclosed for reference purpose of the Bidder.

1. Tentative Plan Layout
2. Tentative SLD
3. Existing Earthing Layout for Switchyard
4. Existing outdoor Cable Trench Layout
5. Indicative Drawings – Civil Works

Note:

In case of any discrepancy between the drawings and text of specification, the requirements of text shall prevail in general. However, the bidder is advised to get these clarified from Employer.

7. DIFFERENT SECTIONS OF TECHNICAL SPECIFICATION

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

1. Technical Specification for Substations – Civil Works.
2. Technical Specification for Substations – Electrical Works.

8. MANDATORY SPARE PARTS

The Mandatory Spare Parts and Condition Monitoring Instruments shall be included in the bid proposal by the bidder. The prices of these spares shall be quoted by the Bidder in the Bid Price Schedule and shall be considered for evaluation of bid. The Bidder shall submit the detailed Price breakup in the BOQ/ Billing Breakup. The list of Mandatory Spare Parts is attached at Annexure- B (SOW).

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.

9. SPECIFIC REQUIREMENT

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10. ANNEXURES

ANNEXURE- A(SOW)

Supply:

Sl. No.	Item Description	Unit	Quantity	Unit Rate	Freight & Insurance	GST (INR)	Total Amount (INR)

Service:

Sl. No.	Item Description	Unit	Quantity	Unit Rate	GST (INR)	Total Amount (INR)

ANNEXURE-B (SOW)

List of Mandatory Spare Parts

Sl. No.	Description	Quantity of Each Make & Type	
		At Substation/switchyard Level	At State Level
1.0	CIRCUIT BREAKERS		
	800/420/ 245/ 145/72.5 KV SF6 CIRCUIT BREAKER		
1.1	Complete Pole (Phase) of circuit breaker including closing resistor/ CSD, grading Capacitor (as applicable), pole column, interrupter, operating mechanism, Marshalling Box and terminal connector but without support structure	1. 1 No. pole of each make & type 2. For cyclone/ whirlwind/ tornado prone areas- 10% poles of each make and model installed at the substation (rounded up to the next integer) subject to minimum of one pole	
1.2	Grading Capacitor	3 Nos.	
1.3	Rubber gaskets, `O' rings and seals	1 set	
1.4	Trip coils with resistor	2 sets	
1.5	Closing coils with resistor	2 sets	
1.6	Terminal Pads and connectors	2 sets	
1.7	Molecular filter	2 Nos.	
1.8	Density/ pressure monitoring systems	1 No.	
1.9	Corona rings	1 No.	
1.10	Relays, Power contactors, switch fuse units, limit switches, push buttons, timers & MCB etc.	1 set	
1.11	Pressure switches	1 set	
1.12	Pressure Gauge and coupling	1 set	
1.13	SF6 Gas	15% of total used quantity in substation	

1.14	**Auxiliary switch assembly**	**1 set**	
1.15	**Operation Counter**	**1 No.**	
1.16	**Magnetic ventile, if required**	**3 Nos.**	
1.17	**Actuator rings, if required**	**6 Nos.**	
1.18	**Control valves, if required**	**1 No.**	
1.19	**Fixed, moving and arcing contact assemblies including Insulating Nozzles etc. for 1 Interrupter.**	**2 Nos.**	
1.20	**Pneumatic Operating Mechanism For ICU (INDIVIDUAL COMPRESSOR UNIT)**		
1.21.1	**Complete compressor assembly along with motor, accessories & coupling along with regenerating unit(wherever applicable)**	**1 Set**	
1.21.2	**Micro-filters**	**1 No.**	
1.21.3	**Coupling for compressed air**	**1 Set**	
1.21.4	**Valves & reducers (Including Safety valve)**	**1 Set**	
1.21.5	**Pressure switches**	**1 Set**	
1.21.6	**Pressure gauges**	**1 Set**	
1.21.7	**Gaskets 'O' rings & seals**	**1 Set**	
1.21.8	**Dowty Seal**	**2 Sets**	
1.21.9	**Operating drive**	**1 Set**	
	mechanism with drive motor		
1.22.2	**Ferrules and joints**	**1 Set**	
1.22.3	**Hydraulic filter**	**3 Sets**	
1.22.4	**High pressure hose**	**1 Set**	
1.22.5	**N2 Accumulator**	**2 No.**	
1.22.6	**Pressure transducer**	**1 No.**	

1.22.7	Valves	1 Set	
1.22.8	`O' rings, gaskets and seals	1 Set	
1.22.9	Pipe length (copper & steel)	1 Set	
1.22.10	Pressure switches	1 Set	
1.22.11	Pressure gauges	1 Set	
1.22.12	Hydraulic oil	15% of total used quantity in substation	
1.22	Spring Operated Mechanism		
1.22.1	Closing Dashpot	1 set	
1.22.2	Opening Dashpot	1 set	
1.22.3	Opening Catch gear	1 set	
1.22.4	Closing Catch gear	1 set	
1.22.5	Complete Spring Operating Mechanism	1 set	
1.22.6	Spring Charging Motor	1 Nos.	
Note: 1 set is for 3 poles			
2.0	ISOLATORS		
2.1	800/420/ 245/ 145/ 72.5 KV HORIZONTAL CENTRE BREAK/ DOUBLE BREAK ISOLATORS		
	Contacts and current carrying assembly		
2.1.3	Support Insulators	1 set	
2.1.4	Copper contact fingers for male & female contacts	2 sets	
2.1.5	Open/Close contactor assembly, timers, key interlock push button switch & auxiliary switches	1 set	
2.1.6	Limit switch	2 sets	
2.1.7	Motor housing bearing assembly	1 No.	
2.1.8	Terminal Pads and	2 sets	

	connectors		
2.1.9	Motor with gear assembly and bevel gear assembly	1 No.	
2.1.10	Corona shield rings	3 Nos.	.
2.1.11	Hinge pins	3 Nos.	
2.1.12	Bearings	1 set	
2.1.13	Interlocking coil with resistor	5 Nos.	
2.1.14	Fuses of each rating	5 Nos.	
2.2	420 KV PENTOGRAPH ISOLATOR		
2.2.1	Fixed contacts	3	
2.2.2	Gear Assembly	1	
2.2.3	Damper assembly	1	
2.2.4	Scissors assembly	1	
2.2.5	Scissors contacts	3	
2.2.6	Drive motor	1	
2.2.7	Limit switches	1 set	
2.2.8	Bearings	1 set	
2.2.9	Terminal pads and connectors	4	
2.2.10	Corona shield rings	1 set	
2.2.11	Interlocking coils, timers,key interlocks etc.	1 set	
3.0	CURRENT TRANSFORMER		
3.1	800/420/ 245/ 145/ 72.5/ 36 KV CT		
3.1	Complete CT with Terminal connector & structure	2 Nos. of each rating for population up to 20 Nos. 3 Nos. of each rating for population more than 20 Nos. For cyclone/whirlwind/tornado prone areas- 10% CTs of each voltage class installed at the substation (rounded up to the next integer) subject to a minimum two numbers	For cyclone/whirlwind/ tornado prone areas- Two complete CTs of each voltage class(along with support structure).CT ratio shall be decided by the utility based on the population of similar ratio CTs available in the State.
3.2	Primary Terminal bushing	2 sets	

4.0	**VOLTAGE TRANSFORMER (PT/CVT)**		
4.1	**Complete Potential Transformer / Capacitor Voltage Transformer with terminal connectors & structure**	**2 Nos. of each rating for population up to 20 Nos. 3 Nos. of each rating for population more than 20 Nos. For cyclone/whirlwind/tornado prone areas- 10% CTs of each voltage class installed at the substation (rounded up to the next integer) subject to a minimum two numbers**	**For cyclone/whirlwind/ tornado prone areas- Two complete PT/CVTs of each voltage class (along with support structure).**
5.0	**SURGE ARRESTOR**		
5.1	**Complete Surge Arrester with insulating base and Terminal connector & structure**	**2 Nos. of each rating (not make) for population up to 10 Nos. and 3 Nos. of each rating (not make) for population more than 10 Nos.**	**For cyclone/whirlwind/ tornado prone areas- Four complete SAs of each voltage class (along with support structure)**
5.2	**Surge counter/monitor**	**5 Nos.**	
6.0	**765/400/ 220/ 132/ 66 KV BUS POST INSULATOR**		
6.1	**Bus post insulator assembly (Complete)**	**3 Nos. for each voltage rating**	
7.1.1	**Oil cooler pumps with motor (complete assembly)**	**1 No.**	
7.1.2	**Buchholz relay Complete (main tank)**	**1 No.**	
7.1.3	**Local Winding temperature indicator**	**1 No.**	
7.1.4	**Remote winding temperature indicator with sensing device and matching unit**	**1 No.**	
7.1. 5	**Oil temperature indicator**	**1 No.**	
7.1. 6	**Pressure relief device**	**1 No.**	
7.1.7	**Magnetic oil level gauge**	**1 No.**	
7.1.8	**Cooler Fan with motor**	**1 No.**	
7.1.9	**Set of Valves**	**1 No. of each size and type**	

7.1.10	**Set of starters, contactors, relays and switches for electrical control panel**	**1 set**	
7.1.11	**Remote tap position indicator**	**1 No.**	
7.1.12	**Oil flow indicator with flow switch**	**1 set**	
7.1.13	**Breather assembly for main conservator and OLTC Conservator**	**1 No. each**	
7.1.14	**Terminal connector**	**1 set**	
7.1.15	**Oil surge relay for OLTC**	**1 No.**	
7.1.16	**Aircell**		**1 No. each type**
7.1.17	**OLTC**		**1 No. each type**
7.2	**SHUNT REACTORS:**	As per Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations	One number single-phase/ three-phase unit of each rating, as applicable
7.2.1	**Local winding temperature indicator**	**1 set**	
7.2.2	**Remote winding temperature indicator with contacts and sensing device**	**1 set**	
7.2.3	**OTI with contacts and sensing device**	**1 No.**	
7.2.4	**Magnetic Oil level gauge**	**1 No.**	
7.2.5	**Pressure relief device**	**1 No.**	
7.2.6	**Buchholz relay complete**	**1 No.**	
7.2.7	**Terminal connector**	**2 Nos. of each type/rating**	
7.2.8	**Surge Arrester (connected in neutral of reactor) for each Rating – Wherever applicable**	**1 No.**	

7.2.9	Surge monitor for neutral L.A. (Wherever applicable)	1 No.	
7.2.10	Breather assembly	2 Nos.	
7.2.11	Valves	1 set	
7.3	BUSHINGS		
7.3.1	Bushings 765/ 400 kV Bushing	2 Nos. of each type (dimensional) & rating	For cyclone/whirlwind/ tornado prone areas- 1 No. of each rating & dimension
7.3.2	Bushing 245kV/ 145kV / Neutral Bushing (36kV)	1 No. of each rating & dimension for population up to 10 Bushings 2 Nos. of each rating & dimension for population more than 10 Bushings	
7.3.3	72.5/52KV Bushings for tertiary	2 Nos.	
7.4	INSULATING OIL	10% of quantity of oil of largest unit (20% in case imported oil is used in transformer/reactors)	
7.5	NEUTRAL GROUNDING REACTOR		
7.5.1	NGR for 765kV along with Terminal Clamps & Connectors		1 No. of each rating
7.5.2	NGR for 400kV along with Terminal Clamps & Connectors		1 No. of each rating
7.5.3	145 KV bushing with metal parts and gaskets along with terminal connector (To be covered separately in Bushings)	1 No.	
7.5.4	Grounding bushing of NGR with metal parts gaskets and terminal conductor	1 set	
7.5.5	OTI with contacts	1 No.	
7.5.6	Oil level gauge	1 No.	
7.5.7	Pressure relief device	1 No.	
7.5.8	Buchholz relay	1 No.	
8.0	Controlled Switching Devices (CSD)		
8.1	Controlled Switching Devices along with transducers, Sensors, Cables, Contactors,	1 set of each make	

	Switches etc		
9.0	**PLCC EQUIPMENT**		
9.1	**Set of Prints for Carrier terminal, Speech and Data**	**2 sets**	
9.2	**Set of Prints for protection coupler**	**2 sets**	
9.6	**Telephone 4 wire with necessary connecting cable**	**2 Sets**	
9.7	**Co-axial connector**	**10 Nos.**	
9.8	**Straight through joint (wherever applicable)**	**1 Set**	
9.9	**Co-axial cable**	**1 km**	
9.10	**PLCC tool kit**	**1 set**	
9.11	**Wave Trap LA**	**1 No.**	
9.12	**Wave trap with pedestal & terminal connectors**		**1 No. of each make & rating** **For cyclone/whirlwind/ tornado prone areas-** **2 Nos. of each make & rating**
9.11	**Digital PLCC/ Digital Communication equipment/ Digital Protection Coupler**		
9.11.1	**Card/Module of each type**	**1 No.**	
9.11.2	**Connector of each type**	**1 set**	
9.11.3	**Connecting cables of each type**	**1 No.**	
10.0	**BATTERIES AND BATTERY CHARGERS:**		
10.1	**220V/ 110 V/ 48V Batteries**		
10.1.1	**Spare battery cell without electrolyte**	**10 Nos. for population ≥ 100 Nos.** **5 Nos. for population < 100 Nos.**	
10.1.2	**Terminal connectors with Bolts & Nuts**	**10 Nos. (each type)**	
10.1.3	**Float level indicators**	**10 Nos. (each type)**	

10.1.4	Vent Plugs	10 Nos. (each type)	
10.2	220V/ 110 V / 48V Battery Chargers		
10.2.1	Set of Control Cards	1 Complete set for each type of charger	
10.2.2	Set of relays	1 set	
10.2.3	Rectifier transformer	1 No.	
10.2.4	Control transformer	1 No.	
10.2.5	Series inductor	1 No.	
10.2.6	Set of contactor	1 set	
10.2.7	Micro switches	1 set	
10.2.8	Filter Capacitors	1 set	
10.2.9	Thyristor/ Diode	1 set	
10.2.10	Set of switches	1 set	
10.2.11	Set of wound resistors	1 set	
10.2.12	Potentiometers	1 No.	
10.2.13	Fuses of Thyristor with indicators	6 sets	
11.0	Control and Relay Panel		
11.1	Line Protection Panel Equipment Spare		
11.1.1	Numerical Relay (IED) of each make and type along with software	1 No.	
11.2	Transformer & Reactor Protection Panel		
11.2.1	Numerical Relay (IED) of each make and type along with software	1 No.	
11.3	Bus-Bar Protection Panel		
11.3.1	Numerical Relay (IED) of each make & Type	1 No.	
12.0	L.T. Transformers		1 no. of each voltage rating & MVA capacity
12.1	Bushings		1 set

12.2	**OTI & WTI with sensing device (as applicable)**		**1 set**
12.3	**Tap Changer contacts**		**1 set**
12.4	**Buchholz relay**		**1 No.**
12.5	**Explosion vent diaphragm**		**1 No.**
12.6	**Silica gel Container**		**1 No.**
13.0	**Conductor (Flexible/Aluminum Pipe)**	**5% of the length of each type installed at the substation/ switchyard**	
14.0	**Disc Insulators**	**5% of the total number of discs of each voltage class installed at the substation/switchyard.**	
15.0	**Long Rod Insulator**	**5% of the total number of insulators of each voltage class installed at the substation/ switchyard, subject to a minimum number of three insulators of each voltage class.**	
16.0	**Conductor accessories and hardware**	**Quantity shall be commensuration with the spare for conductor and insulators.**	
17.0	**Coupling Capacitors**	**One number of each voltage Class installed at the substation/ switchyard.**	

----- End of Scope of Work ----