

## BOQ for Erection Testing &amp; Commissioning (ETC) Works for 400kV Switchyard at Banaskantha Rev 02

Customer : POWERGRID CORPORATION OF INDIA LTD.

Project : 400kV S/S Banaskantha

<b>Note:</b>	This BOQ covers only ETC work for 400kV Banaskantha Switchyard <u>excluding unloading and storage</u> . Unloading and storage of all the material required for 765kV & 400kV Switchyard at Banaskantha shall be covered in a separate BOQ (Annexure III). Bidder shall quote only for ETC work in this BOQ, prices for unloading, storage and shifting of material should be filled separately in Annexure III.						
S.No.	Voltage Class (kV)	Type	Description	Unit	Total Qty	Unit Rate	Total Price
<b>MAIN EQUIPMENTS</b>							
<b>400kV REACTOR</b>							
1.1	400 kV	125MVAR	125 MVAR, 3-Ph, Reactor alongwith Marshalling Kiosk, terminal connectors, accessories, with oil. Work includes erection of all auxiliaries, viz turrets, bushings, terminal connectors, nitrogen purging, dry air circulation, filling of oil, oil filtration, Oil testing, laying of cable from Reactor auxiliaries to MK etc as required to complete the installation of reactor.	Nos.	1	5,00,000.00	5,00,000.00
1.2			Dragging charges of above mentioned Reactor (1 No.) upto plinth	m	50	1,200.00	60,000.00
<b>400kV EQUIPMENT</b>							
2	400 kV		400KV SF6, 3 Phase Circuit Breaker alongwith lattice type GI supporting structure, terminal connectors, Breaker Control Cabinets, ladder and interpole cabling, SF6 cylinders complete in all respect (Supervision of Erection, Testing and commissioning will be done by supplier. Supplier will bring Timing kit and Gas leak detector only. Necessary manpower support, tools, tackles and testing kit to be in scope of ETC contractor).				
2.1		CB	with PIR & with CSD	Nos.	1	30,000.00	30,000.00
2.2		CB	without PIR & with CSD	Nos.	5	30,000.00	1,50,000.00
2.3		CB	without PIR & without CSD	Nos.	2	30,000.00	60,000.00
2.4		Cable	Special cabling between CB and Relay Panel in SPR for CSD	m	600	20.00	12,000.00
3	400 kV	HDB (Electrically ganged)	3 Ph, <b>Isolator</b> , 3150/2000A, motor operated complete with 9 nos. of 400kV support insulators & terminal connectors without support structure				
3.1			- with one earth switch (motor/ manual operated)	Nos.	18	22,000.00	3,96,000.00
3.2			- with two earth switch (motor/ manual operated)	Nos.	2	22,000.00	44,000.00
4	400 kV	HDB (Electrically ganged)	1 Ph, <b>Isolator</b> , 3150A, motor operated complete with 3 nos. of 400kV support insulators & terminal connectors without support structure				
4.1			- without earth switch	Nos.	5	7,000.00	35,000.00
4.2			- with one earth switch (motor operated)	Nos.	7	7,000.00	49,000.00
5	400 kV		1 Ph, <b>Current Transformer</b> complete with terminal connectors without support structure.	Nos.	24	8,000.00	1,92,000.00
6	400kV	0.5mH	Wave Trap pedestal mounted including 3 Nos. 400kV Post Insulators and Terminal connectors without structure	Nos.	2	10,000.00	20,000.00
7	400 kV	Solidcore with corona ring	<b>Post Insulators</b> complete with corona ring & terminal connectors without support structure	Nos.	67	2,000.00	1,34,000.00
8	336 kV		1 Phase, Gapless type Metal Oxide <b>Surge Arrester</b> complete with surge counter, leakage current meter, insulating base, connecting cable and terminal connectors without support structure	Nos.	16	3,000.00	48,000.00
9	400 kV		1 Ph, <b>CVT</b> complete with terminal connector without support structure.	Nos.	12	8,000.00	96,000.00
<b>145 kV Equipments</b>							

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S.No.	Voltage Class (kV)	Type	Description	Unit	Total Qty	Unit Rate	Total Price
10	145 kV	Single phase	SF6, 1 Phase <b>Circuit Breaker</b> alongwith lattice type GI supporting structure, terminal connectors, Breaker Control Cabinets, ladder and interpole cabling. (Supervision of Erection, Testing and commissioning will be done by supplier. Supplier will bring Timing kit and Gas leak detector only. Necessary manpower support, tools, tackles and testing kit to be in scope of ETC contractor).	Nos.	2	10,000.00	20,000.00
11	145 kV	Solidcore	<b>Post Insulators</b> complete with terminal connectors without support structure	Nos.	4	2,000.00	8,000.00
	<b>11kV Equipments</b>						
12	<u>11 kV</u>	HDB (Pedestal mounted or double pole structure)	3 Ph, <b>Isolator</b> , manual operated complete with 9 nos. of support insulators & terminal connectors without support structure				
			- without earth switch	Nos.	1	4,000.00	4,000.00
13	<u>11kv</u>	Surge Arrestor	1 Phase, Gapless type Metal Oxide <b>Surge Arrestor</b> complete with surge counter, leakage current meter, insulating base, connecting cable and terminal connectors but without support structure	Nos.	3	500.00	1,500.00
14	<u>11 kV</u>	HGF	1 Phase Horn Gap Fuse along with post insulators without support structure	Nos.	3	500.00	1,500.00
15	<u>11 kV</u>	Solidcore	<b>Post Insulators</b> complete with terminal connectors without support structure	Nos.	3	300.00	900.00
16	<b>CONTROL AND RELAY PANEL</b>						
			<b>400 kV Control &amp; Relay Panels</b>				
			Supervision of testing and commissioning of relays in scope of panel supplier. Necessary manpower support, tools, tackles and testing equipment to be in scope of ETC contractor				
16.01			400kV Circuit Breaker Relay Panel with Auto reclose	Set	5	5,000.00	25,000.00
16.02			400kV Circuit Breaker Relay Panel without Auto reclose	Set	3	5,000.00	15,000.00
16.03			400kV Line Protection Panel	Set	2	5,000.00	10,000.00
16.04			400kV Reactor Protection Panel	Set	1	5,000.00	5,000.00
16.05			400kV Bus Bar Protection Panel(Duplicate Bus bar protection)	Set	1	5,000.00	5,000.00
16.06			Common Equipment's : Time synchronization Equipment - GPS Clock, Display, Antenna with wiring.	Nos.	1	5,000.00	5,000.00
16.07			Panel mounted BCU for controlling & monitoring of Auxiliary System	Set	1	5,000.00	5,000.00
16.08			Station HMI (including necessary softwares )	Set	2	8,000.00	16,000.00
16.09			Industrial Grade Station Server(Main / Standby with necessary softwares)	Set	4	8,000.00	32,000.00
16.10			Disturbance Recorder Work Station ( including necessary softwares)	Set	1	12,000.00	12,000.00
16.11			A4/A3 type colour Laser printer	No.	3	1,500.00	4,500.00
16.12			Dot matrix printer	No.	2	500.00	1,000.00
16.13			Inverter -working on station battery back-up.	No.	1	2,000.00	2,000.00
	<b>FO CABLE LAYING - Contractor's supplied GI Pipe</b>						
16.14			SAS : Armoured Fibre Optic system Cable for SAS and Busbar protection ( to be laid in GI Pipe ) ( Scope - Laying of the cables in the 25NB GI PIPE), SUPPLY OF GI PIPE (Powergrid accepted) shall also be in contractor's scope				

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S.No.	Voltage Class (kV)	Type	Description	Unit	Total Qty	Unit Rate	Total Price
16.14.1		<b>Supply included in bidders scope</b>	Supply and Laying of 25 mm GI pipes( light grade) conduits alongwith socket, bend and joint on trench rack support . Cutting, threading, fixing of clamps sockets/ bends/joints where required etc. complete. Supply of required clamp for fixing GI conduits on Cable rack shall be in ETC contractor scope. (Payment will be made for the as erected pipe length). GI conduits shall be used for laying of fiber optic cables /sensor cables.	M	1500	130.00	1,95,000.00
16.14.2			Armoured FO cable along with connectors for SAS & Busbar Protection. The laying of network/optical cables cables shall be in the contractor scope. However, Optical cable will be laid under SAS supplier's supervision. Splicing and Termination shall be in SAS supplier's scope.). FO cable shall be laid in 25mm dia. GI pipes .	M	2000	10.00	20,000.00
	<b>PLCC SYSTEM</b>						
17			<b>PLCC for 765/400KV BANASKATA STATION</b>				
17.1			Coupling device(Phase to Phase)	Nos.	6	7,000.00	42,000.00
17.2			PLCC Panel-Carrier equipment (for speech + protection and speech +data) (Analogue type )	Nos.	10	7,000.00	70,000.00
17.3			PLCC Panel-Digital Protection coupler	Nos.	8	5,000.00	40,000.00
17.4			4 wire telephone instrument( Along with telephone wiring )	Nos.	4	300.00	1,200.00
17.5			5 Pair Telephone Cables, armoured ,0.5 sq. mm annealed copper conductor and petroleum jelly filled with polyethene outer jackets	m	2000	10.00	20,000.00
17.6			HF Cable	m	1400	10.00	14,000.00
18			<b>PLCC for 765KV CHITTORGARH SUBSTATION END</b>				
18.1			Coupling device(Phase to Phase)	Nos.	2	5,000.00	10,000.00
18.2			PLCC Panel-Carrier equipment (for speech + protection and speech +data) (Analogue type )	Nos.	3	5,000.00	15,000.00
18.3			PLCC Panel-Digital Protection coupler	Nos.	2	5,000.00	10,000.00
18.4			4 wire telephone instrument( Along with telephone wiring )	Nos.	1	300.00	300.00
18.5			5 Pair Telephone Cables, armoured ,0.5 sq. mm annealed copper conductor and petroleum jelly filled with polyethene outer jackets	m	300	10.00	3,000.00
18.6			HF Cable	m	300	10.00	3,000.00
19	<b>Tele communication Equipment</b>						
19.1			Equipment Cabinets for SDH & PDH equipments	Nos	4	3,000.00	12,000.00
19.2			NMS ( For SDH Equipment & Multiplexer) ( Handling & Storage only)	Set	2	3,000.00	6,000.00
20	<b>LT AC &amp; DC SWITCHBOARDS</b>						
20.1			415V Main switchboard	Set	1	10,000.00	10,000.00
20.2			415V ACDB	Set	1	10,000.00	10,000.00
20.3			415V MLDB (alongwith 2 nos. 300 kVA lighting transformer)	Set	1	55,000.00	55,000.00
20.4			415V Emergency Lighting Board (alongwith 1 no. 100 kVA, lighting transformer)	Set	1	25,000.00	25,000.00
20.5			220V DCDB	Sets	2	10,000.00	20,000.00
20.6			48V DCDB	Sets	2	10,000.00	20,000.00

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S.No.	Voltage Class (kV)	Type	Description	Unit	Total Qty	Unit Rate	Total Price
21	<b>BATTERY AND BATTERY CHARGER</b>						
21.1	220 V	VRLA Battery Bank	<b>Battery Bank</b> including all accessories such as racks, interconnecting cables, connectors etc.	Sets	2	55,000.00	1,10,000.00
21.2	48 V	VRLA Battery Bank	<b>Battery Bank</b> including all accessories such as racks, interconnecting cables, connectors etc.	Sets	2	35,000.00	70,000.00
21.3	220 V	Battery charger	<b>Battery Charger</b> (Float cum Boost )	Sets	2	10,000.00	20,000.00
21.4	48 V	Battery charger	<b>Battery Charger</b> (Float cum Boost )	Sets	2	10,000.00	20,000.00
	<b>LT TRANSFORMER</b>						
22	11kV/ 415V	Outdoor/800kV A	<b>LT Auxilairy Oil filled Transformers.</b> Work includes erection at plinth, erection of all auxiliaries, viz bushings, terminal connectors, filling of oil, oil filtration, oil testing, testing & Commissioning etc.	Nos.	1	50,000.00	50,000.00
23	<b>STRINGING HARDWARE</b>						
23.1	400 kV	Double Tension	400kV Double tension insulator string comprising 2x25 discs with subconductor spacing 450mm suitable for QUAD ACSR BERSIMIS / MOOSE conductor with / without turn Buckle	set	0	-	-
23.5	400 kV	Double Tension	400kV Double tension insulator string comprising 2x25 discs with subconductor spacing 450mm suitable for TWIN ACSR BERSIMIS / MOOSE conductor with / without turn Buckle	set	0	-	-
23.3	400 kV	Single Suspension	400kV Single suspension insulator string comprising 1x25 discs with subconductor spacing 450mm suitable for QUAD ACSR BERSIMIS / MOOSE conductor with straight / drop clamp	set	0	-	-
23.4	400 kV	Single Suspension	400kV Single suspension insulator string comprising 1x25 discs with subconductor spacing 450mm suitable for TWIN ACSR BERSIMIS / MOOSE conductor with straight / drop clamp	set	0	-	-
24	<b>BUS MATERIAL</b>						
			Inclusive of fixing various types of clamps, connectors, spacers, corona rings, sleeves, aluminum welding, fixing of socket and bends,				
24.1	-	ACSR Bersimis	Conductor complete with Tee connectors for droppers to equipment connections, PG clamps for busbar jumpering, Twin/Quad bundle spacers etc to complete.	Km	14	40,000.00	5,60,000.00
24.2		4.5"	Al Tube (ETC of Al.Tube includes Aluminium welding and bending to be included. Welding sleeve tube will be supplied by BHEL.)	kM	0.75	3,45,000.00	2,58,750.00
24.3	-	7/9 SWG Shield Wire	GI Stranded Shield wire including tension clamp, PG clamp and clamping on structure for down conductor, fixing/bolting with earth strip etc to complete.	Km	2	25,000.00	50,000.00
25	<b>Marshalling Kiosks &amp; Junction Boxes</b>						
25.1			Bay Marshalling Kiosks ( Outdoor, Floor mounted on cable trench)	Nos.	5	4,000.00	20,000.00
25.2			CT Junction Box (on CT structure)	Nos.	8	3,000.00	24,000.00
25.3			CVT Junction Box (on CVT structure/ on foundation)	Nos.	4	3,000.00	12,000.00
	<b>CABLE LAYING WORKS</b>						
			A. <b>Cabling</b> including laying, tagging , dressing, ferruling, lugging, soldering, tapping, jointing, crimping, termination, and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/PVC pipe over/under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable ties / straps, Al. tags, markers, GI / PVC wall sleeves with rubber / nylon bushes and flexible steel conduits shall be supplied by bidder. Glands shall be quoted separately.				
26			<b>Control cables</b>				
26.1		PVC	2Cx2.5 sqmm Cu	Km	25	10,000.00	2,50,000.00
26.2		PVC	5Cx2.5 sqmm Cu	Km	14	10,000.00	1,40,000.00
26.3		PVC	7Cx2.5 sqmm Cu	Km	2.8	12,000.00	33,600.00

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S.No.	Voltage Class (kV)	Type	Description	Unit	Total Qty	Unit Rate	Total Price
26.4		PVC	10Cx2.5 sqmm Cu	Km	5.5	15,000.00	82,500.00
26.5		PVC	14Cx2.5 sqmm Cu	Km	4.8	18,000.00	86,400.00
26.6		PVC	19Cx2.5 sqmm Cu	Km	4	20,000.00	80,000.00
<b>27</b>			<b>Auxiliary Power cables</b>				
27.1		PVC	2Cx6 sqmm Al/Cu	Km	5	10,000.00	50,000.00
27.2		PVC	4Cx6 sqmm Al/Cu	Km	2.2	10,000.00	22,000.00
27.3		PVC	4Cx16 sqmm Al/Cu	Km	20	12,000.00	2,40,000.00
27.4		PVC	3.5Cx35 sqmm Al/Cu	Km	3.5	18,000.00	63,000.00
27.5		PVC	3.5Cx70 sqmm Al/Cu	Km	10	20,000.00	2,00,000.00
27.6		PVC	1Cx150 sqmm Al/Cu	Km	0.5	35,000.00	17,500.00
27.7		XLPE	3.5Cx300 sqmm Al/Cu	Km	1.8	45,000.00	81,000.00
27.8		XLPE	1Cx630 sqmm Al/Cu	Km	1.6	2,50,000.00	4,00,000.00
	<b>CABLE GLAND</b>		CONTRACTOR'S SUPPLY				
28			Supply & installation - Tin/ Nickel, Nichel/chromium - Plated (coating thickness not less than 10 microns) Powergrid approved / Sunil & Co. / Arup/ Comet / QPIE make brass <b>cable glands</b> , double compression heavy duty type complete with necessary armour clamp & tapered washer etc for the following cables (Bidder's Scope is to supply and fixing) Qty may vary by ±50%				
28.01		PVC/ XLPE	2Cx2.5 sqmm Cu	Nos.	150	170.00	25,500.00
28.02		PVC/ XLPE	5Cx2.5 sqmm Cu	Nos.	500	170.00	85,000.00
28.03		PVC/ XLPE	7Cx2.5 sqmm Cu	Nos.	200	200.00	40,000.00
28.04		PVC/ XLPE	10Cx2.5 sqmm Cu	Nos.	100	250.00	25,000.00
28.05		PVC/ XLPE	14Cx2.5 sqmm Cu	Nos.	350	250.00	87,500.00
28.06		PVC/ XLPE	19Cx2.5 sqmm Cu	Nos.	150	300.00	45,000.00
28.07		PVC/ XLPE	2Cx6 sqmm Al/Cu	Nos.	100	170.00	17,000.00
28.08		PVC/ XLPE	4Cx6 sqmm Al/Cu	Nos.	16	170.00	2,720.00
28.09		PVC/ XLPE	4Cx16 sqmm Al/Cu	Nos.	200	200.00	40,000.00
28.10		PVC/ XLPE	3.5Cx35 sqmm Al/Cu	Nos.	20	200.00	4,000.00
28.11		PVC/ XLPE	3.5Cx70 sqmm Al/Cu	Nos.	56	300.00	16,800.00
28.12		PVC/ XLPE	1Cx150 sqmm Al/Cu	Nos.	10	450.00	4,500.00
28.13		PVC/ XLPE	3.5Cx300 sqmm Al/Cu	Nos.	16	550.00	8,800.00
28.14		PVC/ XLPE	1Cx630 sqmm Al/Cu	Nos.	7	1,500.00	10,500.00
	<b>HT CABLE</b>					-	
29		11kV, XLPE	11kV ,single core, XLPE HT cables along with lugs, cable glands to be laid in burried trench , all civil activities such as excavation, supply and laying of sand, bricks etc. shall be in contractor's scope. Termination kit/staright joint shall be provided by BHEL . All other material like lugs, glands, tripod clamps etc. shall be arranged by contractor (Termination of cable shall be done by termination supplier)	Mtrs	2000	250.00	5,00,000.00
<b>30</b>	<b>STEEL STRUCTURES</b>						
30.1			Galvanised steel Lattice Structures including hardwares for Towers, beams & equipment support	MT	440	3,500.00	15,40,000.00
30.2			Galvanised steel Pipe Structures including hardwares for equipment support	MT	150	3,500.00	5,25,000.00
30.3			Double pole lattice structure	MT	4	3,000.00	12,000.00
	<b>Cable Trench Materials</b>						
31			<b>Cable Rack</b> work includes welding and fabrication of cable racks of mild steel angles( 50x50x6 mm suplied by BHEL) & painted racks (paint suply in scope of bidder) on inserts of trench walls in trenches in switchyard and control room. Cable rack assembly will be of 2/3/4 tier.	MT	20	10,000.00	2,00,000.00

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S.No.	Voltage Class (kV)	Type	Description	Unit	Total Qty	Unit Rate	Total Price
32			Laying of 100/110NB PVC pipe at a depth of 300mm including excavation, backfilling, making and repairing of walls in trenches, cutting, threading, fixing of sockets/ bends where required etc. complete. Both ends of PVC pipe shall be closed . (Payment will be made for the as erected pipe length)	Meter	3000	25.00	75,000.00
33			Laying of 50/65 NB PVC pipe at a depth of 300mm including excavation, backfilling, making and repairing of walls in trenches, cutting, threading, fixing of sockets/ bends where required etc. complete. Both ends of PVC pipe shall be closed . (Payment will be made for the as erected pipe length)	Meter	3000	25.00	75,000.00
34			Laying of <b>Cable trays</b> : including bends, tees, elbow, reducers, stiffeners coupler plates, bolting to racks, structure etc. to complete. Scope of minor fabrication is also involved.				
34.1			100 to 150 mm wide, 2.5 M long Perforated type	Meter	300	55.00	16,500.00
34.2			100 to 750 mm wide, 2.5 M long Ladder type	Meter	150	65.00	9,750.00
		<b>Earthing work</b>					
35			<b>Earthing material</b> - The earthing includes earthing of all switchyard equipment, towers, pipe structure, cable trenches, fence, pipe electrode for LA, CVT, neutral of transformer & at interconnections of other grids, Control room equipments using necessary Connectors for earthing flats. Earthing clamping shall be carried out by ETC contractor. GS strip including cutting, bending, welding with 40 mm dia MS rod riser/earth strip, applying zinc rich paint, clamping to structure/building wall etc. to complete. Hardware required for connecting flat on pads of structure & equipment included in scope. The Earthing of equipments, Auxiliary Earthmats under Iso/ ES/ CB MOM boxes shall be carried out as per Powergrid standard earthing drawing.				
35.1			75 x 12 mm GI Flat	kM	3	75,000.00	2,25,000.00
35.2			50 x 6 mm GI Flat	kM	2	65,000.00	1,30,000.00
35.3			50 x 6 mm MS Flat	kM	2	55,000.00	1,10,000.00
35.4			40NB Pipe electrode	Nos.	4	10,000.00	40,000.00
35.5			40mm dia MS Rod for equipment risers	MT	12	14,000.00	1,68,000.00
36		<b>SUPPLY INCLUDED</b>	SUPPLY AND INSTALLATION OF ISMC 100, ISMC 50 for Panel Supports	MT	1	49,050.00	49,050.00
			<b>Total Amount (Rs.)</b>				<b>96,29,270.00</b>

**Following also forms the scope of ETC work in addition to above, but not limited to this.**

<b>Note</b>	
1	Erection, Installation, pre-commissioning test and commissioning tests (As per BHEL FQP) are included in the scope.
2	Annexure- 2 (Switchyard Erection guidelines) shall be followed for ETC work.
3	All the drawings and documents as per Annexure-1 shall be followed for ETC work.
4	Minor Civil works such as modification of civil foundations, making holes in the trenches/ control room building, grouting, fixing of trench material will be in the scope of ETC contractor.
5	Removal of gravel, if gravelling is done, for connection of Equipment earthing strip to the existing mat (wherever earthing mat is already laid), and after completion of earthing , contractor should place the gravel to bring it in original shape.
6	The quantities given in items mentioned above may undergo a change to any extent.
7	Quoted rates are deemed to be inclusive of miscellaneous works viz erection of clamps and connectors.
8	All paint , welding electrodes & other consumable by contract supplies shall be part of ETC works. Paint /welding electrode make etc. is subject to BHEL/CUSTOMER site incharge approval.
9	Equipment erection (say Isolator ) means complete erection, metallics, post insulator, connectors (expansion/rigid tubular for AI.Tube / single/double/quadruple conductor), connection to the next in line (if connected to overhead busbar or droppers) including PG clamps/Tee connectors etc. This will be clear from the enclosed electrical layout drawings.
10	Equipment and tower erection would include supply and erection of miscellaneous items , viz Phase colour discs , labels painting of equipments , phase colour painting , phase marking , bay identification board , danger plates , rubber mats , device number marking on the equipment, keyboard etc as per site requirements. Supply & Mounting of phase color discs & Danger plates shall be as per IS-2551; 1982 & IS 5; 1978.

## Project : 400kV S/S Banaskantha

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<b>S.No.</b>	<b>Voltage Class (kV)</b>	<b>Type</b>	<b>Description</b>	<b>Unit</b>	<b>Total Qty</b>	<b>Unit Rate</b>	<b>Total Price</b>
11			Welding of Aluminium tubes ( supply of welding sleeve excluded) as per Annexure-3 is in ETC contractor's scope and joints shall be tested by radiography. Welding and Bending machines and any other equipment will be in ETC Contractor scope.				
12			Compleetete ETC package is under the scope of bidder. All TNP including oil filterating machine, cranes etc. required to complete the job shall be provided by bidder only.				
13			Testing istruments (dully calibrated) have to be arranged by ETC Contractor at it's own cost ( List is only provided for information , if any other instrument not mentioned below but required for sucessful completion of ETC work shall be in ETC contractor's scope) , (However OMICRON or equivalent kit for Numerical relay testing shall be arranged by BHEL.)				
13.01			DCRM (OPERATIONAL ANALYZER )				
13.02			Contact Resistance Measurement kit (CRM)				
13.03			Capacitance and Tan delta measurement Kit				
13.04			Dew Point Measurement kit				
13.05			5kV/1kV Megger				
13.06			Primary current Injection Kit				
13.07			Secondary current/Voltgae Injection kit				
13.08			1Ph Variac				
13.09			Multimeters				
13.10			Clamp on meter				
13.11			Relay test kit				

## BOQ for Erection Testing &amp; Commissioning (ETC) Works for 400kV Switchyard at Banaskantha (New Scope) Rev 02

Customer : POWERGRID CORPORATION OF INDIA LTD.

Project : 400kV S/S Banaskantha

<b>Note:</b>	This BOQ covers only <b>ETC work for 400kV Banaskantha Switchyard excluding unloading and storage</b> . Unloading and storage of all the material required for 765kV & 400kV Switchyard at Banaskantha shall be covered in a separate BOQ (Annexure III). Bidder shall quote only for ETC work in this BOQ, prices for unloading, storage and shifting of material should be filled separately in Annexure III.						
S.No.	Voltage Class (kV)	Type	Description	Unit	Total Qty	Unit Rate	Total Price
23.B	<b>STRINGING HARDWARE</b>						
23.B.1	400 kV	Double Tension	400kV Double tension Polymer insulator string with hardware for subconductor spacing 450mm suitable for QUAD ACSR BERSIMIS / MOOSE conductor with / without turn Buckle	set	96	2,111.65	2,02,718.40
23.B.5	400 kV	Double Tension	400kV Double tension Polymer insulator string with hardware for subconductor spacing 450mm suitable for TWIN ACSR BERSIMIS / MOOSE conductor with / without turn Buckle	set	12	2,111.65	25,339.80
23.B.3	400 kV	Single Suspension	400kV Single suspension Polymer insulator string for subconductor spacing 450mm suitable for QUAD ACSR BERSIMIS / MOOSE conductor with straight / drop clamp	set	27	1,266.99	34,208.73
23.B.4	400 kV	Single Suspension	400kV Single suspension Polymer insulator string for subconductor spacing 450mm suitable for TWIN ACSR BERSIMIS / MOOSE conductor with straight / drop clamp	set	15	1,266.99	19,004.85
			<b>Total Amount (Rs.)</b>				<b>2,81,271.78</b>
<b>Following also forms the scope of ETC work in addition to above, but not limited to this.</b>							
<b>Note</b>							
1	Erection, Installation, pre-commissioning test and commissioning tests (As per BHEL FQP) are included in the scope.						
2	Annexure- 2 (Switchyard Erection guidelines) shall be followed for ETC work.						
3	All the drawings and documents as per Annexure-1 shall be followed for ETC work.						
4	Minor Civil works such as modification of civil foundations, making holes in the trenches/ control room building, grouting, fixing of trench material will be in the scope of ETC contractor.						
5	Removal of gravel, if gravelling is done, for connection of Equipment earthing strip to the existing mat (wherever earthing mat is already laid), and after completion of earthing, contractor should place the gravel to bring it in original shape.						
6	The quantities given in items mentioned above may undergo a change to any extent.						
7	Quoted rates are deemed to be inclusive of miscellaneous works viz erection of clamps and connectors.						
8	All paint, welding electrodes & other consumable by contract supplies shall be part of ETC works. Paint /welding electrode make etc. is subject to BHEL/CUSTOMER site incharge approval.						
9	Equipment erection (say Isolator) means complete erection, metallics, post insulator, connectors (expansion/rigid tubular for Al.Tube / single/double/quadruple conductor), connection to the next in line (if connected to overhead busbar or droppers) including PG clamps/Tee connectors etc. This will be clear from the enclosed electrical layout drawings.						
10	Equipment and tower erection would include supply and erection of miscellaneous items, viz Phase colour discs, labels painting of equipments, phase colour painting, phase marking, bay identification board, danger plates, rubber mats, device number marking on the equipment, keyboard etc as per site requirements. Supply & Mounting of phase color discs & Danger plates shall be as per IS-2551; 1982 & IS 5; 1978.						
11	Welding of Aluminium tubes (supply of welding sleeve excluded) as per Annexure-3 is in ETC contractor's scope and joints shall be tested by radiography. Welding and Bending machines and any other equipment will be in ETC Contractor scope.						
12	Complete ETC package is under the scope of bidder. All TNP including oil filtering machine, cranes etc. required to complete the job shall be provided by bidder only.						
13	Testing instruments (dully calibrated) have to be arranged by ETC Contractor at its own cost (List is only provided for information, if any other instrument not mentioned below but required for successful completion of ETC work shall be in ETC contractor's scope), (However OMICRON or equivalent kit for Numerical relay testing shall be arranged by BHEL.)						
13.01	DCRM (OPERATIONAL ANALYZER)						
13.02	Contact Resistance Measurement kit (CRM)						
13.03	Capacitance and Tan delta measurement Kit						
13.04	Dew Point Measurement kit						
13.05	5kV/1kV Megger						
13.06	Primary current Injection Kit						
13.07	Secondary current/Voltgae Injection kit						
13.08	1Ph Variac						
13.09	Multimeters						
13.10	Clamp on meter						
13.11	Relay test kit						



## BOQ for Erection Testing &amp; Commissioning (ETC) Works for 400kV Switchyard at Sankhari Rev 01

Customer : POWERGRID CORPORATION OF INDIA LTD.

Project : 400kV S/S Sankhari

**Note:** This BOQ covers only ETC work for 400kV Switchyard at Sankhari in Gujarat excluding unloading and storage. Unloading and storage of all the material shall be covered in separate BOQ (Annexure IV). Bidder shall quote only for ETC work in this BOQ, **prices for unloading, storage and shifting of material should be filled separately in Annexure IV.**

S.No.	Voltage Class	Type	Description	Unit	Total Qty	Unit Rate	Total
	<b>MAIN</b>						
	<b>400kV EQUIPMENTS</b>						
1	400 kV		400KV SF6, 3 Phase Circuit Breaker alongwith lattice type GI supporting structure, terminal connectors, Breaker Control Cabinets, ladder and interpole cabling , SF6 cylinders complete in all respect (Supervision of Erection, Testing and commissioning will be done by supplier. Supplier will bring Timing kit and Gas leak detector only. Necessary manpower support, tools, tackles and testing kit to be in scope of ETC contractor).				
1.1		CB	without PIR & without CSD	Nos.	2	30000.00	60000.00
2	400 kV	HCB	3 Ph, <b>Isolator</b> , 2000A, motor operated complete with 6 nos. of 400kV support insulators & terminal connectors without support structure				
2.1.			- with one earth switch (motor/ manual operated)	Nos.	2	22000.00	44000.00
3	400 kV	Pantograph	3 Ph, <b>Isolator</b> , 2000A, motor operated complete with 400kV support insulator, operating rod insulator & terminal connectors without support structure				
3.1			- without earth switch (motor/ manual operated)	Nos.	4	22000.00	88000.00
3.2			- with one earth switch (motor/ manual operated)	Nos.	2	22000.00	44000.00
4	400 kV	3000 A	1 Ph, <b>Current Transformer</b> complete with terminal connectors without support structure.	Nos.	6	8000.00	48000.00
5	400 kV		1 Ph, <b>CVT</b> complete with terminal connector without support structure.	Nos.	6	8000.00	48000.00
6	400kV	0.5mH	Wave Trap pedestal mounted including 3 Nos. 400kV Post Insulators and Terminal connectors without structure	Nos.	2	10000.00	20000.00
7	400 kV	BPI	<b>Post Insulators</b> complete with corona ring & terminal connectors without support structure	Nos.	48	2000.00	96000.00
8	336 kV		1 Phase, Gapless type Metal Oxide <b>Surge Arrester</b> complete with surge counter, leakage current meter, insulating base, connecting cable and terminal connectors without support structure	Nos.	6	3000.00	18000.00
9	<b>Control and Relay Panels</b>						
			<b>400 kV Control &amp; Relay Panels</b>				
			Testing and commissioning of relays in scope of panel supplier. Necessary manpower support, tools, tackles and testing equipment to be in scope of ETC contractor				
9.1			400kV Circuit Breaker Relay Panel with Auto reclose	Set	2	5000.00	10000.00
9.2			400kV Line Protection Panel	Set	2	5000.00	10000.00
9.3			400kV Bus Bar Protection Panel	No	1	5000.00	5000.00
9.4			Time synchronization equipment	Lot	1	5000.00	5000.00
	<b>FO CABLE LAYING</b>		Contractor's supplied 30mm HDPE Pipe				
9.5			SAS : Armoured Fibre Optic system Cable for SAS and Busbar protection ( to be laid in HDPE Pipe) ( Scope - Laying of the cables in the 30mm HDPE PIPE), SUPPLY OF HDPE PIPE (Getco/Powergrid accepted) shall also be in contractor's scope				

## Project : 400kV S/S Sankhari

**Note:** This BOQ covers only ETC work for 400kV Switchyard at Sankhari in Gujarat excluding unloading and storage. Unloading and storage of all the material shall be covered in separate BOQ (Annexure IV). Bidder shall quote only for ETC work in this BOQ, **prices for unloading, storage and shifting of material should be filled separately in Annexure IV.**

S.No.	Voltage Class	Type	Description	Unit	Total Qty	Unit Rate	Total
	<b>MAIN</b>						
9.5.1		<b>Supply included in bidders scope</b>	Supply and Laying of 30 mm HDPE pipes conduits alongwith socket, bend and mounting on trench wall / rack support . Installation of the same in complete aspect. Supply of required clamp for fixing of the HDPE pipe on Cable trench wall / rack shall be in ETC contractor scope. (Payment will be made for the as erected pipe length). HDPE Pipe shall be used for laying of fiber optic cables /sensor cables.	M	500	130.00	65000.00
9.5.2			Armoured FO cable along with connectors for SAS & Busbar Protection. The laying of network/optical cables shall be in the contractor scope. However, Optical cable will be laid under SAS supplier's supervision. Splicing and Termination shall be in SAS supplier's scope.). FO cable shall be laid in 30 mm HDPE pipes .	M	500	10.00	5000.00
	<b>PLCC</b>						
10			<b>PLCC for 400KV SANKHARI STATION</b>				
10.1			Coupling device(Phase to Phase)	Nos.	1	7000.00	7000.00
10.2			PLCC Panel-Carrier equipment (for speech + protection and speech +data) (Analogue type )	Nos.	2	7000.00	14000.00
10.3			PLCC Panel-Digital Protection coupler	Nos.	2	5000.00	10000.00
10.4			4 wire telephone instrument( Along with telephone wiring )	Nos.	1	300.00	300.00
10.5			5 Pair Telephone Cables, armoured ,0.5 sq. mm annealed copper conductor and petroleum jelly filled with polyethene outer jackets	m	700	10.00	7000.00
10.6			HF Cable laying	m	100	10.00	1000.00
11	<b>MKJB CTJB CVT JB</b>		Marshalling Kiosks & CT / CVT Junction Boxes				
11.1			Bay Marshalling Kiosks ( Outdoor, Floor mounted on cable trench)	Nos.	2	4000.00	8000.00
11.2			CT Junction Box (on CT structure)	Nos.	2	3000.00	6000.00
11.3			CVT Junction Box (on CVT structure/ on foundation)	Nos.	2	3000.00	6000.00
12	<b>STEEL STRUCTURES</b>						
12.1			Galvanised steel Lattice Structures including hardwares for Towers, beams & equipment support	MT	32	3500.00	112000.00
12.2			Galvanised steel Pipe Structures including hardwares for equipment support	MT	40	3500.00	140000.00
13			<b>LT AC &amp; DC SWITCHBOARDS</b>				
13.1			415V ACDB (having 2. Nos incomer feeder and 12 nos. outgoing feeders)	Set	1	8000.00	8000.00
13.2			220V DCDB (having 4 no. incomer feeder and 12 no. outgoing feeders)	Set	2	8000.00	16000.00
14	<b>Cable Trench Materials</b>						

## Project : 400kV S/S Sankhari

**Note:** This BOQ covers only ETC work for 400kV Switchyard at Sankhari in Gujarat excluding unloading and storage. Unloading and storage of all the material shall be covered in separate BOQ (Annexure IV). Bidder shall quote only for ETC work in this BOQ, **prices for unloading, storage and shifting of material should be filled separately in Annexure IV.**

S.No.	Voltage Class	Type	Description	Unit	Total Qty	Unit Rate	Total
	<b>MAIN</b>						
14.1			<b>Cable Rack</b> work includes welding and fabrication of cable racks of mild steel angles( 50x50x6 mm supplied by BHEL) & painted racks (paint supply in scope of bidder) on inserts of trench walls in trenches in switchyard and control room. Cable rack assembly will be of 2/3/4 tier.	MT	1	10000.00	10000.00
14.2			Laying of 100/110NB PVC pipe at a depth of 300mm including excavation, backfilling, making and repairing of walls in trenches, cutting, threading, fixing of sockets/ bends where required etc. complete. Both ends of PVC pipe shall be closed . (Payment will be made for the as erected pipe length)	Meter	750	25.00	18750.00
14.3			Laying of 50/65 NB PVC pipe at a depth of 300mm including excavation, backfilling, making and repairing of walls in trenches, cutting, threading, fixing of sockets/ bends where required etc. complete. Both ends of PVC pipe shall be closed . (Payment will be made for the as erected pipe length)	Meter	750	25.00	18750.00
			Laying of <b>Cable trays:</b> including bends, tees, elbow, reducers, stiffeners coupler plates, bolting to racks, structure etc. to complete. Scope of minor fabrication is also involved.				
14.4			100 to 150 mm wide, 2.5 M long Perforated type	Meter	75	55.00	4125.00
14.5			100 to 750 mm wide, 2.5 M long Ladder type	Meter	40	65.00	2600.00
		<b>Earthing work</b>					
15			<b>Earthing material-</b> The earthing includes earthing of all switchyard equipment, towers, pipe structure, cable trenches, fence, pipe electrode for LA, CVT, neutral of transformer & at interconnections of other grids, Control room equipments using necessary Connectors for earthing flats. Earthing clamping shall be carried out by ETC contractor. GS strip including cutting, bending, welding with 40 mm dia MS rod riser/earth strip, applying zinc rich paint, clamping to structure/building wall etc. to complete. Hardware required for connecting flat on pads of structure & equipment included in scope. The Earthing of equipments, Auxiliary Earthmats under Iso/ ES/ CB MOM boxes shall be carried out as per Powergrid standard earthing drawing.				
15.1			75 x 12 mm GI Flat	kM	0.75	75000.00	56250.00
15.2			50 x 6 mm GI Flat	kM	0.5	65000.00	32500.00
15.3			50 x 6 mm MS Flat	kM	0.5	55000.00	27500.00
15.4			40mm dia MS Rod for equipment risers	MT	3	14000.00	42000.00
16		<b>BUS MATERIAL</b>					
			Inclusive of fixing various types of clamps & connectors including fire wedge type, spacers, corona rings, sleeves, aluminum welding, fixing of socket and bends, refer note 1.				
16.1	400 kV	Double Tension	400kV Double tension insulator string comprising 2x25 discs with subconductor spacing 450mm suitable for QUAD ACSR BERSIMIS / MOOSE conductor with / without turn Buckle	set	0		0.00
16.2	400 kV	Double Tension	400kV Double tension insulator string comprising 2x25 discs with subconductor spacing 450mm suitable forTWIN HIGH AMPACITY ALUMINIUM Conductor with / without turn Buckle	set	0		0.00

## Project : 400kV S/S Sankhari

**Note:** This BOQ covers only ETC work for 400kV Switchyard at Sankhari in Gujarat excluding unloading and storage. Unloading and storage of all the material shall be covered in separate BOQ (Annexure IV). Bidder shall quote only for ETC work in this BOQ, **prices for unloading, storage and shifting of material should be filled separately in Annexure IV.**

S.No.	Voltage Class	Type	Description	Unit	Total Qty	Unit Rate	Total
	<b>MAIN</b>						
16.3	400 kV	Single Suspension	400kV Single suspension insulator string comprising 1x25 discs with subconductor spacing 450mm suitable for QUAD ACSR BERSIMIS / MOOSE conductor with straight / drop clamp	set	0		0.00
16.4	400 kV	Single Suspension	400kV Single suspension insulator string comprising 1x25 discs with subconductor spacing 450mm suitable for TWIN HIGH AMPACITY ALUMINIUM Conductor with straight / drop clamp	set	0		0.00
16.5	-	7/9 SWG Shield Wire	GI Stranded Shield wire including tension clamp, PG clamp and clamping on structure for down conductor, fixing/bolting with earth strip etc to complete.	M	300	25.00	7500.00
16.6	-	HIGH AMPACITY ALUMINIUM	Conductor complete with Tee connectors for droppers to equipment connections, PG clamps for busbar jumpering, Twin bundle spacers etc to complete.	M	450	75.00	33750.00
16.7	-	MOOSE ACSR	Conductor complete with Tee connectors for droppers to equipment connections, PG clamps for busbar jumpering, Quad bundle spacers etc to complete.	M	2200	55.00	121000.00
16.8		4.5"	Al Tube (ETC of Al.Tube includes Aluminium welding and bending to be included. Welding sleeve tube will be supplied by BHEL.)	kM	0.45	345000.00	155250.00
	<b>Cable Laying Work</b>						
			A. <b>Cabling</b> including laying, tagging , dressing, ferruling, lugging, soldering, tapping, jointing, crimping, termination, and drilling/cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/PVC pipe over/under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable ties / straps, Al. tags, markers, GI / PVC wall sleeves with rubber / nylon bushes and flexible steel conduits shall be supplied by bidder. Glands shall be quoted separately.				
<b>19</b>			<b>Control cable</b>				
19.1		PVC	2Cx2.5 sqmm Cu	Km	2	10000.00	20000.00
19.2		PVC	4Cx2.5 or 5CX2.5 sqmm Cu	Km	2	10000.00	20000.00
19.3		PVC	7Cx2.5 sqmm Cu	Km	3	12000.00	36000.00
19.4		PVC	10Cx2.5 sqmm Cu	Km	0.5	15000.00	7500.00
19.5		PVC	12Cx2.5 or 14CX2.5 sqmm Cu	Km	1	18000.00	18000.00
19.6		PVC	19Cx2.5 sqmm Cu	Km	3.5	20000.00	70000.00
19.7		PVC	27Cx2.5 sqmm Cu	Km	0.5	25000.00	12500.00
19.8		PVC	4Cx4 sqmm Cu	Km	1.2	12000.00	14400.00
		PVC	12Cx4 sqmm Cu	Km	2	20000.00	40000.00
<b>20</b>							
20.1			<b>Auxiliary and Power cable</b>				
20.2		PVC	2Cx6 or 2CX4 sqmm Al/Cu	Km	1	10000.00	10000.00
20.3		PVC	4Cx6 sqmm Al/Cu	Km	0.5	10000.00	5000.00
20.4		PVC	4Cx16 sqmm Al/Cu	Km	0.5	12000.00	6000.00
20.4		PVC	3.5Cx25 sqmm Al/Cu	Km	0.2	18000.00	3600.00
20.5		PVC	3.5Cx50 sqmm Al/Cu	Km	0.5	20000.00	10000.00
20.6		PVC	1Cx50 sqmm Al/Cu	Km	2	10000.00	20000.00
	<b>CABLE GLAND</b>		CONTRACTOR'S SUPPLY				

**Project : 400kV S/S Sankhari**

**Note:** This BOQ covers only ETC work for 400kV Switchyard at Sankhari in Gujarat excluding unloading and storage. Unloading and storage of all the material shall be covered in separate BOQ (Annexure IV). Bidder shall quote only for ETC work in this BOQ, **prices for unloading, storage and shifting of material should be filled separately in Annexure IV.**

S.No.	Voltage Class	Type	Description	Unit	Total Qty	Unit Rate	Total
	<b>MAIN</b>						
21			Supply & installation - Tin/ Nickel, Nickel/chromium - Plated (coating thickness not less than 10 microns) Powergrid approved / Sunil & Co. / Arup/ Comet / QPIE make brass cable glands, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc for the following cables (Bidder's Scope is to supply and fixing) Qty may vary by ±50%				
19.1		PVC	2Cx2.5 sqmm Cu	No.	50	170.00	8500.00
19.2		PVC	4Cx2.5 or 5CX2.5 sqmm Cu	No.	10	170.00	1700.00
19.3		PVC	7Cx2.5 sqmm Cu	No.	80	200.00	16000.00
19.4		PVC	10Cx2.5 sqmm Cu	No.	40	250.00	10000.00
19.5		PVC	12Cx2.5 or 14CX2.5 sqmm Cu	No.	60	250.00	15000.00
19.6		PVC	19Cx2.5 sqmm Cu	No.	150	300.00	45000.00
19.7		PVC	27Cx2.5 sqmm Cu	No.	10	750.00	7500.00
19.8		PVC	4Cx4 sqmm Cu	No.	50	210.00	10500.00
		PVC	12Cx4 sqmm Cu	No.	30	310.00	9300.00
20.2		PVC	2Cx6 or 2CX4 sqmm Al/Cu	No.	40	170.00	6800.00
20.3		PVC	4Cx6 sqmm Al/Cu	No.	40	170.00	6800.00
20.4		PVC	4Cx16 sqmm Al/Cu	No.	20	200.00	4000.00
20.4		PVC	3.5Cx25 sqmm Al/Cu	No.	20	200.00	4000.00
20.5		PVC	3.5Cx50 sqmm Al/Cu	No.	10	300.00	3000.00
20.6		PVC	1Cx50 sqmm Al/Cu	No.	10	510.00	5100.00
21		<b>SUPPLY INCLUDED</b>	SUPPLY AND INSTALLATION OF ISMC 100, ISMC 50 for Panel Supports	MT	1	49050.00	49050.00
			<b>Total Amount (Rs.)</b>				<b>1926525.00</b>

**Following also forms the scope of ETC work in addition to above, but not limited to this.**

1	Clamps and connectors shall be as per GETCO philosophy. e.g. Fire wedge type is to be used for Lines / Bus Dropper interconnection to bay equipment in place of bolted type clamps. Bidder to make all the arrangement for mounting of clamp and connectors except the gun/ firing procedure that will be dealt by connector supplier.
2	FO cable shall be laid in HDPE duct, which shall be supported on side wall of cable trench
3	GETCO standard ferruling methodology shall be adopted for wiring work. e.g. Wire No./ TB number/ destination wire no. with TB no. e.g. ( K3 / X01-05 / R1A X04-09).
5	Installation, pre-commissioning test and commissioning tests (As per BHEL FQP) are included in the scope.
6	Annexure- 2 (Switchyard Erection guidelines) shall be followed for ETC work.
7	All the drawings and documents as per Annexure-1 shall be followed for ETC work.
8	Minor Civil works such as modification of civil foundations, making holes in the trenches/ control room building, grouting, fixing of trench material will be in the scope of ETC contractor.
9	Removal of gravel, if gravelling is done, for connection of Equipment earthing strip to the existing mat (wherever earthing mat is already laid), and after completion of earthing, contractor should place the gravel to bring it in original shape.
10	The quantities given in items mentioned above may undergo a change to any extent.
11	Quoted rates are deemed to be inclusive of miscellaneous works viz erection of clamps and connectors.
12	All paint, welding electrodes & other consumable by contract supplies shall be part of ETC works. Paint /welding electrode make etc. is subject to BHEL/CUSTOMER site incharge approval.
13	Equipment erection (say Isolator) means complete erection, metallics, post insulator, connectors (expansion/rigid tubular for Al.Tube / single/double/quadruple conductor), connection to the next in line (if connected to overhead busbar or droppers) including PG clamps/Tee connectors etc. This will be clear from the enclosed electrical layout drawings.
14	Equipment and tower erection would include supply and erection of miscellaneous items, viz Phase colour discs, labels painting of equipments, phase colour painting, phase marking, bay identification board, danger plates, rubber mats, device number marking on the equipment, keyboard etc as per site requirements. Supply & Mounting of phase color discs & Danger plates shall be as per IS-2551; 1982 & IS 5; 1978.

**Project : 400kV S/S Sankhari**

**Note:** This BOQ covers only **ETC work for 400kV Switchyard at Sankhari in Gujarat excluding unloading and storage**. Unloading and storage of all the material shall be covered in separate BOQ (**Annexure IV**). Bidder shall quote only for ETC work in this BOQ, **prices for unloading, storage and shifting of material should be filled separately in Annexure IV.**

S.No.	Voltage Class	Type	Description	Unit	Total Qty	Unit Rate	Total
	<b>MAIN</b>						
15			Welding of Aluminium tubes ( supply of welding sleeve excluded) as per Annexure-3 is in ETC contractor's scope and joints shall be tested by radiography. Welding and Bending machines and any other equipment will be in ETC Contractor scope.				
16			Compleete ETC package is under the scope of bidder. All TNP including oil filterating machine, cranes etc. required to complete the job shall be provided by bidder only.				
17			Testing istruments (dully calibrated) have to be arranged by ETC Contractor at it's own cost ( List is only provided for information , if any other instrument not mentioned below but required for sucessful completion of ETC work shall be in ETC contractor's scope) , (However OMICRON or equivalent kit for Numerical relay testing shall be arranged by BHEL.)				
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17.02			Contact Resistance Measurement kit (CRM)				
17.03			Capacitance and Tan delta measurement Kit				
17.04			Dew Point Measurement kit				
17.05			5kV/1kV Megger				
17.06			Primary current Injection Kit				
17.07			Secondary current/Voltgae Injection kit				
17.08			1Ph Variac				
17.09			Multimeters				
17.10			Clamp on meter				
17.11			Relay test kit				

**BOQ for Erection Testing & Commissioning (ETC) Works for 400kV Switchyard at Sankhari (New Scope) Rev 01****Customer : POWERGRID CORPORATION OF INDIA LTD.****Project : 400kV S/S Sankhari**

**Note:** This BOQ covers only ETC work for 400kV Switchyard at Sankhari in Gujarat excluding unloading and storage. Unloading and storage of all the material shall be covered in separate BOQ (Annexure IV). Bidder shall quote only for ETC work in this BOQ, **prices for unloading, storage and shifting of material should be filled separately in Annexure IV.**

S.No.	Voltage Class	Type	Description	Unit	Total Qty	Unit Rate	Total Price
16.B	<b>BUS MATERIAL</b>						
			Inclusive of fixing various types of clamps & connectors including fire wedge type, spacers, corona rings, sleeves, aluminum welding, fixing of socket and bends, refer note 1.				
16.B.1	400 kV	Double Tension	400kV Double tension Polymer insulator string for subconductor spacing 450mm suitable for QUAD ACSR BERSIMIS / MOOSE conductor with / without turn Buckle	set	12	2,111.65	25,339.80
16.B.2	400 kV	Double Tension	400kV Double tension Polymer insulator string for subconductor spacing 450mm suitable for TWIN HIGH AMPACITY ALUMINIUM Conductor with / without turn Buckle	set	6	2,111.65	12,669.90
16.B.3	400 kV	Single Suspension	400kV Single suspension Polymer insulator string for subconductor spacing 450mm suitable for QUAD ACSR BERSIMIS / MOOSE conductor with straight / drop clamp	set	6	1,266.99	7,601.94
16.B.4	400 kV	Single Suspension	400kV Single suspension Polymer insulator string for subconductor spacing 450mm suitable for TWIN HIGH AMPACITY ALUMINIUM Conductor with straight / drop clamp	set	3	1,266.99	3,800.97
			<b>Total Amount (Rs.)</b>				<b>49,412.61</b>

**Following also forms the scope of ETC work in addition to above, but not limited to this.**

1	Clamps and connectors shall be as per GETCO philosophy. e.g. Fire wedge type is to be used for Lines / Bus Dropper interconnection to bay equipment in place of bolted type clamps. Bidder to make all the arrangement for mounting of clamp and connectors except the gun/ firing procedure that will be dealt by connector supplier.
2	FO cable shall be laid in HDPE duct, which shall be supported on side wall of cable trench
3	GETCO standard ferruling methodology shall be adopted for wiring work. e.g. Wire No./ TB number/ destination wire no. with TB no. e.g. ( K3 / X01-05 / R1A X04-09).
5	Installation, pre-commissioning test and commissioning tests (As per BHEL FQP) are included in the scope.
6	Annexure- 2 (Switchyard Erection guidelines) shall be followed for ETC work.
7	All the drawings and documents as per Annexure-1 shall be followed for ETC work.
8	Minor Civil works such as modification of civil foundations, making holes in the trenches/ control room building, grouting, fixing of trench material will be in the scope of ETC contractor.
9	Removal of gravel, if gravelling is done, for connection of Equipment earthing strip to the existing mat (wherever earthing mat is already laid), and after completion of earthing, contractor should place the gravel to bring it in original shape.
10	The quantities given in items mentioned above may undergo a change to any extent.
11	Quoted rates are deemed to be inclusive of miscellaneous works viz erection of clamps and connectors.
12	All paint, welding electrodes & other consumable by contract supplies shall be part of ETC works. Paint /welding electrode make etc. is subject to BHEL/CUSTOMER site incharge approval.
13	Equipment erection (say Isolator) means complete erection, metallics, post insulator, connectors (expansion/rigid tubular for Al.Tube / single/double/quadruple conductor), connection to the next in line (if connected to overhead busbar or droppers) including PG clamps/Tee connectors etc. This will be clear from the enclosed electrical layout drawings.
14	Equipment and tower erection would include supply and erection of miscellaneous items, viz Phase colour discs, labels painting of equipments, phase colour painting, phase marking, bay identification board, danger plates, rubber mats, device number marking on the equipment, keyboard etc as per site requirements. Supply & Mounting of phase color discs & Danger plates shall be as per IS-2551; 1982 & IS 5; 1978.
15	Welding of Aluminium tubes (supply of welding sleeve excluded) as per Annexure-3 is in ETC contractor's scope and joints shall be tested by radiography. Welding and Bending machines and any other equipment will be in ETC Contractor scope.
16	Complete ETC package is under the scope of bidder. All TNP including oil filtering machine, cranes etc. required to complete the job shall be provided by bidder only.
17	Testing instruments (dully calibrated) have to be arranged by ETC Contractor at its own cost (List is only provided for information, if any other instrument not mentioned below but required for successful completion of ETC work shall be in ETC contractor's scope), (However OMICRON or equivalent kit for Numerical relay testing shall be arranged by BHEL.)
17.01	DCRM (OPERATIONAL ANALYZER)
17.02	Contact Resistance Measurement kit (CRM)
17.03	Capacitance and Tan delta measurement Kit
17.04	Dew Point Measurement kit
17.05	5kV/1kV Megger
17.06	Primary current Injection Kit
17.07	Secondary current/Voltage Injection kit
17.08	1Ph Variac
17.09	Multimeters
17.10	Clamp on meter
17.11	Relay test kit

## BILL OF QUANTITY FOR UNLOADING &amp; STORAGE OF 765/400KV EQUIPMENTS AT BANSKANTHA

Project : 765kV/400kV S/S Banaskantha

(Rev.02)

Customer : POWERGRID CORPORATION OF INDIA LTD.

This BOQ covers unloading, storage of equipments/materials and handing over of mandatory spares to customer for 400 kV switchyard at Banaskantha. Unloading and storage of 765kV Equipments and material to be used in 765kV Switchyard is also covered under present scope. ETC contractor of 765kV switchyard package(separate contract) shall ask in writing for issuance of items/material required for 765kV Switchyard. All arrangement for Lifting and shifting of 765kV equipments/ items (for 765kV Switchyard) from the storage area to erection site shall be in the scope of the another contractor (765kV Package). Responsibility of keeping all equipment (including 765kV Equipments and items) in safe and proper condition shall be in the scope of contractor of this package. It will also be contractor's responsibility to hand over mandatory spares(including spares for 765kV equipments) to customer. Bidder shall quote only for unloading, storage and handing over of mandatory spares to customer.

1	2	3	4	5	6	7	8	9
Sl. No.		Item Description	Unit	Main Qty	Extn Qty	Total Qty	Unit Rate	Total Price
		<b>765kV Equipments</b>						
<b>1.0</b>		<b>765kV CB</b>						
1.1	3 Phase	765KV SF6, 3 Phase Circuit Breaker alongwith lattice type Gi supporting structure, terminal connectors, Breaker Control Cabinets, ladder and interpole cables , SF6 gas cylinders with/without CSD including accessories etc.	Sets	0	6	6	5,000.00	30,000.00
1.2	1 Phase	765KV SF6, 1 Phase Circuit Breaker alongwith lattice type Gi supporting structure, terminal connectors, Breaker Control Cabinets, ladder and interpole cables , SF6 gas cylinders with/without CSD including accessories etc.	Sets	1	0	1	2,000.00	2,000.00
2.0	3 Phase	<b>765KV Isolator knee type</b> , motor operated Isolator and earth switch, electrically ganged, complete with 6 nos. of support insulators & terminal connectors without support structure (with 3 Nos. operating rod insulator)						
2.1		- with one earth switch (motor operated)	Sets	0	2	2	3,000.00	6,000.00
2.2		- with two earth switch (motor operated)	Sets	0	2	2	3,000.00	6,000.00
3.0	1 Phase	<b>765KV Isolator knee type single phase</b> , motor operated Isolator and earth switch electrically ganged complete with 2 nos. of support insulators & terminal connectors without support structure (with one No. Operating Rod insulator )						
3.1		- without earth switch	Nos.	0	2	2	1,500.00	3,000.00
3.2		- with one earth switch (motor operated)	Nos.	0	2	2	1,500.00	3,000.00
		Note: 624kV LA, 765kV CT or 765kV CVT may or may not be despatched in container by the manufacturers, it will be ETC contractor's responsibility to unload container and then unload equipments from the container. No additional price for unloading shall be payable.						
4.0		<b>624kV LA</b>						
		1 Phase, Gapless type Metal Oxide <b>Surge Arrester</b> complete with surge counter, leakage current meter, insulating base, connecting cable/strip and terminal connectors. Without support structure	Nos.	24	12	36	400.00	14,400.00
5.0		<b>765kV CT</b>						
	1 Phase	<b>Current Transformer</b> complete with terminal connectors without support structure.	Nos.	0	2	2	2,000.00	4,000.00
6.0		<b>765kV CVT</b>						
	1 Phase	<b>Capacitive Voltage Transformer</b> complete with terminal connectors without support structure.	Nos.	0	2	2	2,000.00	4,000.00
7.0		<b>765kV Post Insulators</b>						
		Bus support Insulators (Solid core Post insulator) with corona ring complete with terminal connectors without support structure.	Nos.	10	5	15	500.00	7,500.00
8.0		<b>765kV Wave Trap</b>						



Project : 765kV/400kV S/S Banaskantha

(Rev.02)

Customer : POWERGRID CORPORATION OF INDIA LTD.

This BOQ covers unloading, storage of equipments/materials and handing over of mandatory spares to customer for 400 kV switchyard at Banaskantha. Unloading and storage of 765kV Equipments and material to be used in 765kV Switchyard is also covered under present scope. ETC contractor of 765kV switchyard package(separate contract) shall ask in writing for issuance of items/material required for 765kV Switchyard. All arrangement for Lifting and shifting of 765kV equipments/ items (for 765kV Switchyard) from the storage area to erection site shall be in the scope of the another contractor (765kV Package). Responsibility of keeping all equipment (including 765kV Equipments and items) in safe and proper condition shall be in the scope of contractor of this package. It will also be contractor's responsibility to hand over mandatory spares(including spares for 765kV equipments) to customer. Bidder shall quote only for unloading, storage and handing over of mandatory spares to customer.

1	2	3	4			5		7
Sl. No.		Item Description	Unit	Main Qty	Extn Qty	Total Qty	Unit Rate	Total Price
		Wave Trap pedestal mounted including 3 Nos. 765kV Post Insulators and Terminal connectors, without support structure	Nos.	0	4	4	3,000.00	12,000.00
		<b>400kV Equipments</b>						
		<b>400kV REACTOR</b>						
9.0	3 Phase	125MVAR Bus Reactor 3Phase 400kV , with Oil (supplied in separate drums), all auxiliaries, viz bushings, radiator assembly, MB with its cables, terminal connectors. On line DGA - Dissolved multi Gas and moisture analyser and On line Insulating Oil Drying System etc to complete.	Nos.	1		1	90,000.00	90,000.00
10.0		<b>400kV CIRCUIT BREAKER</b>						
10.1	with PIR	SF <sub>6</sub> , 3 Phase Circuit Breaker with PIR alongwith lattice type GI supporting structure, terminal connectors, Breaker Control Cabinets, ladder , interpole cabling ,SF <sub>6</sub> Gas Cylinders and all accessories	Nos.	1	0	1	5,000.00	5,000.00
10.2	without PIR	SF <sub>6</sub> , 3 Phase Circuit Breaker without PIR alongwith lattice type GS supporting structure, terminal connectors, Breaker Control Cabinets, ladder ,interpole cabling ,SF <sub>6</sub> Gas Cylinder and all accessories	Nos.	0		0		-
		<b>400kV ISOLATOR (HDB), 3 Ph</b>						
11.0	3 Phase	3 Ph, <b>Isolator</b> , motor operated complete with 9 nos. of 400kV support insulators & terminal connectors without support structure						
11.1		- with one earth switch (motor/ manual operated)	Set	18		18	3,000.00	54,000.00
11.2		- with two earth switch (motor/ manual operated)	Set	2		2	3,000.00	6,000.00
		<b>400kV ISOLATOR (HDB), 1 Ph</b>						
12.0	1 Phase	1 Ph, <b>Isolator</b> , motor operated complete with 3 nos. of 400kV support insulators & terminal connectors without support structure						
12.1		- without earth switch	Nos.	5		5	1,500.00	7,500.00
12.2		- with one earth switch (motor operated)	Nos.	7		7	1,500.00	10,500.00
13.0		<b>400kV CT</b>						
		<b>1 Ph, Current Transformer ( 3000 A)</b> complete with terminal connectors without support structure.	Nos.	2		2	1,500.00	3,000.00
14.0		<b>400kV CVT</b>						
		<b>1 Ph, CVT</b> complete with terminal connector without support structure.	Nos.	12		12	1,500.00	18,000.00
15.0		<b>336kV LA</b>						
		<b>1 Phase, Gapless type Metal Oxide Surge Arrester</b> complete with surge counter, leakage current meter, insulating base, connecting cable and terminal connectors without support structure	Nos.	2		2	500.00	1,000.00
16.0		<b>400kV POST INSULATORS</b>						
		<b>Post Insulators</b> complete with corona ring & terminal connectors without support structure	Nos.	40		40	300.00	12,000.00

Project : 765kV/400kV S/S Banaskantha

(Rev.02)

Customer : POWERGRID CORPORATION OF INDIA LTD.

This BOQ covers unloading, storage of equipments/materials and handing over of mandatory spares to customer for 400 kV switchyard at Banaskantha. Unloading and storage of 765kV Equipments and material to be used in 765kV Switchyard is also covered under present scope. ETC contractor of 765kV switchyard package(separate contract) shall ask in writing for issuance of items/material required for 765kV Switchyard. All arrangement for Lifting and shifting of 765kV equipments/ items (for 765kV Switchyard) from the storage area to erection site shall be in the scope of the another contractor (765kV Package). Responsibility of keeping all equipment (including 765kV Equipments and items) in safe and proper condition shall be in the scope of contractor of this package. It will also be contractor's responsibility to hand over mandatory spares(including spares for 765kV equipments) to customer. Bidder shall quote only for unloading, storage and handing over of mandatory spares to customer.

1	2	3	4			5		7
Sl. No.		Item Description	Unit	Main Qty	Extn Qty	Total Qty	Unit Rate	Total Price
17.0		<b>400kV WAVE TRAP</b>						
		Wave Trap, pedestal mounted including 3 Nos. 400 kV Post Insulators and Terminal connectors, without support structure	Set	2		2	2,000.00	4,000.00
18.0		<b>145 kV Equipments</b>						
18.1	1 Phase	SF6, 1 Phase Circuit Breaker with PIR alongwith lattice type GI supporting structure, terminal connectors, Breaker Control Cabinets, ladder , interpole cabling ,SF6 Gas Cylinders and all accessories	Set	0	2	4	2,000.00	8,000.00
18.2		<b>Post Insulators</b> complete with terminal connectors without support structure	Nos.	4	4	8	400.00	3,200.00
19.0		<b>72.5 kV &amp; 11 kV EQUIPMENTS</b>						
		<b>11kV ISOLATOR (HDB)</b>						
19.1		3 Ph, <b>Isolator</b> , manual operated complete with 9 nos. of support insulators & terminal connectors without support structure						
		- without earth switch	SET	1		1	300.00	300.00
		<b>09kV Surge Arrestor</b>						
19.2		1 Phase, Gapless type Metal Oxide <b>Surge Arrestor</b> complete with surge counter, leakage current meter, insulating base, connecting cable and terminal connectors but without support structure	Nos.	3		3	300.00	900.00
		<b>11kV Horn Gap Fuse</b>						
19.3		Horn Gap Fuse along with post insulators without support structure	Nos.	3		3	100.00	300.00
		<b>11kV Post Insulator</b>						
19.4		<b>Post Insulators</b> complete with terminal connectors without support structure	Nos.	3		3	100.00	300.00
		<b>LT TRANSFORMER (OUTDOOR OIL FILLED)</b>						
20.0		800kVA, 11/0.433kV LT Transformer including oil drums and all accessories	Nos.	1		1	7,000.00	7,000.00
21.0		<b>Structure Material (including fixing hardware, foundation bolts etc.)</b>						
21.1		Lattice Structure	MT	228	862	1090	300.00	3,27,000.00
21.2		Pipe Structure	MT	160	1	161	300.00	48,300.00
21.3		40mm MS ROD	MT	24	7.2	31.2	300.00	9,360.00
21.4		50x50x6 MS Angle	MT	40	10	50	300.00	15,000.00
21.5		50X6 MS Flat	KM	4	1.2	5.2	300.00	1,560.00
21.6		75 x 12 mm GI Flat	KM	10	4.2	14.2	300.00	4,260.00
21.7		50 x 6 mm GI Flat	kM	4.5	1.5	6	300.00	1,800.00
22.1		PVC pipe, 50/ 63 NB including socket and bends	m	1648	3000	4648	2.00	9,296.00
22.2		PVC Pipe, 100/ 110NB including socket and bends	m	1100	4200	5300	2.00	10,600.00

Project : 765kV/400kV S/S Banaskantha

(Rev.02)

Customer : POWERGRID CORPORATION OF INDIA LTD.

This BOQ covers unloading, storage of equipments/materials and handing over of mandatory spares to customer for 400 kV switchyard at Banaskantha. Unloading and storage of 765kV Equipments and material to be used in 765kV Switchyard is also covered under present scope. ETC contractor of 765kV switchyard package(separate contract) shall ask in writing for issuance of items/material required for 765kV Switchyard. All arrangement for Lifting and shifting of 765kV equipments/ items (for 765kV Switchyard) from the storage area to erection site shall be in the scope of the another contractor (765kV Package). Responsibility of keeping all equipment (including 765kV Equipments and items) in safe and proper condition shall be in the scope of contractor of this package. It will also be contractor's responsibility to hand over mandatory spares(including spares for 765kV equipments) to customer. Bidder shall quote only for unloading, storage and handing over of mandatory spares to customer.

1	2	3	4			5		7
Sl. No.		Item Description	Unit	Main Qty	Extn Qty	Total Qty	Unit Rate	Total Price
<b>23.0</b>		<b>BUS Material</b>						
23.1		GI Stranded Shield wire including tension clamp, PG clamp and clamping on structure for down conductor, fixing/bolting materials etc	Km	6	2	8	3,000.00	24,000.00
<b>23.2</b>		ACSR BERSIMIS Conductor complete with Tee connectors for droppers to equipment connections, PG clamps for busbar jumpering, Twin/Quad bundle spacers etc to complete.	Km	0		0		-
<b>23.3</b>		AAAC BULL Conductor complete with Tee connectors for droppers to equipment connections, PG clamps for busbar jumpering, Twin/Quad bundle spacers etc to complete.	Km	10	14	24	3,000.00	72,000.00
23.4		Al Tube (ETC of Al.Tube includeing corona bells, Aluminium . Welding sleeves etc.	KM	0	0	0		-
24.0		Disc Insulators and hardware						
24.1		765kV Double tension insulator string comprising 2x44 discs with subconductor spacing 450mm suitable for quad AAC Bull / quad Bersimis conductor with/without turn Buckle	set			0		-
24.2		765kV Single suspension insulator string comprising 1x44 discs with subconductor spacing 450mm suitable for quad AAC Bull / quad Bersimis conductor with/ without drop clamp	set			0		-
24.3		Guy wire arrangement excluding conductor and shield wire (as per enclosed sketch). 1 set includes 2 number 765KV long rod insulators, terminal connector, anchoring materials etc./	set			0		-
24.4		400kV Double tension insulator string comprising 2x25 discs with subconductor spacing 450mm suitable for QUAD ACSR BERSIMIS conductor with / without turn Buckle	set			0		-
24.5		400kV Double tension insulator string comprising 2x25 discs with subconductor spacing 450mm suitable for TWIN ACSR BERSIMIS conductor with / without turn Buckle	set			0		-
24.6		400kV Single suspension insulator string comprising 1x25 discs with subconductor spacing 450mm suitable for QUAD ACSR BERSIMIS conductor with straight / drop clamp	set			0		-
24.7		400kV Single suspension insulator string comprising 1x25 discs with subconductor spacing 450mm suitable for TWIN ACSR BERSIMIS conductor with straight / drop clamp	set			0		-
		<b>LTAC &amp; DC PANELS</b>						
25.0		415V Main switchboard	Set	1		1	2,000.00	2,000.00
26.0		415V ACDB	Set	1		1	2,000.00	2,000.00
27.0		415V MLDB (alongwith 2 nos. 300 kVA lighting transformer)	Set	1		1	2,000.00	2,000.00
28.0		415V Emergency Lighting Board (alongwith 1 no. 100 kVA, lighting transformer)	Set	1		1	2,000.00	2,000.00
29.0		220V DCDB	Sets	2		2	2,000.00	4,000.00
30.0		48V DCDB	Sets	2		2	2,000.00	4,000.00
		<b>Battery Banks and Battery Chargers</b>						
31.0		220V Battery Bank including all accessories	Sets	2		2	10,000.00	20,000.00
32.0		48V Battery Bank including all accessories	Sets	2		2	10,000.00	20,000.00
33.0		220V Battery Charger (Float cum Boost )	Sets	2		2	2,000.00	4,000.00
34.0		48V Battery Charger (Float cum Boost )	Sets	2		2	2,000.00	4,000.00

Project : 765kV/400kV S/S Banaskantha

(Rev.02)

Customer : POWERGRID CORPORATION OF INDIA LTD.

This BOQ covers unloading, storage of equipments/materials and handing over of mandatory spares to customer for 400 kV switchyard at Banaskantha. Unloading and storage of 765kV Equipments and material to be used in 765kV Switchyard is also covered under present scope. ETC contractor of 765kV switchyard package(separate contract) shall ask in writing for issuance of items/material required for 765kV Switchyard. All arrangement for Lifting and shifting of 765kV equipments/ items (for 765kV Switchyard) from the storage area to erection site shall be in the scope of the another contractor (765kV Package). Responsibility of keeping all equipment (including 765kV Equipments and items) in safe and proper condition shall be in the scope of contractor of this package. It will also be contractor's responsibility to hand over mandatory spares(including spares for 765kV equipments) to customer. Bidder shall quote only for unloading, storage and handing over of mandatory spares to customer.

1	2	3	4		5		7
Sl. No.		Item Description	Unit	Main Qty	Extn Qty	Total Qty	Total Price
35.0		<b>Air Conditioning System</b>					
35.1		Split AC unit of 2 Tr capacity	Nos.				-
35.2		Free cooling AC unit of 2 Tr capacity	Nos.		1	1	500.00
35.3		Free cooling AC unit of 3 Tr capacity	Nos.		1	1	500.00
		<b>Cables</b>					
36.0		Control cables (PVC)					
36.1		2Cx2.5 sqmm Cu	Km	16.017	2	18.017	700.00
36.2		5Cx2.5 sqmm Cu	Km	0	10.613	10.613	700.00
36.3		7Cx2.5 sqmm Cu	Km	0	2	2	700.00
36.4		10Cx2.5 sqmm Cu	Km	0	2	2	700.00
36.5		14Cx2.5 sqmm Cu	Km	0	2	2	700.00
36.6		19Cx2.5 sqmm Cu	Km	0	2	2	700.00
		<b>Aux. Power Cable</b>					-
37.0		2Cx6 sqmm Al/Cu	Km	0	2	2	700.00
37.1		4Cx6 sqmm Al/Cu	Km	0	2	2	700.00
37.2		4Cx16 sqmm Al/Cu	Km	0	2	2	700.00
37.3		3.5Cx35 sqmm Al/Cu	Km	0	0.5	0.5	800.00
37.4		3.5Cx70 sqmm Al/Cu	Km	0	2	2	1,000.00
37.5		1Cx150 sqmm Al/Cu	Km	0	0.5	0.5	2,000.00
37.6		3.5Cx300 sqmm Al/Cu	Km	0	0.8	0.8	3,000.00
37.7		1Cx630 sqmm Al/Cu	Km	0.8	0	0.8	8,000.00
38.0		33kV XLPE Cable including termination kit	km	1	0	1	10,000.00
39.0		<b>Cable Trays</b>					
39.1		100 to 150 mm wide, 2.5 M long Perforated type	m	800	300	1100	5.00
39.2		100 to 750 mm wide, 2.5 M long Ladder type	m	200	60	260	5.00
40.0		<b>Marshalling Kiosks &amp; CT / CVT Junction Boxes</b>					
40.1		Bay Marshalling Kiosks ( Outdoor, Floor mounted on cable trench)	Nos.	0	0	0	-
40.2		CT Junction Box (on CT structure)	Nos.	0	0	0	-
40.3		CVT Junction Box (on CVT structure/ on foundation)	Nos.	0	2	2	1,000.00
41.0		<b>765 kV Control &amp; Relay Panels :</b>					
41.1		765kV Circuit Breaker Relay Panel with Auto reclose	Nos.	5	4	9	1,000.00
41.2		765kV Circuit Breaker Relay Panel without Auto reclose	Nos.	3	2	5	1,000.00
41.30		765kV Line Protection Panel	Nos.	2	2	4	1,000.00
41.4		Transformer Protection Panel (For both HV & MV side)	Nos.	2	0	2	1,000.00
41.5		765kV Reactor Protection Panel	Nos.	3	2	5	1,000.00
41.6		765kV Busbar Protection Panel	Nos.	1	0	1	1,000.00
42.0		<b>400 kV Control &amp; Relay Panels and SAS :</b>					
42.1		400kV Circuit Breaker Relay Panel with Auto reclose	Nos.	5		5	1,000.00

Project : 765kV/400kV S/S Banaskantha

(Rev.02)

Customer : POWERGRID CORPORATION OF INDIA LTD.

This BOQ covers unloading, storage of equipments/materials and handing over of mandatory spares to customer for 400 kV switchyard at Banaskantha. Unloading and storage of 765kV Equipments and material to be used in 765kV Switchyard is also covered under present scope. ETC contractor of 765kV switchyard package(separate contract) shall ask in writing for issuance of items/material required for 765kV Switchyard. All arrangement for Lifting and shifting of 765kV equipments/ items (for 765kV Switchyard) from the storage area to erection site shall be in the scope of the another contractor (765kV Package). Responsibility of keeping all equipment (including 765kV Equipments and items) in safe and proper condition shall be in the scope of contractor of this package. It will also be contractor's responsibility to hand over mandatory spares(including spares for 765kV equipments) to customer. Bidder shall quote only for unloading, storage and handing over of mandatory spares to customer.

1	2	3	4			5		7
Sl. No.		Item Description	Unit	Main Qty	Extn Qty	Total Qty	Unit Rate	Total Price
42.2		400kV Circuit Breaker Relay Panel without Auto reclose	Nos.	3		3	1,000.00	3,000.00
42.3		400kV Line Protection Panel	Nos.	2		2	1,000.00	2,000.00
42.4		400kV Reactor Protection Panel	Nos.	1		1	1,000.00	1,000.00
42.5		400kV Bus Bar Protection Panel(Duplicate Bus bar protection)	Nos.	1		1	1,000.00	1,000.00
42.6		Common Equipments : Time synchronization Equipment	Nos.	1		1	1,000.00	1,000.00
42.7		Common Equipments : Relay Test Kit ( Only Handling and storage)	Nos.	1		1	300.00	300.00
42.8		SAS : Panel for Auxiliaries	Nos.	1		1	200.00	200.00
42.9		SAS : Panel for Networking	Nos.	1		1	200.00	200.00
42.10		SAS : Station HMI	Nos.	2		2	200.00	400.00
42.11		SAS : Server PC	Nos.	4		4	200.00	800.00
42.12		SAS : Disturbance Recorder Workstation	Nos.	1		1	200.00	200.00
42.13		SAS : Remote Work Station including HMI and A4 Colour Laser printer	Nos.	2		2	200.00	400.00
42.14		SAS : A3 Colour Printer	Nos.	1		1	200.00	200.00
42.15		SAS : Dot Matrix Printer	Nos.	2		2	200.00	400.00
42.16		SAS : Armoured Fibre Optic system Cable for SAS	m	5000	4800	9800	1.00	9,800.00
								-
43.0		PLCC						-
		PLCC for BANASKANTHA SUBSTATION						-
43.1		Coupling device(Phase to Phase)	Nos.	3	3	6	2,000.00	12,000.00
43.2		PLCC Panel -Carrier equipment (for speech + protection and speech +data) (Analogue type )	Nos.	5	5	10	2,000.00	20,000.00
43.4		PLCC Panel -Digital Protection coupler	Nos.	4	4	8	50.00	400.00
43.5		4 wire telephone instrument( Along with telephone wiring )	Nos.	2	2	4	50.00	200.00
43.6		5 Pair Telephone Cables, armoured ,0.5 sq. mm annealed copper conductor and petroleum jelly filled with polyethylene outer jackets	m	1500	1500	3000	0.50	1,500.00
43.7		Testing & maintenance equipment(print test kit only) ( Handling & Storage only)	Set	1	1	2	1,000.00	2,000.00
43.8		HF Cable	m	1000	1000	2000	0.50	1,000.00
								-
44.0		PLCC for 765KV CHITTORGARH SUBSTATION						-
44.1		Coupling device(Phase to Phase)	Nos.	2		2	2,000.00	4,000.00
44.2		PLCC Panel-Carrier equipment (for speech + protection and speech +data) (Analogue type )	Nos.	3		3	1,000.00	3,000.00
44.3		PLCC Panel-Digital Protection coupler	Nos.	2		2	2,000.00	4,000.00
44.4		4 wire telephone instrument( Along with telephone wiring )	Nos.	1		1	50.00	50.00
44.5		5 Pair Telephone Cables, armoured ,0.5 sq. mm annealed copper conductor and petroleum jelly filled with polyethylene outer jackets	m	300		300	0.50	150.00
44.6		Testing & maintenance equipment(print test kit only) ( Handling & Storage only)	Set	1		1	1,000.00	1,000.00
44.7		HF Cable	m	300		300	0.50	150.00
								-
45.0		Tele Communication Equipment						-
45.1		Equipment Cabinets for SDH & PDH equipments	Nos.	4		4	200.00	800.00
45.2								-
45.3		NMS ( For SDH Equipment & Multiplexer) ( Handling & Storage only)	Set	2		2	200.00	400.00
45.4		Loose items for telecommunication system						-
								-
		Watch and Ward - Material Security						-

Project : 765kV/400kV S/S Banaskantha

(Rev.02)

Customer : POWERGRID CORPORATION OF INDIA LTD.

This BOQ covers unloading, storage of equipments/materials and handing over of mandatory spares to customer for 400 kV switchyard at Banaskantha. Unloading and storage of 765kV Equipments and material to be used in 765kV Switchyard is also covered under present scope. ETC contractor of 765kV switchyard package(separate contract) shall ask in writing for issuance of items/material required for 765kV Switchyard. All arrangement for Lifting and shifting of 765kV equipments/ items (for 765kV Switchyard) from the storage area to erection site shall be in the scope of the another contractor (765kV Package). Responsibility of keeping all equipment (including 765kV Equipments and items) in safe and proper condition shall be in the scope of contractor of this package. It will also be contractor's responsibility to hand over mandatory spares(including spares for 765kV equipments) to customer. Bidder shall quote only for unloading, storage and handing over of mandatory spares to customer.

1	2	3	4			5		7
Sl. No.		Item Description	Unit	Main Qty	Extn Qty	Total Qty	Unit Rate	Total Price
46.0		Watch and ward of stored / erected material at project site and storage area or any other locations as per instruction of site in charge. (round the clock security by authorised service agency consisting of armed guard)	Mont hs	11		11	27,000.00	2,97,000.00
								-
49		DG Set along with Control panel (500 kVA) - Unloading, storage of DG set and its shifting from storage area to DG set foundation	No	0		0		-
								-
50	Spares	MANDATORY SPARES FOR SUBSTATION EQUIPMENT AS PER ANNEXURE -VI						-
A	Spares	765 kV SF6 Circuit Breaker	Set			1	8,000.00	8,000.00
B	Spares	420kV, 125Mvar Bus Reactor	Set			1	25,000.00	25,000.00
C	Spares	3000A, 765kV, 6 core Current Transformer (1-Ph) complete in all respect including terminal connectors	Set			1	7,000.00	7,000.00
D	Spares	765kV, 8800pf CVT (1-Ph) complete in all respects including terminal connector	Set			1	7,000.00	7,000.00
E	Spares	624kV Surge Arrester	Set			1	3,000.00	3,000.00
F1	Spares	765 kV Isolator- 3150A	Set			1	5,000.00	5,000.00
F2	Spares	765 kV Isolator- 2000A	Set			1	5,000.00	5,000.00
G	Spares	400kV SF6 Circuit Breaker - one complete poles with PIR and one pole without PIR and loose spares	Set			1	5,000.00	5,000.00
H	Spares	3000A, 400kV, 6 core Current Transformer (1-Ph) complete in all respect including terminal connectors	Set			1	3,000.00	3,000.00
I	Spares	400kV, 4400pf CVT (1-Ph) complete in all respects including terminal connector	Set			1	3,000.00	3,000.00
J	Spares	336kV Surge Arrester	Set			1	2,000.00	2,000.00
K1	Spares	400kV Isolator - 3150A	Set			1	3,500.00	3,500.00
K2	Spares	400kV Isolator - 2000A	Set			1	3,500.00	3,500.00
Q	Spares	Bus Post Insulator	Set			1	1,000.00	1,000.00
R	Spares	Relay and Protection system - Line Protection, Transformer Protection, Reactor Protection Panel spares & common spares	Set			1	5,000.00	5,000.00
S	Spares	Substation Automation / SCADA system	Set			1	2,000.00	2,000.00
T	Spares	PLCC, DPC & EPAX Spares	Set			1	4,000.00	4,000.00
U	Spares	Fire protection System - Deluge valve only	Set			1	2,000.00	2,000.00
V	Spares	220V Battery Charger	Set			1	4,550.00	4,550.00
W	Spares	50V Battery Charger	Set			1	4,550.00	4,550.00
X	Spares	DG SETS : Self starter assembly & AVR	Set			1	600.00	600.00
Y	Spares	Telecommunication equipments	Set			1	3,500.00	3,500.00
		<b>Total Amount (Rs.)</b>						<b>14,78,667.00</b>
Notes:								
1	Loading / Unloading, verification, handling, proper storage of all materials and handing over of mandatory spares are included in the scope.							
2	The quantities given in items mentioned above may undergo a change to any extent.							
3	All Tools and Plants required for above works have to be arranged by bidder only.							
4	The quantities given in items mentioned above may undergo a change to any extent.							

**BILL OF QUANTITY FOR UNLOADING & STORAGE OF 765/400KV EQUIPMENTS AT BANSKANTHA (New Scope)****Project : 765kV/400kV S/S Banaskantha****(Rev.01)****Customer : POWERGRID CORPORATION OF INDIA LTD.**

This BOQ covers unloading, storage of equipments/materials and handing over of mandatory spares to customer for 400 kV switchyard at Banaskantha. Unloading and storage of 765kV Equipments and material to be used in 765kV Switchyard is also covered under present scope. ETC contractor of 765kV switchyard package(separate contract) shall ask in writing for issuance of items/material required for 765kV Switchyard. All arrangement for Lifting and shifting of 765kV equipments/ items (for 765kV Switchyard) from the storage area to erection site shall be in the scope of the another contractor (765kV Package). Responsibility of keeping all equipment (including 765kV Equipments and items) in safe and proper condition shall be in the scope of contractor of this package. It will also be contractor's responsibility to hand over mandatory spares(including spares for 765kV equipments) to customer. Bidder shall quote only for unloading, storage and handing over of mandatory spares to customer.

1	2	3	4			5		7
Sl. No.		Item Description	Unit	Main Qty	Extn Qty	Total Qty	Unit Rate	Total Price
24.B		Disc Insulators and hardware						
24.B.1		765kV Double tension Polymer string insulator with hardware for subconductor spacing 450mm suitable for quad AAC Bull / quad Bersimis conductor with/without turn Buckle	set	126	46	172	422.33	72,640.76
24.B.2		765kV V Type suspension Polymer string insulator with hardware for subconductor spacing 450mm suitable for quad AAC Bull / quad Bersimis conductor with/ without drop clamp	set	67	32	99	422.33	41,810.67
24.B.3		Guy wire arrangement excluding conductor and shield wire (as per enclosed sketch). 1 set includes 2 number 765KV long rod insulators, terminal connector, anchoring materials etc./	set	9	8	17	211.17	3,589.81
24.B.4		400kV Double tension Polymer string insulator with hardware for subconductor spacing 450mm suitable for QUAD ACSR BERSIMIS conductor with / without turn Buckle	set	102		102	422.33	43,077.66
24.B.5		400kV Double tension Polymer string insulator with hardware for subconductor spacing 450mm suitable for TWIN ACSR BERSIMIS conductor with / without turn Buckle	set	12		12	422.33	5,067.96
24.B.6		400kV Single suspension Polymer string insulator with hardware for subconductor spacing 450mm suitable for QUAD ACSR BERSIMIS conductor with straight / drop clamp	set	27		27	422.33	11,402.91
24.B.7		400kV Single suspension Polymer string insulator with hardware for subconductor spacing 450mm suitable for TWIN ACSR BERSIMIS conductor with straight / drop clamp	set	15		15	422.33	6,334.95
								-
		<b>Cables</b>						-
36.B.6		27Cx2.5 sqmm Cu	Km	0	2	2	496.66	993.32
Notes:		<b>Total Amount (Rs.)</b>						<b>1,84,918.04</b>
1	Loading / Unloading, verification, handling, proper storage of all materials and handing over of mandatory spares are included in the scope.							
2	The quantities given in items mentioned above may undergo a change to any extent.							
3	All Tools and Plants required for above works have to be arranged by bidder only.							
4	The quantities given in items mentioned above may undergo a change to any extent.							

**BILL OF QUANTITY FOR UNLOADING & STORAGE OF 400KV EQUIPMENTS AT SANKHARI****Project : 400kV S/S Sankhari (Veloda)****Customer : POWERGRID CORPORATION OF INDIA LTD.**

This BOQ covers unloading, storage of equipments/materials and handing over of mandatory spares to customer for 400 kV switchyard at Sankhari. Responsibility of keeping all equipment in safe and proper condition shall be in the scope of contractor of this package. It will also be contractor's responsibility to hand over mandatory spares to customer. Bidder shall quote only for unloading, storage and handing over of mandatory spares to customer.

1	2	3	4	5		
Sl. No.		Item Description	Unit	Qty	Unit Rate	Total
		<b>400kV Equipments</b>				
1.0		<b>400kV CIRCUIT BREAKER</b>				
1.1	w/o PIR	SF6, 3 Phase Circuit Breaker with PIR alongwith lattice type GI supporting structure, terminal connectors, Breaker Control Cabinets, ladder , interpole cabling ,SF6 Gas Cylinders and all accessories	Nos.	2	5000.00	10000.00
2.0		<b>400KV ISOLATOR</b>				
	Panto	3 Ph, <b>Pantograph Isolator</b> , 2000A, motor operated complete with 400kV support insulator, operating rod insulator & terminal connectors without support structure				
2.1		- without earth switch	Nos.	4	2000.00	8000.00
2.2		- with one earth switch (motor/ manual operated)	Nos.	2	2000.00	4000.00
	HCB	3 Ph, HCB <b>Isolator</b> , 2000A, motor operated complete with 6 nos. of 400kV support insulators & terminal connectors without support structure				
2.3		- with one earth switch (motor/ manual operated)	Nos.	2	3000.00	6000.00
3.0		<b>400kV CT</b>				
		<b>1 Ph, Current Transformer ( 3000 A )</b> complete with terminal connectors without support structure.	Nos.	6	1500.00	9000.00
4.0		<b>400kV CVT</b>				
		<b>1 Ph, CVT</b> complete with terminal connector without support structure.	Nos.	6	1500.00	9000.00
5.0		<b>336kV LA</b>				
		<b>1 Phase, Gapless type Metal Oxide Surge Arrester</b> complete with surge counter, leakage current meter, insulating base, connecting cable and terminal connectors without support structure	Nos.	6	500.00	3000.00
6.0		<b>400kV POST INSULATORS</b>				
		<b>Post Insulators</b> complete with corona ring & terminal connectors without support structure	Nos.	48	300.00	14400.00
7.0		<b>400kV WAVE TRAP</b>				
		Wave Trap, pedestal mounted including 3 Nos. 400 kV Post Insulators and Terminal connectors, without support structure	Set	2	2000.00	4000.00
8.0		<b>Structure Material (including fixing hardware, foundation bolts etc.)</b>				
8.1		Lattice Structure	MT	32	300.00	9600.00
8.2		Pipe Structure	MT	40	300.00	12000.00
8.3		40mm MS ROD	MT	3	300.00	900.00
8.4		50x50x6 MS Angle	MT	1	300.00	300.00



**Project : 400kV S/S Sankhari (Veloda)**

**Customer : POWERGRID CORPORATION OF INDIA LTD.**

This BOQ covers unloading, storage of equipments/materials and handing over of mandatory spares to customer for 400 kV switchyard at Sankhari. Responsibility of keeping all equipment in safe and proper condition shall be in the scope of contractor of this package. It will also be contractor's responsibility to hand over mandatory spares to customer. Bidder shall quote only for unloading, storage and handing over of mandatory spares to customer.

1	2	3	4	5		
Sl. No.		Item Description	Unit	Qty	Unit Rate	Total
		<b>400kV Equipments</b>				
8.5		50X6 MS Flat	KM	0.5	300.00	150.00
8.6		75 x 12 mm GI Flat	kM	0.75	300.00	225.00
8.7		50 x 6 mm GI Flat	kM	0.5	300.00	150.00
9.0		PVC pipe, 50/ 63 NB including socket and bends	m	750	2.00	1500.00
10.0		PVC Pipe, 100/ 110NB including socket and bends	m	750	2.00	1500.00
11.0		<b>BUS Material</b>				
11.1	Double Tension	400kV Double tension insulator string comprising 2x25 discs with subconductor spacing 450mm suitable for QUAD ACSR BERSIMIS / MOOSE conductor with / without turn Buckle	set	0		0.00
11.2	Double Tension	400kV Double tension insulator string comprising 2x25 discs with subconductor spacing 450mm suitable forTWIN HIGH AMPACITY ALUMINIUM Conductor with / without turn Buckle	set	0		0.00
11.3	Single Suspension	400kV Single suspension insulator string comprising 1x25 discs with subconductor spacing 450mm suitable for QUAD ACSR BERSIMIS / MOOSE conductor with straight / drop clamp	set	0		0.00
11.4	Single Suspension	400kV Single suspension insulator string comprising 1x25 discs with subconductor spacing 450mm suitable for TWIN HIGH AMPACITY ALUMINIUM Conductor with straight / drop clamp	set	0		0.00
11.5	7/9 SWG Shield Wire	GI Stranded Shield wire including tension clamp, PG clamp and clamping on structure for down conductor, fixing/bolting with earth strip etc to complete.	M	300	3.00	900.00
11.6	HIGH AMPACITY ALUMINIUM	Conductor complete with Tee connectors for droppers to equipment connections, PG clamps for busbar jumpering, Twin bundle spacers etc to complete.	M	450	10.00	4500.00
11.7	MOOSE ACSR	Conductor complete with Tee connectors for droppers to equipment connections, PG clamps for busbar jumpering, Quad bundle spacers etc to complete.	M	2200	10.00	22000.00
11.8	4.5"	Al Tube (ETC of Al.Tube includes Aluminium welding and bending to be included. Welding sleeve tube will be supplied by BHEL.)	kM	0.45	7000.00	3150.00
12.0		<b>LTAC &amp; DC PANELS</b>				
12.1		415V ACDB (having 2. Nos incomer feeder and 12 nos. outgoing feeders)	Set	1	3000.00	3000.00
12.2		220V DCDB (having 4 no. incomer feeder and 12 no. outgoing feeders)	Set	2	3000.00	6000.00

**Project : 400kV S/S Sankhari (Veloda)**

**Customer : POWERGRID CORPORATION OF INDIA LTD.**

This BOQ covers unloading, storage of equipments/materials and handing over of mandatory spares to customer for 400 kV switchyard at Sankhari. Responsibility of keeping all equipment in safe and proper condition shall be in the scope of contractor of this package. It will also be contractor's responsibility to hand over mandatory spares to customer. Bidder shall quote only for unloading, storage and handing over of mandatory spares to customer.

1	2	3	4	5		
Sl. No.		Item Description	Unit	Qty	Unit Rate	Total
		<b>400kV Equipments</b>				
		<b>Cables</b>				
13.0		<b>Control cable</b>				
13.1	PVC	2Cx2.5 sqmm Cu	Km	2	700.00	1400.00
13.2	PVC	4Cx2.5 or 5CX2.5 sqmm Cu	Km	2	700.00	1400.00
13.3	PVC	7Cx2.5 sqmm Cu	Km	3	700.00	2100.00
13.4	PVC	10Cx2.5 sqmm Cu	Km	0.5	700.00	350.00
13.5	PVC	12Cx2.5 or 14CX2.5 sqmm Cu	Km	1	700.00	700.00
13.6	PVC	19Cx2.5 sqmm Cu	Km	3.5	700.00	2450.00
13.6	PVC	27Cx2.5 sqmm Cu	Km	0.5	1000.00	500.00
13.7	PVC	4Cx4 sqmm Cu	Km	1.2	1000.00	1200.00
13.8	PVC	12Cx4 sqmm Cu	Km	2	1000.00	2000.00
14.00		<b>Auxiliary and Power cable</b>				
14.01	PVC	2Cx6 or 2CX4 sqmm Al/Cu	Km	1	700.00	700.00
14.02	PVC	4Cx6 sqmm Al/Cu	Km	0.5	700.00	350.00
14.03	PVC	4Cx16 sqmm Al/Cu	Km	0.5	700.00	350.00
14.04	PVC	3.5Cx25 sqmm Al/Cu	Km	0.2	800.00	160.00
14.09	PVC	3.5Cx50 sqmm Al/Cu	Km	0.5	1000.00	500.00
14.10	PVC	1Cx50 sqmm Al/Cu	Km	2	2000.00	4000.00
15.1		<b>CABLE TRAY</b>				
15.2		100 to 150 mm wide, 2.5 M long Perforated type	m	75	5.00	375.00
15.3		100 to 750 mm wide, 2.5 M long Ladder type	m	40	5.00	200.00
16.0		<b>Marshalling Kiosks &amp; CT / CVT Junction Boxes</b>				
16.1		Bay Marshalling Kiosks ( Outdoor, Floor mounted on cable trench)	Nos.	2	1000.00	2000.00
16.2		CT Junction Box (on CT structure)	Nos.	2	1000.00	2000.00
16.3		CVT Junction Box (on CVT structure/ on foundation)	Nos.	2	1000.00	2000.00
17.0		<b>400 kV Control &amp; Relay Panels and SAS :</b>				
17.1		400kV Circuit Breaker Relay Panel with Auto reclose	Nos.	2	1000.00	2000.00
17.2		400kV Line Protection Panel	Nos.	2	1000.00	2000.00
17.3		400kV Bus Bar Protection Panel	Nos.	1	1000.00	1000.00
17.4		Time synchronization Equipment	Nos.	1	1000.00	1000.00
17.5		Common Equipments : Relay Test Kit ( Only Handling and storage)	Nos.	1	300.00	300.00
18.0		<b>PLCC</b>				
		<b>PLCC for SANKHARI SUBSTATION</b>				
18.1		Coupling device(Phase to Phase)	Nos.	1	2000.00	2000.00

**Project : 400kV S/S Sankhari (Veloda)**

**Customer : POWERGRID CORPORATION OF INDIA LTD.**

This BOQ covers unloading, storage of equipments/materials and handing over of mandatory spares to customer for 400 kV switchyard at Sankhari. Responsibility of keeping all equipment in safe and proper condition shall be in the scope of contractor of this package. It will also be contractor's responsibility to hand over mandatory spares to customer. Bidder shall quote only for unloading, storage and handing over of mandatory spares to customer.

1	2	3	4	5		
Sl. No.		Item Description	Unit	Qty	Unit Rate	Total
		<b>400kV Equipments</b>				
18.2		PLCC Panel -Carrier equipment (for speech + protection and speech +data) (Analogue type )	Nos.	2	2000.00	4000.00
18.3		PLCC Panel -Digital Protection coupler	Nos.	2	50.00	100.00
18.4		4 wire telephone instrument( Along with telephone wiring )	Nos.	1	50.00	50.00
18.5		5 Pair Telephone Cables, armoured ,0.5 sq. mm annealed copper conductor and petroleum jelly filled with polyethene outer jackets	m	700	0.50	350.00
18.6		Testing & maintenance equipment(print test kit only) ( Handling & Storage only)	Set	1	1000.00	1000.00
18.7		HF Cable	m	100	0.50	50.00
		<b>Air Conditioning System</b>				
19.0		AC unit of 2 Tr capacity	Nos.	2	200.00	400.00
		<b>Yard Kiosk</b>	<b>A</b>			
20.0		Unloading, storage of Yard Kiosk and its shifting from storage area to foundation, size 5m X 3.5m X 3.3m	Nos.	1	10500.00	10500.00
		<b>Watch and Ward - Material Security</b>				
21.0		Watch and ward of stored / erected material at project site and storage area or any other locations as per instruction of site in charge. (round the clock security by authorised service agency consisting of armed guard)	Months	15	27000.00	405000.00
<b>22</b>	<b>Spares</b>	<b>MANDATORY SPARES FOR SUBSTATION EQUIPMENT AS PER ANNEXURE-VII</b>				
A	Spares	400kV SF6 Circuit Breaker - one complete poles with PIR and one pole without PIR and loose spares	Set	1	5000.00	5000.00
B	Spares	3000A, 400kV, 6 core Current Transformer (1-Ph) complete in all respect including terminal connectors	Set	1	3000.00	3000.00
C	Spares	400kV, 4400pf CVT (1-Ph) complete in all respects including terminal connector	Set	1	3000.00	3000.00
D	Spares	336kV Surge Arrester	Set	1	2000.00	2000.00
E	Spares	400kV Isolator	Set	1	3500.00	3500.00
F	Spares	Relay and Protection system	Set	1	5000.00	5000.00
G	Spares	Substation Automation / SCADA system	Set	1	2000.00	2000.00
H	Spares	PLCC, DPC & EPAX Spares	Set	1	4000.00	4000.00
		<b>Total Amount (Rs.)</b>				<b>615260.00</b>
1	Loading / Unloading, verification, handling, proper storage of all materials and handing over of mandatory spares are included in the scope.					
2	The quantities given in items mentioned above may undergo a change to any extent.					
3	All Tools and Plants required for above works have to be arranged by bidder only.					

**BILL OF QUANTITY FOR UNLOADING & STORAGE OF 400KV EQUIPMENTS AT SANKHARI (New Scope)****Project : 400kV S/S Sankhari (Veloda)****Customer : POWERGRID CORPORATION OF INDIA LTD.**

This BOQ covers unloading, storage of equipments/materials and handing over of mandatory spares to customer for 400 kV switchyard at Sankhari. Responsibility of keeping all equipment in safe and proper condition shall be in the scope of contractor of this package. It will also be contractor's responsibility to hand over mandatory spares to customer. Bidder shall quote only for unloading, storage and handing over of mandatory spares to customer.

1	2	3	4			7
Sl. No.		Item Description	Unit	Quantity	Unit Rate	Total Price
<b>11.B</b>		<b>BUS Material</b>				
11.B.1	Double Tension	400kV Double tension Polymer Insulator string for subconductor spacing 450mm suitable for QUAD ACSR BERSIMIS / MOOSE conductor with / without turn Buckle	set	12	422.33	5,067.96
11.B.2	Double Tension	400kV Double tension Polymer Insulator string for subconductor spacing 450mm suitable forTWIN HIGH AMPACITY ALUMINIUM Conductor with / without turn Buckle	set	6	422.33	2,533.98
11.B.3	Single Suspension	400kV Single suspension Polymer Insulator string for subconductor spacing 450mm suitable for QUAD ACSR BERSIMIS / MOOSE conductor with straight / drop clamp	set	6	422.33	2,533.98
11.B.4	Single Suspension	400kV Single suspension Polymer Insulator string for subconductor spacing 450mm suitable for TWIN HIGH AMPACITY ALUMINIUM Conductor with straight / drop clamp	set	3	422.33	1,266.99
		<b>Total Amount (Rs.)</b>				<b>11,402.91</b>
1	Loading / Unloading, verification, handling, proper storage of all materials and handing over of mandatory spares are included in the scope.					
2	The quantities given in items mentioned above may undergo a change to any extent.					
3	All Tools and Plants required for above works have to be arranged by bidder only.					

**TRANSMISSION BUSINESS GROUP  
(SUB- CONTRACTS MANAGEMENT)  
TBG – NOIDA**

**PRICE SCHEDULE FORMAT**

**(ANNEXURE-V)**

**SUB: RECEIPT OF EQUIPMENT/ MATERIAL AT SITE, UNLOADING, INSPECTION, VERIFICATION, STORAGE, UP-KEEPING DURING STORAGE, ERECTION, TESTING, COMMISSIONING AND HANDING OVER OF 400KV SWITCHYARD AT BANASKANTHA & SANKHARI IN GUJARAT (PACKAGE-II).**

- (a) I/ We hereby agree to execute the above work at ----- % (in figure) ----- (in words) Above/ Below/At Par the rates of items given in BOQ (Annexure-I.1,I.2, II.1, II.2, III.1, III.2, IV.1 & IV.2) of subject tender.

**NOTE:**

1. In this annexure the tenderer shall quote a percentage above or below or at par the rates shown in the BOQ (Annexure-I.1,I.2, II.1, II.2, III.1, III.2, IV.1 & IV.2). The percentage quoted shall be clearly written both in words and figures In case of discrepancy in rates in figure and words, the minimum will be taken into account by BHEL.
2. The quoted percentage will apply to the individual items of BOQ (Annexure-I.1, I.2, II.1, II.2, III.1, III.2, IV.1 & IV.2) uniformly.

Date:  
Place

Signature of tenderer  
Name & Designation of authorized person(s) with seal

## ANNEXURE-VI

### SUMMARY OF PRICES FOR RECEIPT OF EQUIPMENT/ MATERIAL AT SITE, UNLOADING, INSPECTION, VERIFICATION, STORAGE, UP-KEEPING DURING STORAGE, ERECTION, TESTING, COMMISSIONING AND HANDING OVER OF 400KV SWITCHYARD AT BANASKANTHA & SANKHARI IN GUJARAT (PACKAGE-II)

Sl No.	Description	Annexure	Amount (Rs.)
1	Total Amount for ETC work for 400kV Banaskantha Switchyard excluding unloading and storage	Annexure-I.1	96,29,270.00
2	Total Amount for ETC Work (excluding storage & Unloading) for Polymer Insulator (Banaskanta)-New Scope	Annexure-I.2	2,81,271.78
3	Total Amount for ETC work for 400kV Switchyard at Sankhari in Gujarat excluding unloading and storage	Annexure-II.1	19,26,525.00
4	Total Amount for ETC Work (excluding storage & Unloading) for Polymer Insulator(Shankari)-New Scope	Annexure-II.2	49,412.61
5	Total Amount for Unloading, storage of equipments/materials and handing over of mandatory spares to customer for 765/400 kV switchyard at Banaskantha	Annexure-III.1	14,78,667.00
6	Total Amount for for Unloading, storage of equipments/materials and handing of Polymer Insulatro for 765/400 kV switchyard at Banaskantha-New Scope	Annexure-III.2	1,84,918.04
7	Total Amount for Unloading, storage of equipments/materials and handing over of mandatory spares to customer for 400 kV switchyard at Sankhari	Annexure-IV.1	6,15,260.00
8	Total Amount for Unloading, storage of equipments/materials and handing of Ploymer Insulatro 400 kV switchyard at Sankhari-New Scope	Annexure-IV.2	11,402.91
9	Total Amount (1+2+3+4+5+6+7+8)		141,76,727.34
10	Value of percentage above/below/at par (As indicated in Price Schedule Format, Annexure-V) applicable to the total amount mentioned at sl. no. 9 above.		.....% above/below/ at par
11	<b>Total amount after consideration of percentage above/below/ at par.</b>		

List of Mandatory Spares Banaskantha					
Project : 765kV/400kV S/S Banaskantha					
Customer : POWERGRID CORPORATION OF INDIA LTD.					(Rev.01)
		Unit	Main Qty	Extn Qty	Total Qty
<b>A)</b>	<b>765KV SF6 CB</b>				
II	765 kV SF6 Circuit Breaker				
1	One complete pole of 765 kV CB with PIR including Grading Capacitor, Pole column, Interrupter, driving mechanism and Marshaling Box without support structure	Lot	1	1	2
2	Grading capacitor (if applicable)	No	1	1	2
3	Rubber gasket, 'O' rings and seal (For Complete replacement for one	Set	1	1	2
4	Trip coils with resistor	Nos.	3	3	6
5	Closing coils with resistor	Nos.	3	3	6
6	Terminal Pad	Nos.	2	2	4
7	Molecular filter (For Complete replacement for one phase)	Nos	2	2	4
8	Corona Rings	Nos	1	1	2
9	Relay Power contactors, switch fuse units, limit switches, push button, timers & MCB etc ( One No. of each Type)	Set	1	1	2
10.0	Pressure switch of each type/Density monitor (One No. of each Type)	Set	1	1	2
11.0	Auxiliary switch assembly (For one Phase of CB)	Set	1	1	2
<b>B)</b>	<b>420kV, 125Mvar Bus Reactor</b>				
1.0	Buchholz relay complete with contacts	nos.	1		1
2.0	Local WTI with sensing device and contacts	nos.	1		1
3.0	Remote WTI with sensing device and contacts	nos.	1		1
4.0	Oil temperature indicator (OTI) with contacts and sensing device	nos.	1		1
5.0	420kV Bushing with metal parts and gaskets along with lifting tools	Set	1		1
6.0	145kV Bushing with metal parts and gaskets along with lifting tools	Set	1		1
7.0	Spares insulating oil for washing of oil storage tank , hose pipe, reactor tank inside etc.	KL	10		10
<b>C.</b>	<b>3000A, 50kA, 765kV, 6 core Current Transformer (1-Ph) complete in all respect including terminal connectors</b>	<b>No.</b>	<b>1</b>	<b>1</b>	<b>2</b>
<b>D</b>	<b>765kV, 8800pf CVT (1-Ph) complete in all respects including terminal connector</b>	<b>No.</b>	<b>1</b>	<b>1</b>	<b>2</b>
<b>E.</b>	<b>624kV Surge Arrester</b>				
1.0	624kV Surge arrester complete with insulating base and terminal connectors	No.	1	1	2
2.0	Surge counter/monitor	No.	2	5	7
<b>F)</b>	<b>765 kV Isolator</b>				
F1	3150A, 50kA, Isolator with one E/S				
1.0	One complete pole of Isolator including support insulator with 1 E/S with operating mechanism for main isolator and earth switch (excluding structure)	No.	1	1	2

<b>Project : 765kV/400kV S/S Banaskantha</b>					
<b>Customer : POWERGRID CORPORATION OF INDIA LTD.</b>					<b>(Rev.01)</b>
		<b>Unit</b>	<b>Main Qty</b>	<b>Extn Qty</b>	<b>Total Qty</b>
2.0	Copper contact fingers for female & male contacts	set	2	2	4
3.0	Open/Close Contactor Assembly, Timer, Key Interlock push button switch & auxiliary switches	set	1	1	2
4.0	Limit switch	Nos.	2	2	4
5.0	Terminal pads & Connectors	no	3	3	6
6.0	Corona shielding ring	Nos.	3	3	6
F2	2000A, 50kA, Isolator with one E/S				
1.0	One complete pole of Isolator including support insulator with 1 E/S with operating mechanism for main isolator and earth switch (excluding structure)	No.	1	1	2
2.0	Copper contact fingers for female & male contacts	set	2	2	4
3.0	Open/Close Contactor Assembly, Timer, Key Interlock push button switch & auxiliary switches	set	1	1	2
4.0	Limit switch	Nos.	2	2	4
5.0	Terminal pads & Connectors	no	3	3	6
6.0	Corona shielding ring	Nos.	3	3	6
<b>G</b>	<b>400kV SF6 Circuit Breaker</b>				
1.0	One Complete Pole of 400kV CB without PIR including Grading Capacitor, Pole column interrupter, with driving mechanism and Marshaling Box but without support structure.	Pole	1		1
1(a)	One Complete Pole of 400kV CB with PIR including Grading Capacitor, Pole column interrupter, with driving mechanism and Marshaling Box but without support structure.	Pole	1		1
2.0	Grading capacitor (if applicable)	No	1		1
3.0	Rubber gasket, 'O' rings and seal (For Complete replacement for one phase)	Set	1		1
4.0	Trip coils with resistor	Nos.	3		3
5.0	Closing coils with resistor	Nos.	3		3
6.0	Terminal Pad	Nos.	2		2
7.0	Molecular filter (For Complete replacement for one phase)	Nos	2		2
8.0	Corona Rings	Nos	1		1
9.0	Relay Power contactors, switch fuse units, limit switches, push button, timers & MCB etc ( One No. of each Type)	Set	1		1
10.0	Pressure switch of each type/Density monitor (One No. of each Type)	Set	1		1
11.0	Auxiliary switch assembly (For one Phase of CB)	Set	1		1
<b>H</b>	<b>3000A, 63kA, 400kV, 6 core Current Transformer (1-Ph) complete in all respect including terminal connectors</b>	<b>No.</b>	<b>1</b>		<b>1</b>
<b>I</b>	<b>400kV, 4400pf CVT (1-Ph) complete in all respects including terminal connector</b>	<b>No.</b>	<b>1</b>		<b>1</b>
<b>J</b>	<b>336kV Surge Arrester</b>				



<b>Project : 765kV/400kV S/S Banaskantha</b>					
<b>Customer : POWERGRID CORPORATION OF INDIA LTD.</b>					<b>(Rev.01)</b>
		<b>Unit</b>	<b>Main Qty</b>	<b>Extn Qty</b>	<b>Total Qty</b>
1.0	336kV Surge arrester complete with insulating base and terminal connectors	No.	1		1
2.0	Surge counter/monitor	No.	2		2
<b>K</b>	<b>400kV Isolator</b>				
K.1	3150A, 63kA, Isolator with one E/S				
1.0	One complete pole of Isolator including support insulator with 1 E/S with operating mechanism for main isolator and earth switch (excluding structure)	No.	1		1
2.0	Copper contact fingers for female & male contacts	set	2		2
3.0	Open/Close Contactor Assembly, Timer, Key Interlock push button switch & auxiliary switches	set	1		1
4.0	Limit switch	Nos.	2		2
5.0	Terminal pads & Connectors	no	3		3
6.0	Corona shielding ring	Nos.	3		3
K.2	2000A, 63kA, Isolator with one E/S				
1.0	One complete pole of Isolator including support insulator with 1 E/S with operating mechanism for main isolator and earth switch (excluding structure)	No.	1		1
2.0	Copper contact fingers for female & male contacts	set	2		2
3.0	Open/Close Contactor Assembly, Timer, Key Interlock push button switch & auxiliary switches	set	1		1
4.0	Limit switch	Nos.	2		2
5.0	Terminal pads & Connectors	no	3		3
6.0	Corona shielding ring	Nos.	3		3
<b>Q</b>	<b>Bus Post Insulator</b>				
1.0	765kV	Nos.	2	1	3
2	400kV	Nos.	1		1
3	145 kV	Nos.	0	1	1
<b>R</b>	<b>Relay and Protection system</b>				
1.0	Line Protection panel spares				
a	Main-I Numerical distance relay (complete unit)	Nos.	1	1	2
b	Main-II Numerical distance relay (complete unit)	Nos.	1	1	2
c	Numerical Line current differential relay (complete unit)	Nos.	1		1
2.0	Transformer protection panel spare				0
a	Transformer differential protection	Nos.	1		1
b	Restricted earth fault protection relay with non-linear resistor	Nos.	1		1
c	Direction O/C & E/F relay (if stand alone)	Nos.	1		1
3.0	Reactor Protection panel spare				0
a	Reactor differential protection relay	Nos.	1	1	2
b	Reactor Back up impedance relay (if standalone)	Nos.	1	1	2
c	Restricted earth fault protection relay with non-linear resistor	Nos.	1	1	2
4	Common Spares				0
a	Power supply module for Bus Bar protection.(If applicable)	Nos.	1		1

<b>Project : 765kV/400kV S/S Banaskantha</b>					
<b>Customer : POWERGRID CORPORATION OF INDIA LTD.</b>					<b>(Rev.01)</b>
		<b>Unit</b>	<b>Main Qty</b>	<b>Extn Qty</b>	<b>Total Qty</b>
b	Bus Bar Bay unit module if Applicable	Nos.	1		1
<b>S Sub-Station Automation /SCADA system</b>					
1.	Bay control unit (IED) of each type	Nos.	1	1	2
2.	Ethernet switch of each type	Nos.	1	1	2
<b>T PLCC, DPC and EPAX Spares</b>					
1.	Set of prints for carrier terminal	Set	2	2	4
2.	Set of prints for Analogue protection coupler (of each type)	Set	2	2	4
3.	Set of prints for EPAX	Set	1	1	2
4.	Set of print for Digital Protection coupler	Set	2	2	4
<b>U Fire protection System</b>					
1.0	Deluge Valve	Set	1	1	2
<b>V 220V Battery Charger</b>					
1.	Set of Control Cards	Set	1		1
2.	Set of relays	Set	1		1
3.	Rectifier transformer	Set	1		1
4.	Thyristor/ Diode	Set	1		1
5.	Fuses of Thyristor with indicators	Set	1		1
<b>W 48V Battery Charger</b>					
1.	Set of Control Cards	Set	1		1
2.	Set of relays	Set	1		1
3.	Rectifier transformer	Set	1		1
4.	Thyristor/ Diode	Set	1		1
5.	Fuses of Thyristor with indicators	Set	1		1
<b>X DG SETS :</b>					
1	Self starter assembly	Nos.	1		1
2.0	AVR (Auto Voltage Regulator)/ AVR card	Set	1		1
<b>Y Mandatory Spare for Telecommunication equipment</b>					
1	Transmission Equipment				
	SDH Equipment ( STM- 16 MADM, upto 3 MSP protected directions)				
(I)	Common cards, Cross-connect/control cards, Optical base cards, Power supply cards, power cabling, other hardware & accessories (each)	Set	1		1
(II)	Optical cards / SFP@ for :				
(a)	S16.1	No.	1		1
(b)	L16.1	No.	1		1
(c)	L16.2	No.	1		1
(d)	Optical Line Interface card (to support minimum 150 km) for STM-	No.	1		1
(e)	Optical Line Interface card (to support minimum 225 km) for STM-				
i	To support minimum 175 km	No.	1		1
ii	To support minimum 200 km	No.	1		1
iii	To support minimum 225 km	No.	1		1
(III)	Tributary Cards				
(a)	E1 Interface card (Minimum 16 interfaces per card)	No.	1		1
(b)	Ethernet interfaces 10/100 Mbps with Layer-2 switching (Minimum 4 interfaces per card.)	No.	1		1
2	Termination Equipment				

<b>Project : 765kV/400kV S/S Banaskantha</b>					
<b>Customer : POWERGRID CORPORATION OF INDIA LTD.</b>					<b>(Rev.01)</b>
		<b>Unit</b>	<b>Main Qty</b>	<b>Extn Qty</b>	<b>Total Qty</b>
A1	Drop & Insert Multiplexer Base Equipment (Common cards, Power supply cards, power cabling, other hardware & accessories including sub-racks, etc. fully equipped excluding subscriber line interface cards)	Set\$\$	1		1
A2	Subscriber Line Interface Cards				
a)	2 wire (sub/sub) voice channel cards (min 8 channels per card)	No.	1		1
b)	4 wire (E&M) voice channel cards (min 8 channels per card)	No.	1		1
c)	Asynchronous Sub Channels data cards (V.24/V.28) , minimum 4 channels per card	No.	1		1
3.0	Pre Connectorized Optical Fiber Patch Cords (10 Mtrs) – Pack of six <del>Patch cords</del>	Set	3		3
4.0	4 port VOIP gateway for remote locations (RTU locations)	No.	1		1

### List of Mandatory Spares for Sankhari Substation

**Project : 400kV S/S SANKHARI**

**Customer : POWERGRID CORPORATION OF INDIA LTD.**

SI No.	Description	Unit	Qty
<b>A</b>	<b>400kV SF6 Circuit Breaker</b>		
1	One Complete Pole of 400kV CB without PIR including Grading Capacitor, Pole column interrupter, with driving mechanism and Marshaling Box but without support structure.	Pole	1
2	Grading capacitor (if applicable)	No	1
3	Rubber gasket, 'O' rings and seal (For Complete replacement for one phase)	Set	1
4	Trip coils with resistor	Nos.	3
5	Closing coils with resistor	Nos.	3
6	Terminal Pad	Nos.	2
7	Molecular filter (For Complete replacement for one phase)	Nos	2
8.0	Corona Rings	Nos	1
9.0	Relay Power contactors, switch fuse units, limit switches, push button, timers & MCB etc ( One No. of each Type)	Set	1
10.0	Pressure switch of each type/Density monitor (One No. of each Type)	Set	1
11.0	Auxiliary switch assembly (For one Phase of CB)	Set	1
<b>B</b>	<b>3000A, 40kA, 400kV, 6 core Current Transformer (1-Ph) complete in all respect including terminal connectors</b>	<b>No.</b>	<b>1</b>
<b>C</b>	<b>400kV, 4400pf CVT (1-Ph) complete in all respects including terminal connector</b>	<b>No.</b>	<b>1</b>
<b>D</b>	<b>336kV Surge Arrester</b>		
1.0	336kV Surge arrester complete with insulating base and terminal connectors	No.	1
2.0	Surge counter/monitor	No.	2
<b>E</b>	<b>400kV Isolator</b>		
E.1	2000A,40 kA, Isolator with one E/S (HCB)		
1.0	One complete pole of Isolator including support insulator with 1 E/S with operating mechanism for main isolator and earth switch (excluding structure)	No.	1
2.0	Copper contact fingers for female & male contacts	set	2
3.0	Open/Close Contactor Assembly, Timer, Key Interlock push button switch & auxiliary switches	set	1
4.0	Limit switch	Nos.	2
5.0	Terminal pads & Connectors	no	3
6.0	Corona shielding ring	Nos.	3
E.2	2000A, 40kA, Isolator with one E/S (Pentograph)		
1.0	One complete pole of Isolator including support insulator with 1 E/S with operating mechanism for main isolator and earth switch (excluding structure)	No.	1
2.0	Copper contact fingers for female & male contacts	set	2
3.0	Open/Close Contactor Assembly, Timer, Key Interlock push button switch & auxiliary switches	set	1

Project : 400kV S/S SANKHARI

Customer : POWERGRID CORPORATION OF INDIA LTD.

SI No.	Description	Unit	Qty
4.0	Limit switch	Nos.	2
5.0	Terminal pads & Connectors	no	3
6.0	Corona shielding ring	Nos.	3
<b>F</b>	<b>Relay and Protection system</b>		
1.0	Line Protection panel spares		
a	Main-I Numerical distance relay (complete unit)	Nos.	1
b	Numerical Line current differential relay (complete unit)	Nos.	1
2.0	Common Spares		
a	Power supply module for Bus Bar protection.(If applicable)	Nos.	1
b	Bus Bar Bay unit module if Applicable	Nos.	1
<b>G</b>	<b>Sub-Station Automation /SCADA system</b>		
1.	Bay control unit (IED) of each type	Nos.	1
2.	Ethernet switch of each type	Nos.	1
<b>H</b>	<b>PLCC, DPC and EPAX Spares</b>		
1.	Set of prints for carrier terminal	Set	1
2.	Set of prints for Analogue protection coupler (of each type)	Set	1
3.0	Set of print for Digital Protection coupler	Set	1