

**ANNEXURE-I**  
**BILL OF QUANTITY FOR ERECTION, TESTING AND COMMISSIONING (ETC) WORK (REV. 03)**

**Bharat Heavy Electricals Limited**

**Project : 400kV GIS for Chamera**

<b>A</b>	Work shall include Loading ,Unloading,Verification Handling and Shifting to Stores , Erection/Installation, Testing & Commissioning of BHEL MAKE - 400 kV GIS (Items A1-A8) (As per SLD - Attached). The 400 KV SF6 gas insulated switch gear shall have double bus bar arrangement. The SF6 gas insulated switch gear (50 HZ) shall be of the indoor metal- enclosed type, comprising of following modules:-  1. Bus Reactor Bay Extension, GIB and Interconnection of busbars.  2.The Switchgear shall be complete with all necessary terminal boxes, inspection window, SF6 gas filling, interconnecting power and control wiring, grounding connections, gas monitoring equipment and piping, support structures.				
<b>A1</b>	<b>400 kV Bus Reactor Bay</b>  400kV, 40KA for 1 second, SF6 gas-insulated metal enclosed Bus Reactor bay module each set comprising of :- a) ONE set of 3150A, 3x1-phase, SF6 insulated circuit breaker, complete with operating mechanism (suitable for 1&3 phase auto reclose). b) ONE sets of 3x1-phase, 3150A,multi ratio, current transformer module as per single line diagram. c) THREE sets of 3x1-phase, 3150A,Disconnecter switches, complete operating mechanisms. d) TWO set of 3x1-phase,safety grounding switches, complete with operating mechanism. e) ONE set of 3x1-phase, high speed fault make grounding switch, complete with operating mechanisms. f) Gas monitoring system, pressure switches, Barrier cones, mechanism box and other items as required.  including Busbars One set of three single phase(isolated), 3150A, 40kA for 1 sec, SF6 gas-insulated metal enclosed bus bars, each comprising of :  a) 3PHASE Bus bars enclosures running the length of the switch gear to inter connect the circuit breaker bay modules in double main bus system.  b) Gas monitoring systems, pressure switches, telescopic enclosure etc. as required.  c) Barriers (communicating , non-communicating types )  d) 2 sets of 3x1phase Interface Unit to connect the reactor bay busbar to busbar of existing 400 kV GIS of M/s Siemens.	Set	1	261471.80	261471.80
<b>A2</b>	<b>400kV SF6 to Air Bushing</b>  400kV, 3150A, 40 kA for 1 sec, SF6 gas insulated SF6 to Air Bushing for Over head connection of Bus Reactor with GIS.	Nos.	3	10838.21	32514.63
<b>A3</b>	<b>400kV GIS duct from 400kV GIS to SF6 to Air Bushing</b>  400kV, 3150A 40kA for 1 sec, SF6 gas insulated GIS duct shall be complete & comprising of:- a) Three Nos. single phase (isolated) SF6 ducts along with all accessories to connect 400kV GIS with 400kV side Bus Reactor. b) Gas monitoring devices, barriers, pressure switches, etc. c) T Connector Nos. 18 d) Z Connector Nos. 6 e) Bus bar and ben Connection Nos. 17 f) Expansion Joint Nos. 15  Total length is approximately 150 m is equal to sum of single phase lengths of all GIS ducts.	lot	1	121929.85	121929.85
<b>A4</b>	<b>SF6 Gas Handling</b> ( Gas filling/evacuation kit shall not be in Bidders Scope : The work shall include	-	-		
<b>A4.1</b>	Recovery of SF6 Gas from existing Siemens Make GIS thereby evacuating it and storing SF6 gas in Gas Cylinders. ( Gas Cylinders shall be arranged by ETC contractor on returnable basis ) ( 1 Lot = Gas quantity includes total gas in one set of BUS - 3 phase of enclosure =540 kG )	Lot	2	16257.31	32514.63
<b>A4.2</b>	Refilling of SF6 gas in the existing Siemens Make GIS and GIB after installation of BHEL Supplied Interconnecting Unit ( 1 Lot = Gas quantity includes total gas in one set of BUS - 3 phase of enclosure =540 kG )	Lot	2	Included in Item A4.1	Included in Item A4.1
<b>A4.3</b>	Recovery of SF6 Gas from BHEL Make GIS and GIB thereby evacuating it and storing SF6 gas in Gas Cylinders. ( Gas Cylinders shall be arranged by ETC contractor on returnable basis )	kG	1362	30.11	41004.56
<b>A4.4</b>	Refilling of SF6 Gas into BHEL Make GIS and GIB ( Gas Cylinders shall be arranged by ETC contractor on returnable basis )	kG	1362	Included in Item A4.1	Included in Item A4.1
<b>A5</b>	<b>Local Control Cabinet for Bus Reactor Bay</b>	Nos.	1	3027.01	3027.01
<b>A6</b>	<b>Partial Discharge Monitoring Panel</b>	Nos.	1	16257.31	16257.31

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A7	Structure assembly work for Installation of GIS including support structure for GIS ducts, SF6 to air bushings, supports, platforms, ladders, foundation bolts, embedded parts in floors etc., which are required for installation of GIS.	MT	20	13547.76	270955.23
A8	Earthing of GIS & GIB - including GIS to GIS, GIS to GIB, GIS/GIB to Earth Mesh on Floor and Earth Mesh at risers and to Earth Mat (40 mm dia MS Rod) by Welding/Brazing/bolting/clamping				
A8.1	GIS to GIS Earthing by Aluminium / Copper Strip and Braide ( Supply Scope BHEL)	mtr	200	54.19	10838.21
A8.2	Earthing by GI Flat 75x12 ( Supply Scope - ETC Contractor )	mtr	500	437.36	218681.28
A8.3	Earthing by GI Flat 50x 6 ( Supply Scope - ETC Contractor )	mtr	500	183.72	91860.63
A8.4	MS Rod (Supply Scope - BHEL)	mtr	100	162.75	16275.00
<b>C</b>	<b><u>Storage ,Handling and Handover of Mandatory Spares and Testing Equipment to the customer( Supply Scope-BHEL)</u></b>	Lot	1	86705.67	86705.67
C1	Spare Parts as per Annexure C				
C2	Special Instruments As per Annexure D				
C3	Testing Instruments as per Annexure E				
<b>D</b>	<b><u>Support for HV Test Kit Handling and HV Test of the GIS at Chamera Site.</u></b> HV Test Kit shall be arranged by BHEL.The bidder shall be responsible for following activities to be done strictly in accordance with instruction of the supervising authority but not limited to - 1.Safe Unloading ,Unpacking and Storage of HV Test Kit 2.Setting up the HV Test Kit including assembly at required location in switchyard for HV Test . 3.Cleaning of testing terminals of HV Test Kit subject equipment including making physical connections etc for carrying out the HV Test . 4.Arranging for the power supply to the kit for testing 5.Dismantling, packing and loading of the HV Test kit on carriage after the completion of the HV Test . All the tools and plants and crane( 25 Tonne)/hoist required in this activity shall be arranged by the bidder including appropriate lifting tools like ropes,sling and winch etc.The bidder shall also arrange for competent foreman,testing engineer/electrician ,fitter etc for the above work.	Lot	1	108382.09	108382.09
<b>E</b>	<b><u>Cabling</u></b>				
E1	Cabling between LCC and Existing Aux Power Distribution Boards ( As per E3.1 )	-	-		
E2	Cabling between LCC and BHEL Make GIS ( As per E3.2 )	-	-		
E3	<b><u>Cabling</u></b> including laying, dressing and termination of cables - laying can be either on supports, underground, over ground etc. All other erection materials viz. ferrules, lugs, cable ties / straps, markers etc. to be included in the quoted rates. Cable tags at 30 M intervals and at turning points, cable route markers for burried cables etc. to be included in the quoted rates.	-	-		
<b>E3.1</b>	<b><u>1.1kV Power cables</u></b>	-	-		
a)	3.5 C x 35 sq.mm PVC/ Al.	kM	0.1	48432.17	4843.22
b)	4 C x 16 sq.mm PVC/ Al.	kM	0.45	30270.11	13621.55
c)	2 C x 25 sq.mm PVC/ Tinned Cu	kM	1	30270.11	30270.11
d)	1 C x 120 sq.mm PVC/ Tinned Cu	kM	0.125	48432.17	6054.02
<b>E3.2</b>	<b><u>1.1kV PVC/CU Control cable</u></b>				
a)	4C x 6 mm <sup>2</sup> PVC Tinned Cu Cable	kM	1.2	44436.66	53323.99
b)	4C x 4 mm <sup>2</sup> PVC Tinned Cu Cable	kM	1.45	43352.84	62861.61
c)	5C x 2.5 mm <sup>2</sup> PVC Tinned Cu Cable	kM	0.25	48771.94	12192.99
d)	10C x 2.5 mm <sup>2</sup> PVC Tinned Cu Cable	kM	3	54191.05	162573.14
e)	14C x 2.5 mm <sup>2</sup> PVC Tinned Cu Cable	kM	1.8	59610.15	107298.27
f)	19C x 2.5 mm <sup>2</sup> PVC Tinned Cu Cable	kM	1.9	59610.15	113259.29
g)	2C x 2.5 mm <sup>2</sup> PVC Tinned Cu Cable	kM	0.25	41185.19	10296.30
<b>E4</b>	<b><u>Cable Glands</u></b>				
	<b>Supply and Fitting of Double Compression Nickel Plated Brass Cable Glands as per IS 12943 and BS 6121 for following cables. (Glands shall be supplied of Reputed Make which shall be subject to BHEL/ Customer Approval). Refer enclosed Annexure-3 regarding specification of cable glands.</b>				
<b>E4.1</b>	<b><u>Glands for 1.1kV Power cables</u></b>				
a)	3.5 C x 35 sq.mm PVC/ Al.	Nos.	2	605.40	1210.80
b)	4 C x 16 sq.mm PVC/ Al.	Nos.	8	605.40	4843.22
c)	2 C x 25 sq.mm PVC/ Tinned Cu	Nos.	14	605.40	8475.63
d)	1 C x 120 sq.mm PVC/ Tinned Cu	Nos.	2	605.40	1210.80

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<b>E4.2</b>	<b>Glands for 1.1kV PVC/CU Control cable</b>				
a)	4C x 6 mm <sup>2</sup> PVC Tinned Cu Cable	Nos.	12	605.40	7264.83
b)	4C x 4 mm <sup>2</sup> PVC Tinned Cu Cable	Nos.	20	605.40	12108.04
c)	5C x 2.5 mm <sup>2</sup> PVC Tinned Cu Cable	Nos.	2	847.56	1695.13
d)	10C x 2.5 mm <sup>2</sup> PVC Tinned Cu Cable	Nos.	40	847.56	33902.52
e)	14C x 2.5 mm <sup>2</sup> PVC Tinned Cu Cable	Nos.	22	847.56	18646.39
f)	19C x 2.5 mm <sup>2</sup> PVC Tinned Cu Cable	Nos.	22	1210.80	26637.70
g)	2C x 2.5 mm <sup>2</sup> PVC Tinned Cu Cable	Nos.	6	605.40	3632.41
<b>F</b>	<b>INSTALLATION OF CABLE TRAY AND CABLE RACKS (Supply of Material in BHEL Scope)</b>				
F1	Installation of Cable Rack assembly of 1/2 tier arrangement and fixing it with anchor fastners.	Nos	20	812.87	16257.31
F2	Laying of Cable Tray : Including bends,tees,elbows,reducers,stiffners,coupler plates,bolting to racks,structure etc to complete				
F2.1	150mm to 750 mm wide cable tray of 2.5 mtrs length (ladder type)	mtr	20	246.75	4935.00
F2.2	150mm to 750 mm wide cable tray of 2.5 mtrs length (perforated type)	mtr	20	236.25	4725.00
<b>G</b>	<b>Watch and Ward - Material Security</b>				
G1	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)	Month	6	31500.00	189000.00
	<b>Total Amount (Rs.)</b>				<b>2223557.17</b>
	<b>Notes:</b>				
1	<b>Bidders to quote a percentage above/ below/ at par the item rate mentioned in the BOQ. The quoted percentage shall be applicable uniformly on all item rates of BOQ. The Percentage to be quoted in price schedule format attached with this BOQ.</b>				
2	Loading / Unloading, handling, shifting to & from stores, proper storage, assembly, installation, pre-commissioning test and commissioning tests are included in the scope of the bidder.				
3	The T & P required for carrying out shifting , storage and erection of the above items shall be arranged by the bidder (Like Trolley,Crane,Wagons,Scaffolding with Clamps,Manlift etc ) .				
4	Erection, Work Force, Means and General Tools to be provided by the bidder. <b>As per Annexure F.</b>				
5	Drilling/anchoring in RCC for fixing bolts with chemical grouts for GIS erection shall be in the bidders scope.				
6	All paint, welding electrode and other Consumables required for the GIS erection shall be arranged by ETC Contractor and its cost shall be included in the bid.				
7	Quantities given above may change to any extent.				
8	Supervision of erection for 400 kV GIS is in GIS supplier scope. Providing skilled man power and tools & tackles for GIS erection is in ETC contractor's scope				
9	Minor Civil work including modification of existing foundation like chipping, Anchoring, Drilling, grouting, earthing work and concreting, required for foundation work etc. to finish the work shall be in bidders scope.				
10	<b>Drawings Enclosed:</b>				
11	Mandatory Maintenance T and P and duly calibrated testing instruments shall be arranged on returnable basis by the bidder -	lot	1		
11.01	Wheeled maintenance unit/Mobile platform	Nos	1		
11.02	Portable gas leak detector	Nos.	1		
11.03	Hygrometer/Dew Point Measurement Kit	Nos.	1		
11.04	Portable dust counter	Nos.	1		
11.05	Special gas mask for GIS maintenance	Nos.	5		
11.06	Vacuum meter	Nos.	1		
11.07	Operational Analyser with DCRM	Nos.	1		
11.08	Partial discharge measurement set	Set	1		
11.09	1 ph Variac	Nos.	1		
11.1	Power operated insulation tester/Megger (5kV/1kV)	Nos.	1		
11.11	Tong testers of suitable ranges	Nos.	1		
11.12	Contact resistance measuring (CRM)	Nos.	1		
11.13	Capacitance measurement unit/Tan Delta Kit	Nos.	1		
11.14	Primary Current Injection Kit	Nos	1		
11.15	Multimeters	Nos	1		

**(ANNEXURE-II)**

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

**PRICE SCHEDULE FORMAT**

**SUB: RECEIPT OF EQUIPMENT/ MATERIAL AT SITE, UNLOADING, INSPECTION, VERIFICATION, STORAGE, UP-KEEPING DURING STORAGE, ERECTION, TESTING, COMMISSIONING AND HANDING OVER OF 400KV GIS AT CHAMERA IN HIMACHAL PRADESH**

I/ We hereby agree to execute the above work at ----- % (in figure) -----  
Percentage (in words) Above / Below/ at Par the rates of items given in BOQ for erection testing and commissioning work (Annexure-I) of subject tender.

**NOTE:**

1. 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 unit rate uniformly.

Date:

Place

Signature of tenderer

Name & Designation of authorized person(s) with seal

**ANNEXURE-III**

**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 GIS AT CHAMERA IN HIMACHAL PRADESH**

**Tender Spec. No. TBSM/CHAMERA/ETC/TENDER/02, Date: 18.11.2016**

<b>SI No.</b>	<b>Description</b>	<b>Amount (Rs.)</b>
1	Total amount as per the rates in BOQ for ETC works (Annexure-I)	22,23,557.17
2	Applicable percentage above/below/ at Par to the total amount in BOQ for ETC works (As indicated in Price Schedule Format, Annexure - A).	.....% above/below/ at par
3	<b>Total amount of ETC works after consideration of percentage above/below/ at par.</b>	