

ANNEXURE-I

Project : MANGDECHHU HYDROELECTRIC POWER PROJECT (4X180MW) in Bhutan
 Customer : Mangdechhu Hydroelectric Project Authority, Thimphu, Bhutan
 Consultant : NHPC, Faridabad

REV-02

Package: Erection, Testing & Commissioning for 400kV Pothead Yard of Mangdechhu Hydroelectric Project (4x180MW), Trongsa, Bhutan.

SCOPE:

1) Loading/ Unloading, handling, verification & storage of material at site are NOT in bidder's scope. All material shall be stored at BHEL stores. However once material is issued from BHEL stores to contractor, all responsibility of material shall lie with the contractor.
 2) Bidder shall complete Erection, Testing & Commissioning of 400kV Pothead Yard as per the following BOQ. Any local transportation to & from stores, store to site or vice versa shall also be in bidder's scope.

S.No.	Supply/ ETC	Voltage Class (kV)	Type	Description	Unit	Quantity	Unit Rate	Total Amount
1	ETC	400 kV	HDB (2500A)	3 Ph, Isolator, motor/ manual operated complete with 9 nos. of support insulators & terminal connectors and interpole cabling without support structure				
1.1				- with one earth switch (motor/ manual operated, normal type)	Nos.	4	38,500.00	1,54,000.00
2	ETC	400 kV	1000A	1 Ph, Current Transformer (1000 A), dead tank complete with terminal connectors without support structure.	Nos.	12	20,166.67	2,42,000.00
3	ETC	400 kV		1 Ph, CVT complete with terminal connector without support structure.	Nos.	12	19,666.67	2,36,000.00
4	ETC	336 kV	20kA	1 Phase, Gapless type Metal Oxide Surge Arrester complete with surge counter, leakage current meter, insulating base, connecting cable and terminal connectors.	Nos.	12	17,333.33	2,08,000.00
5	ETC	400 kV	Solidcore	Post Insulators complete with terminal connectors without support structure	Nos.	4	16,500.00	66,000.00
6	ETC			Marshalling Kiosks & CT / CVT Junction Boxes				
6.1				Bay Marshalling Kiosks (Outdoor, Floor mounted on cable trench)	Nos.	1	12,000.00	12,000.00
6.2				CT Junction Box (on foundation/structure)	Nos.	4	7,000.00	28,000.00
6.3				VT Junction Box (on foundation/structure)	Nos.	4	7,000.00	28,000.00
7	ETC			Galvanised steel Lattice Structures including hardwares for Towers, beams & equipment support	MT	100	22,000.00	22,00,000.00
8	ETC			Stringing hardware				
8.1	400 kV	400 kV	Double Tension	Tension insulator string with double/single anchoring point , string comprising 2X25 nos. disc with hardware set with all accessories including tension clamp with/ without Turn Buckle set suitable for twin/quad conductor.	Set	3	25,000.00	75,000.00
8.2		400 kV	Single Suspension	Suspension insulator string comprising 1X25 nos. disc with hardware set with all accessories including drop/through type suspension clamp suitable for single/twin/quad conductor.	Set	3	20,666.67	62,000.00
9	ETC	-	7/9 SWG	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	450	116.67	52,500.00
10	ETC	-	ACSR Moose	Conductor complete with Tee connectors for droppers to equipment connections, PG clamps for busbar jumpering, Twin/Quad bundle spacers etc to complete.	Km	1.3	1,46,153.85	1,90,000.00
11a	SUPPLY		4.0"	Supply of Al Tube (Tube to be supplied in 7/6/5m cut lengths. Cut length wise quantity shall be provided by BHEL after award of order.) Technical specifications of Al. tube to be supplied by bidder shall be as per Annexure-E2.	m	280	1,406.00	3,93,678.70
11b	ETC		4.0"	ETC of Al Tube (ETC of Al.Tube includes Aluminium welding and bending. Welding sleeve will be supplied by BHEL.)	m	280	1,117.14	3,12,800.00
12	ETC			Cabling including laying, tagging , dressing, ferruling, Glanding, 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 pipe over 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 under item no. 13.				
12.1				Control cables				
12.1.1			PVC	5Cx2.5 sqmm Cu	km	2.0	35,000.00	70,000.00
12.1.2			PVC	7Cx2.5 sqmm Cu	km	1.0	34,000.00	34,000.00
12.1.3			PVC	10Cx2.5 sqmm Cu	km	2.0	45,000.00	90,000.00
12.1.4			PVC	14Cx2.5 sqmm Cu	km	2.0	66,000.00	1,32,000.00
12.1.5			PVC	19Cx2.5 sqmm Cu	km	2.0	70,000.00	1,40,000.00
12.2				Auxiliary Power cables				
12.2.1			PVC	2Cx6 sqmm Al	km	1.0	50,000.00	50,000.00
12.2.2			PVC	4Cx6 sqmm Al	km	1.0	80,000.00	80,000.00
12.2.3			PVC	4Cx16 sqmm Al	km	1.0	90,000.00	90,000.00
13	SUPPLY			Nickel Chrome - Plated brass cable glands, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc for the following cables (Bidder's Scope under this item is to supply only & ETC is covered under item no. 12) Overall Qty may vary by ±50% Technical specifications of Cable glands to be supplied by bidder shall be as per Annexure-E1.				

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S.No.	Supply/ ETC	Voltage Class (kV)	Type	Description	Unit	Quantity	Unit Rate	Total Amount
13.1				Control cables				
13.1.1			PVC	5Cx2.5 sqmm Cu	Nos.	150	493.33	74,000.00
13.1.2			PVC	7Cx2.5 sqmm Cu	Nos.	70	1,037.14	72,600.00
13.1.3			PVC	10Cx2.5 sqmm Cu	Nos.	30	1,866.67	56,000.00
13.1.4			PVC	14Cx2.5 sqmm Cu	Nos.	20	1,740.00	34,800.00
13.1.5			PVC	19Cx2.5 sqmm Cu	Nos.	70	1,157.14	81,000.00
13.2				Auxiliary Power cables				
13.2.2			PVC	2Cx6 sqmm Al	Nos.	20	660.00	13,200.00
13.2.3			PVC	4Cx6 sqmm Al	Nos.	10	1,200.00	12,000.00
13.2.4			PVC	4Cx16 sqmm Al	Nos.	10	1,240.00	12,400.00
14	ETC		Perforated type	Laying of Cable trays : including bends, tees, elbow, reducers, stiffeners coupler plates, bolting to racks, structure etc. to complete.				
14.1				100 to 750 mm wide, 2.5 M long Perforated type	Nos.	44	3,481.82	1,53,200.00
15	ETC		BOLTED	Cable Rack work for BOLTED TYPE steel racks for trenches in outdoor switchyard and OR indoor area. Cable rack assembly will be of 1/2 tier. (Bolted type Cable Rack/Tray material shall be free issued by BHEL.)				
15.1				Cable racks 1 & 1/2 tier assembly	Nos.	37	2,362.16	87,400.00
16a	SUPPLY		GI PIPE	Supply of GI conduits & accessories as per technical specification Annexure-E3				
16a.1				50mm diameter GI pipe with socket at one end & threaded at both ends	m	1500	237.00	3,55,500.00
16a.2				90 Deg. Bend for 50mm diameter GI pipe with socket at one end & threaded at both ends	Nos.	100	375.00	37,500.00
16a.3				Tee Bend for 50mm diameter GI pipe with socket at one end & threaded at all ends	Nos.	50	310.00	15,500.00
16a.4				Sockets for 50mm diameter GI pipe	Nos.	50	85.00	4,250.00
16a.5				100mm diameter GI pipe with socket at one end & threaded at both ends	m	1500	580.00	8,70,000.00
16a.6				90 Deg. Bend for 100mm diameter GI pipe with socket at one end & threaded at both ends	Nos.	400	1,500.00	6,00,000.00
16a.7				Tee Bend for 100mm diameter GI pipe with socket at one end & threaded at all ends	Nos.	60	800.00	48,000.00
16a.8				Sockets for 100mm diameter GI pipe	Nos.	200	185.00	37,000.00
16b	ETC		GI PIPE	Laying of GI conduits at a depth of 300mm including excavation, backfilling, making holes in RCC/ brick walls and repairing of walls in trenches, cutting, threading, fixing of sockets/ bends where required etc. complete. <u>Both ends of GI conduits shall be closed by by suitable material as per instruction of site-incharge.</u> (Payment will be made for the as erected pipe length)				
16b.1				GI pipe, 50 NB	m	1500	246.67	3,70,000.00
16b.2				GI Pipe, 100 NB	m	1500	353.33	5,30,000.00
17	ETC			Fixing of GI Pipes on Lattice/ Pipe Structure including clamping, fixing of sockets/ bends as required etc. complete. Both ends of GI Pipes shall be closed by plastering. (Payment will be made for the as erected pipe length)				
17.1				50 mm dia	m	50	520.00	26,000.00
17.2				100 mm dia	m	100	800.00	80,000.00
18	ETC			Earthing material- The earthing includes earthing of all potheadyard equipment, towers, lattice structure, cable trenches, fence, electrode for LA, CVT & towers with peak 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 MOM boxes shall be carried out as per enclosed equipment earthing drawings.				
18.1				75 x 12 mm GI Flat	m	2500	140.00	3,50,000.00
18.2				50 x 6 mm GI Flat	m	750	146.67	1,10,000.00
19	ETC			Installing of 40 mm diameter Rod Electrode without test pit/link as per Equipment Earthing drawing including following works including following works: - excavation/hammering of rod in earth - installing the rod electrode - backfilling and compaction - any other work necessary to complete the work (40 mm Diameter MS rod will be supplied by BHEL)	Nos.	20	10,000.00	2,00,000.00

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S.No.	Supply/ ETC	Voltage Class (kV)	Type	Description	Unit	Quantity	Unit Rate	Total Amount
20	ETC			Installing of 40/100 mm dia GS pipe Electrode (length - 3.0 Mtr) with test links and treated earth pit as per Equipment Earthing drawing with CI frame and hinged cover alongwith all associated civil works i.e - excavation - installing the pipe electrode with alternate layers of Coke & charcoal, salt - backfilling and compaction - Casting the Test Pit with Cast Iron covers - any other work necessary to complete the work (Only GI Pipe, Nuts, Bolts & Washers, test links will be supplied by BHEL. Other items like CI frame, CI cover, charcoal, salt etc shall be supplied by contractor)	Nos.	12	18,000.00	2,16,000.00
21	ETC			Fabrication & laying of Auxiliary Mat of 40 mm Dia MS Rods at a depth of 300 mm from top of FGL including excavation & backfilling as per Equipment Earthing drawing & connection with existing main earthmat - any other work necessary to complete the laying of earthmat (40 mm Diameter MS rod will be supplied by BHEL)	Nos.	24	5,166.67	1,24,000.00
22	ETC			Handing over of Essential/ Mandatory spares to Customer as per Annexure-A	Lot	1	50,000.00	50,000.00
23	SUPPLY & ETC			Supply & ETC of Customer/ BHEL approved make 0.5 HP Automatic Start/ Stop type Centrifugal pump and accessories for sump pit	Nos.	1	30,000.00	30,000.00
24	SUPPLY			Supply of Equipment Erection hardware (nuts, bolts, washers) required for erecting Switchyard equipments. (Bidder's Scope is to supply only & ETC is covered under the ETC of individual equipments) Technical specifications of Hardware to be supplied by bidder shall be as per Annexure-E4.	Kg	100	66.30	6,630.00
							TOTAL	96,02,958.70

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

1	This is a percentage rate tender. 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 (Annexure-I) attached with this BOQ.
2	Pothed yard ETC work shall be completed in 2 phases. Phase-1 shall involve ETC of all towers & gantry structure. Remaining all ETC work including equipment ETC shall be completed in Phase-2. Bidder shall arrange necessary manpower for both the phases within 15 days of intimation provided by BHEL Site Incharge.
3	Loading/ Unloading, handling, verification & storage of material at site are NOT in bidder's scope. All material shall be stored at BHEL stores. However once material is issued from BHEL stores to contractor, all responsibility of material shall lie with the contractor.
4	Any local transportation to & from stores, store to site or vice versa, assembly of material for erection, installation, pre-commissioning test and commissioning tests (as per BHEL FQP) are included in bidder's scope.
5	All the drawings and documents as per Annexure-1 shall be followed for ETC work.
6	Minor Civil works such as modification of civil foundations, making holes in the trenches, grouting, fixing of trench material will be in the scope of ETC contractor.
7	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.
8	The quantities given in items mentioned above may undergo a change to any extent. However, overall value of contract shall be within $\pm 30\%$.
9	Quoted rates are deemed to be inclusive of miscellaneous works viz erection of clamps and connectors.
10	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.
11	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.
12	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.
13	Welding of Aluminium tubes (supply of welding sleeve excluded) as per Annexure-B 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.
14	Any bending machine required for bending of Aluminium tubes and any other equipment will be in ETC Contractor scope.
15	Supervision of erection, Testing & commissioning of all 400kV Isolators shall be done by supplier. Necessary manpower support, tools, tackles etc shall be in the scope of ETC contractor.
16	For specification of Cable Glands, Aluminium tube, GI Pipe & accessories and erection hardware refer Annexure-E1, E2, E3 & E4 respectively.
17	Scope for spare items shall include shifting to and from stores and handing over to customer.
18	Testing instruments (duly 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 successful completion of ETC work shall be in ETC contractor's scope),
18.1	Capacitance and Tan delta measurement Kit
18.2	5kV/1kV Megger
18.3	Primary current Injection Kit
18.4	Secondary current/Voltage Injection kit
18.5	1Ph Variac
18.6	Multimeters
18.7	Clamp on meter

(ANNEXURE-II)

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

PRICE SCHEDULE FORMAT

SUB: RECEIPT OF EQUIPMENT/ MATERIAL AT SITE, INSPECTION, VERIFICATION, ERECTION, TESTING, COMMISSIONING AND HANDING OVER OF 400KV POTHEAD YARD OF MANGDECHHU HYDROELECTRIC PROJECT (4X180MW), TRONGSA, BHUTAN.

- (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) 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). 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).

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, INSPECTION, VERIFICATION, ERECTION, TESTING, COMMISSIONING AND HANDING OVER OF 400KV POTHEAD YARD OF MANGDECHHU HYDROELECTRIC PROJECT (4X180MW), TRONGSA, BHUTAN

SI No.	Description	Amount (Rs.)
1	Total Amount for ETC work of 400kV pothead yard of Mangdechhu Hydroelectric Project (4X180MW), Trongsa, Bhutan (Annexure-I)	96,02,958.70
2	Value of percentage above/below/at par (As indicated in Price Schedule Format, Annexure-II) applicable to the total amount mentioned at sl. no. 1 above.% above/below/ at par
3	Total amount after consideration of percentage above/below/ at par.	