

Project : 220/132 kV SWITCHYARD AT TALCHER

Customer : NATIONAL THERMAL POWER CORPORATION

**Bill of Quantities for ETC Works**

S.No.	Description	Unit	Qty.	Remarks	Rate	Amount
<b>1</b>	<b>MAIN EQUIPMENT</b>					
	<b>Breakers</b>					
1.1	245KV, 1600/2500A, SF6, Circuit Breaker alongwith support structure, Rigid / Expansion type terminal connectors for Al tube / ACSR Moose, Breaker Control Cabinets and interpole cabling	nos.	13			
1.3	132KV, 1250/1600A, SF6, Circuit Breaker alongwith support structure, Rigid / Expansion type terminal connectors for Al tube / ACSR Moose, Breaker Control Cabinets and interpole cabling	nos.	11			
1.3	Breaker/ Gas Maintenance Equipment	Lot		No Erection required		
1.31.	SF6 Gas filling & evacuating unit (Portable)	No.	1			
1.3.2	SF6 Gas drying, recycling and purifying plant (600 litres)	No.	1			
1.3.3	SF6 Gas leak detector	No.	1			
1.3.4	SF6 gas analysing equipment for Moisture and SF6 content	No.	1			
<b>2</b>	<b>Isolators</b>					
2.1	<b>245kV Isolators</b>					
2.1.1	245 kV, 1600/2500A, 3 phase Central post rotating Double Break, motor operated (Standard- mechanically ganged) isolator, <b>mounting on existing gantries at 17 meters height</b> complete with support insulators, Rigid / Expansion type terminal connectors for Al tube / ACSR Moose					
2.1.1.1	- without earth switch	nos.	6			
2.1.1.2	- with one earth switch	nos.	4			
2.1.2	245 kV, 1600/2500A, 3 phase Central post rotating Double Break, motor operated (Standard- mechanically ganged) isolator, <b>mounting on existing structures at 9 meters height</b> complete with support insulators, Rigid / Expansion type terminal connectors for Al tube / ACSR Moose					
2.1.2.1	- without earth switch	nos.	3			
2.1.3	245 kV, 1600/2500A, 3 phase Central post rotating Double Break, motor operated (Standard- mechanically ganged) isolator, <b>mounting on existing gantries at 7 meters height</b> complete with support insulators, Rigid / Expansion type terminal connectors for Al tube / ACSR Moose					
2.1.3.1	- without earth switch	nos.	3			
2.1.4	245 kV, 1600/2500A, 3 phase Central post rotating Double Break, motor operated (Standard- mechanically ganged) isolator, <b>mounting on existing structures at 5 meters height</b> complete with support insulators, Rigid / Expansion type terminal connectors for Al tube / ACSR Moose					
2.1.4.1	- with one earth switch	nos.	2			
2.1.5	245 kV, 1600/2500A, 3 phase Central post rotating Double Break, motor operated (Standard- mechanically ganged) isolator, <b>mounting on existing gantries at 3 meters height</b> complete with support insulators, Rigid / Expansion type terminal connectors for Al tube / ACSR Moose					
2.1.5.1	- with two earth switch	nos.	3			
2.1.6	245 kV, 1600/2500A, 3 phase Central post rotating Double Break, motor operated (Standard- mechanically ganged) isolator, <b>mounting on existing structures at 3 meters height</b> complete with support insulators, Rigid / Expansion type terminal connectors for Al tube / ACSR Moose					
2.1.6.1	- without earth switch	nos.	10			
2.1.6.2	- with one earth switch	nos.	6			
2.1.6.2	- with two earth switch	nos.	3			
2.2	<b>145kV Isolators</b>					
2.2.1	145 kV, 1250/1600A, 3 phase Central post rotating Double Break, motor operated (Standard- mechanically ganged) isolator, <b>mounting on existing gantries at 12 meters height</b> complete with support insulators, Rigid / Expansion type terminal connectors for Al tube / ACSR Moose					

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2.2.1.1	- without earth switch	nos.	12			
2.2.1.2	- with one earth switch	nos.	8			
2.2.1.3	- with two earth switch	nos.	2			
2.2.2	145 kV, 1250/1600A, 3 phase Central post rotating Double Break, motor operated (Standard- mechanically ganged) isolator, <b>mounting on existing structures at 6 meters height</b> complete with support insulators, Rigid / Expansion type terminal connectors for Al tube / ACSR Moose					
2.2.2.1	- without earth switch	nos.	2			
2.2.2.2	- with one earth switch	nos.	2			
2.2.3	145 kV, 1250/1600A, 3 phase Central post rotating Double Break, motor operated (Standard- mechanically ganged) isolator, <b>mounting on existing gantries at 6 meters height</b> complete with support insulators, Rigid / Expansion type terminal connectors for Al tube / ACSR Moose					
2.2.2.1	- with two earth switch	nos.	4			
<b>3</b>	<b>Capacitive voltage Transformer</b>					
3.1	245KV , CVT, 1 Phase, complete with Line terminal connector, mounting on existing GS supporting structure	nos.	24			
3.2	145KV , CVT, 1 Phase, complete with Line terminal connector, mounting on existing GS supporting structure	nos.	24			
<b>4</b>	<b>Current Transformer</b>					
4.1	245KV, Current Transformer, 1 Phase, complete with Rigid / Expansion type terminal connectors for Al tube / ACSR Moose and mounting on existing GS supporting structure	nos.	39			
4.2	145KV, Current Transformer, 1 Phase, complete with Rigid / Expansion type terminal connectors for Al tube / ACSR Moose and <b>mounting on existing GS supporting structure</b>	nos.	31			
4.3	145KV, Current Transformer, 1 Phase, complete with Rigid / Expansion type terminal connectors for Al tube / ACSR Moose and <b>new GS supporting structure</b>	nos.	8			
<b>5</b>	<b>Post Insulators</b>					
<b>5.1</b>	<b>245kV Post Insulator</b>					
5.1.2	245kV Post Insulators for Bus support complete with corona ring, terminal connector and mounting on existing structure at standard height	nos.	59			
5.1.2	245kV Post Insulators for Bus support complete with corona ring, terminal connector and mounting on existing structure at 6 mt height	nos.	12			
5.1.3	245kV Post Insulators for Bus support complete with corona ring, terminal connector and mounting on existing gantries at 17 mt height	nos.	12			
5.1.4	245kV Post Insulators for Bus support complete with corona ring, terminal connector and mounting on existing gantries at 3 mt height	nos.	6			
5.2.5	245kV Post Insulators for wave trap	nos.	24			
<b>5.2</b>	<b>145kV Post Insulator</b>					
5.2.1	145kV Post Insulators for Bus support complete with terminal connector and mounting on existing tower at 18 mt height	nos.	6			
5.2.2	145kV Post Insulators for Bus support complete with terminal connector and mounting on existing gantries at 6 mt height	nos.	30			

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S.No.	Description	Unit	Qty.	Remarks	Rate	Amount
5.2.3	145kV Post Insulators for Bus support complete with terminal connector and mounting on existing gantries at 12 mt height	nos.	3			
5.2.4	145kV Post Insulators for Bus support complete with terminal connector and mounting on existing structure at standard height	nos.	18			
6	<b>LT Switchgear</b>					
6.1	415V LV AC Distribution Board consisting of 3 Incomers, 2B/C & 62 Nos. outgoing feeders	Sets	1			
6.2	220V LV DC Distribution Board consisting of 2 Incomers, 1B/C & 60 Nos. outgoing feeders	Sets	1			
6.3	48V LV DC Distribution Board consisting of 2 Incomers, 1B/C & 30 Nos. outgoing feeders	Sets	1			
7	<b>Battries</b>					
7.1	220V, 400AH Plante Battery or 220V, 250AH Nickle Cadmium	Sets	2			
7.2	48V, 400AH Plante Battery or 48V, 250AH Nickle Cadmium	Sets	1			
8	<b>Battery Charger system</b>					
8.1	80A, 220V DC Battery charger (Float cum boost)	Sets	2			
8.2	80A, 48V DC Battery charger (Float cum boost)	Sets	1			
9	<b>BUS BAR MATERIALS</b>					
9.1	245 kV, Double Tenstion Insulator string with double anchoring point, comprising 1x15 nos 120 kN Anti fog discs per string complete with compression type / bolted tension clamp set, including corona ring, with / without turn buckle set <b>suitable for Twin Moose.</b>	set	108			
9.2	245 kV, Double Tenstion Insulator string with double anchoring point, comprising 1x15 nos 120 kN Anti fog discs per string complete with compression type / bolted tension clamp set, including corona ring, with / without turn buckle set <b>suitable for Single Moose.</b>	set	126			
9.3	245 kV, Single suspension Insulator string comprising 15 nos 120 kN Anti fog discs complete with <b>drop type / through type</b> suspension clamp set, including corona ring, suitable for <b>Quad Moose.</b>	set	21			
9.4	245 kV, Single suspension Insulator string comprising 15 nos 120 kN Anti fog discs complete with <b>straight clamp set</b> , including corona ring, suitable for <b>Twin Moose.</b>	set	54			
9.5	245 kV, Single suspension Insulator string comprising 15 nos 120 kN Anti fog discs complete with <b>straight clamp set</b> , including corona ring, suitable for <b>Single Moose.</b>	set	14			
9.6	132 kV, Double Tenstion Insulator string with double anchoring point, comprising 1x10 nos 120 kN Anti fog discs per string complete with compression type / bolted tension clamp set, including corona ring, with / without turn buckle set suitable for <b>Twin Moose.</b>	set	60			
9.7	132 kV, Double Tenstion Insulator string with double anchoring point, comprising 1x10 nos 120 kN Anti fog discs per string complete with compression type / bolted tension clamp set, including corona ring, with / without turn buckle set suitable for <b>Single Moose.</b>	set	120			
9.8	132 kV, Single suspension Insulator string comprising 10 nos 120 kN Anti fog discs complete with <b>drop type / through type</b> suspension clamp set, including corona ring, suitable for <b>Quad Moose.</b>	set	-			

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S.No.	Description	Unit	Qty.	Remarks	Rate	Amount
9.9	132 kV, Single suspension Insulator string comprising 10 nos 120 kN Anti fog discs complete with <b>straight clamp set</b> , including corona ring, suitable for <b>Twin Moose</b> .	set	36			
9.1	132 kV, Single suspension Insulator string comprising 10 nos 120 kN Anti fog discs complete with <b>straight clamp set</b> , including corona ring, suitable for <b>Single Moose</b> .	set	-			
9.11	Disc insulator for 132kV Wave Trap	set	3			
9.12	GS Stranded Shield wire, 7/9 SWG, 10.98 mm dia including tension clamp, PG clamp and clamping on structure for down conductor, fixing/bolting with earth strip etc to complete.	m	1,800			
9.13	ACSR "Moose" conductor complete with tee connectors for droppers to equipment connections, PG clamps for busbar jumpering, Twin / Quad bundle spacers etc to complete.	m	9,000			
9.14	4 " IPS Al tube including cutting , bending , Al welding with sleeves, Radiography testing & D.P.Test of 100%welded joints, fixing Corona end bells etc. to complete.	m	1,660			
9.15	220kV Clamps and Connectors of all types suitable for single/twin conductor suitable for Mosse ACSR conductor for busbar connections, bus drops etc in form of TEE connectors, PG clamps, spacers, earthing clamps, shield wire clamps etc.	Lot	1			
9.16	132kV Clamps and Connectors of all types suitable for single/twin conductor suitable for Mosse ACSR conductor for busbar connections, bus drops etc in form of TEE connectors, PG clamps, spacers, earthing clamps, shield wire clamps etc.	Lot	1			
	<b>YARD WORK INCLUDING CABLING, TRENCH &amp; EARTHING.</b>					
10	Cabling including laying, dressing and termination of cables - laying can be either on trays, supports, underground, over ground etc. Glands will be supplied by BHEL and all other erection materials viz. ferrules, lugs, cable ties / straps, markers etc. included in the quoted rates.					
10.1	<b>Control cables- PVC insulated , Copper conductor</b>					
10.1.1	19C, 2.5 sq.mm	m	20,000			
10.1.2	14C, 2.5 sq.mm	m	55,000			
10.1.3	10C, 2.5 sq.mm	m	87,000			
10.1.4	7C, 2.5 sq.mm	m	24,000			
10.1.5	5C, 2.5 sq.mm	m	8,000			
10.1.6	2C, 2.5 sq.mm	m	4,000			
10.2	<b>Auxiliary Power cables, PVC insulated, Al conductor</b>					
10.2.1	1C X 185 SQ.MM PVC / AL	m	1,000			
10.2.2	4C X 25 SQ.MM PVC / AL	m	6,000			
10.2.3	3.5C X 95 SQ.MM PVC / AL	m	6,500			
10.2.4	3.5C X 400 SQ.MM PVC / AL	m	500			
10.2.5	4C X 6 SQ.MM PVC / AL	m	5,000			
10.2.6	2C X 6 SQ.MM PVC / AL	m	2,500			
	<b>Note: The above lengths are subject to change at contract stage. Also these lengths will be laid in various part lengths may be from 15 metres to 500 metres with termination at both ends complete with glands etc.</b>					
11	<b>Trench Material</b>					
11.1	Cable Trench Material consisting of ladder type trays of various width complete with side coupler plate, bolts, nuts, washers etc and also various type of rack assemblies eg., 1/2/3/4 tiers normal or under hung type in various combinations					

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12	Laying of GI conduits including excavation, backfilling, making and repairing of walls in trenches, cutting, threading, fixing of sockets/bends where required etc. complete ( Payment will be made for the as erected pipe length)					
12.1	GI pipe, 50 NB	m	1,250			
12.2	GI Pipe, 100NB	m	2,500			
13	Marshalling Kiosks & CT / CVT Junction Boxes					
13.1	Bay MK	nos.	24			
13.2	CT JB	nos.	24			
13.3	CVT JB	nos.	16			
14	Earthing material- GS strip including cutting, bending, welding with 40 dia MS rod riser/earth strip, applying zinc rich paint, clamping to structure/building wall etc. to complete.		2			
14.1.	75 x12 mm GS Flat	m	3,500			
14.2	50 x 6 mm GS Flat	m	1,000			
14.3	40mm dia MS Rod	MT	15			
	<b>Note: Note for Earthing: The earthing includes earthing of all 220/132kV switchyard equipment, pipe structures, fence and Control room equipments using necessary Connectors for earthing flats.</b>					
15	Galvanised steel structures including hardware	MT				
16	Lattice Structures for Towers , Beams and equipments	MT				
17	<b>CONTROL ROOM EQUIPMENT</b>					
17.1	220kV Control & Relay / Protection panels located either in Switchyard Control room or Power House control room					
17.1.1	Control Panles (1 set = 14 panel)	Set	1			
17.1.2	Line protection panels- Comprising MI & MII protn panels for one line( Total two panels in one set)	Set	6			
17.1.3	125MVA Gen.transformer protection panels (1 set = one panel)	Set	2			
17.1.4	Bus Coupler Protection Panel (1 set = one panel)	Set	1			
17.1.5	20 MVA Station Transformer Panel (1 set = one panel)	Set	2			
17.1.6	160 MVA Auto Transformer Panel (1 set = one panel)	Set	2			
17.2	132kV Control & Relay / Protection panels located either in Switchyard Control room or Power House control room					
17.2.1	Control Panles (1 set = 14 panel) + 1 No relocation	Set	1			
17.2.2	Line protection panels- Comprising MI & MII protn panels for one line( Total two panels in one set)	Set	4			
17.2.3	75MVA Gen.transformer protection panels (1 set = one panel)	Set	4			
17.2.4	Bus Coupler Protection Panel (1 set = one panel)	Set	1			
17.2.5	160 MVA Auto Transformer Panel (1 set = one panel)	Set	2			
17.2.6	<b>Relocation of Station Transformer Panel (1 set = one panel)</b>	<b>Set</b>	<b>2</b>			
17.3	132kV Busbar Protection panel(1 set = four panel)	Set	1			
17.4	132kV Busbar Protection panel(1 set = four panel)	Set	1			
17.5	132kV Metering panel(1 set = two panel)	Set	1			
17.6	132kV Metering panel(1 set = two panel)	Set	1			
17.7	Event logger(1 set = one panel)	No	1			
17.7	TSE (1 set = one panel)	No	2			
17.8	Relay test equipment	No	1			No erection reqd
17.9	Synchronising Trolley	Set	2			No erection reqd
17.1	<b>Generator Protection Panels (1 set = two panel)</b>	Set	4			
17.11	<b>Generator Control Panels (1 set = one panel)</b>	Set	4			
17.12	<b>Relocation of PLCC, EPAX panels</b>	No	22			
17.13	<b>Relocation of Remote Tap changer Panel</b>	No	2			

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S.No.	Description	Unit	Qty.	Remarks	Rate	Amount
17.14	Mounting of 11kV CT on existing Transformer structures					
17.14.1	For ICT REF protection	No	2			
17.14.2	For Station tranformer LV side neutral for REF Protection	No	2			
17.14.3	For Station tranformer HV side neutral for REF Protection	No	2			
17.14.4	For GT REF protection	No.	4			
17.15	PC, Printers & laptops	Set	4			
TOTAL AMOUNT :						No erection reqd

**Notes for ETC works**

- 1 Loading / Unloading, handling, shifting to & from stores, proper storage, assembly, installation, pre-commissioning test and Commissioning tests are included in the scope.
- 2 MS welding - apply red lead paint then aluminium paint then bitumen after welding
- 3 GS welding - apply 2 coats of cold galvanising anti corrosive paint after welding
- 4 10% welding joints in earthing shall be tested for dye penetration test.
- 5 Quoted rates are deemed to be inclusive of miscellaneous works, viz.. Erection of clamps and connectors, phase colour discs etc.