

## BILL OF QUANTITY CUM PRICE SCHEDULE (Annexure-I)

Name of the Work:- BALANCE ETC WORKS OF 765KV/400KV SUBSTATION AT ARIYALUR IN VILLUPURAM REGION IN TAMILNADU

Customer :- M/s TAMILNADU TRANSMISSION CORPORATION LIMITED (TANTRANSCO)

Tender Spec. No.:- TBSM/ARIYALUR/BALANCE ETC/TENDER/22-23, Date: 10.05.2022

SR_NO	Description_of_Item	Total Quantity	UOM	Unit Rate (Rs.)	Amount (Rs.)
A1.1	ETC of Cable - 28C X 2.5 SQ. MM.	2025	Mtrs	38.41	77778.23
A1.2	ETC of Cable - 20C X 2.5 SQ. MM.	3050	Mtrs	27.55	84033.60
A1.3	ETC of Cable - 14C X 2.5 SQ. MM.	3700	Mtrs	30.79	113908.20
A1.4	ETC of Cable - 4C X 2.5 SQ. MM.	3460	Mtrs	27.71	95874.87
A1.6	ETC of Cable - 14C X 4 SQ. MM.	19740	Mtrs	27.55	543876.48
A1.7	ETC of Cable - 8C X 4 SQ. MM.	6410	Mtrs	33.76	216385.58
A1.8	ETC of Cable - 8C X 2.5 SQ. MM.	7185	Mtrs	17.14	123122.16
A1.9	ETC of Cable - 4C X 4 SQ. MM.	17154	Mtrs	17.34	297373.17
A1.10	ETC of Cable - 2C X 2.5 SQ. MM.	90	Mtrs	17.55	1579.10
A1.12	ETC of Cable - 4C X 50 SQ. MM.	6682	Mtrs	35.45	236863.54
A1.13	ETC of Cable - 2C x 35 SQ. MM.	100	Mtrs	40.03	4002.60
A1.13	ETC of Cable - 4C x 25 SQ. MM.	1757	Mtrs	46.18	81136.50
A1.14	ETC of Cable - 4C x 240 SQ. MM.	350	Mtrs	79.91	27966.75
A2	Balance Cable Works: Glanding of already laid balance work cables with suitable gland ( Gland provided by BHEL )	550	Per End	49.00	26951.93
A3	Balance Cable Works: Termination of already laid balance Cable with continuity checking and ferrule printing & fixing	1436	Per End	79.80	114592.80
A4	Balance Cable Works: Fixing of Aluminium cable Tags at individual Cable End and Trench/road crossing and bending inclusive of aluminium tag supply and punching as per instruction of EIC	3997.2	Nos	13.65	54561.78
A5	Balance Cable Works: Dressing of Interpole cabling in 765 kV, 3-Ph CT with Nylon/ SS Ties as per instruction of EIC along with closing of extra holes in equipment by GI Sheet	22	Per Set	945.00	20790.00
A6	Balance Cable Works: Dressing of Interpole cabling in 765 kV, 3-Ph CB with Nylon/ SS Ties as per instruction of EIC along with closing of extra holes in equipment by GI Sheet	17	Per Set	945.00	16065.00
A7	Balance Cable Works: Dressing of Interpole cabling in 765 kV, 3-Ph ISO - 2ES with Nylon/ SS Ties as per instruction of EIC along with closing of extra holes in equipment by GI Sheet	12	Per Set	945.00	11340.00
A8	Balance Cable Works: Dressing of Interpole cabling in 765 kV, 3-Ph ISO - 1ES with Nylon/ SS Ties as per instruction of EIC along with closing of extra holes in equipment by GI Sheet	32	Per Set	945.00	30240.00
A9	Balance Cable Works: Dressing of Interpole cabling in 765 kV, 3-Ph CVT with Nylon/ SS Ties as per instruction of EIC along with closing of extra holes in equipment by GI Sheet	6	Per Set	945.00	5670.00
A10	Balance Cable Works: Dressing of Interpole cabling in 400 kV, 3-Ph CT with Nylon/ SS Ties as per instruction of EIC along with closing of extra holes in equipment by GI Sheet	20	Per Set	945.00	18900.00
A11	Balance Cable Works: Dressing of Interpole cabling in 400 kV, 3-Ph CB with Nylon/ SS Ties as per instruction of EIC along with closing of extra holes in equipment by GI Sheet	14	Per Set	945.00	13230.00
A12	Balance Cable Works: Dressing of Interpole cabling in 400 kV, 3-Ph ISO - 2ES with Nylon/ SS Ties as per instruction of EIC along with closing of extra holes in equipment by GI Sheet	14	Per Set	945.00	13230.00
A13	Balance Cable Works: Dressing of Interpole cabling in 400 kV, 3-Ph ISO - 1ES with Nylon/ SS Ties as per instruction of EIC along with closing of extra holes in equipment by GI Sheet	31	Per Set	945.00	29295.00
A14	Balance Cable Works: Dressing of Interpole cabling in 400 kV, 3-Ph CVT with Nylon/ SS Ties as per instruction of EIC along with closing of extra holes in equipment by GI Sheet	8	Per Set	945.00	7560.00
A15	Balance Cable Works: Cable Identification, Handling Charges and Dressing with Nylon/ SS Ties as per instruction of EIC along with closing of extra holes in equipment by GI Sheet for each Switchyard Panel Room (SPR) (765kV & 400 kV)	11	Nos	1030.91	11340.02
A16	Balance Cable Works: Cable Identification, Handling Charges and Dressing with Nylon/ SS Ties as per instruction of EIC along with closing of extra holes in equipment by GI Sheet for Control Room Building ( ACDB , DCDB , Control Room	3	Per Room	5670.00	17010.00
A17	Balance Cable Works: Cable Identification, Handling Charges and Dressing with Nylon/ SS Ties as per instruction of EIC along with closing of extra holes in equipment by GI Sheet for Control Room Building (Battery Room , Telecom Room)	2	Per Room	5670.00	11340.00
A18	Balance Cable Works: Dressing of 765 kV & 400 kV control & Power cable with Nylon/SS Ties as per instruction of EIC in Main Trench	2061	Per Route Meter	75.60	155811.60

A19	Balance Cable Works: Dressing of 765 kV & 400 kV control & Power cable with Nylon/SS Ties as per instruction of EIC in Branch Trench	6704	Per Route Meter	37.80	253411.20
A20	Balance Cable Works: Dressing of HDPE Pipe for FO cable laying ( 24 F & 48 F ) as per the instruction of EIC	18500	Mtrs	4.73	87412.50
A21.1	Earthing works with 75x12 MM Flat - works including cutting, bending, bolting/ clamping to structure, Painting, welding with MS Flat/40 mm dia MS rod riser etc. equipment's to be earthed includes all switchyard equipment's, towers , lattice structure, cable trenches, fence, electrodes for neutral of LT transformer/ ICT Transformer/ /NGR/ Reactor/DG Set, Control Room equipment's, SPR equipment's using necessary Connectors for earthing flats. Earthing work to be done as per Drg. no. TB-4-394-316-012, Rev-01 for equipment's earthing and TANTRANSCO Specification for earthing (Annexure-1) Note -1- Only cleat for earthing of MS flat on structure , MS flat and rod electrode shall be supply by BHEL . Note-2- All other required material for earthing shall be in ETC contractor scope. Note -4- The supply of Hardware ( nut, bolt and washer) required for connecting flat on tower of structure , pad of equipment's, MOM box , junction box etc. For bolting of MS flat shall be in contractor scope. painting of MS flat shall be carried out as per customer /BHEL guidelines. Note -5- MS flat shall be painted by the MS Flat welding contractor .	1.845	KM	161625.38	298198.82
A21.2	Earthing works with 50x8 MM Flat - works including cutting, bending, bolting/ clamping to structure, Painting, welding with MS Flat/40 mm dia MS rod riser etc. equipment's to be earthed includes all switchyard equipment's, towers , lattice structure, cable trenches, fence, electrodes for neutral of LT transformer/ ICT Transformer/ /NGR/ Reactor/DG Set, Control Room equipment's, SPR equipment's using necessary Connectors for earthing flats. Earthing work to be done as per Drg. no. TB-4-394-316-012, Rev-01 for equipment's earthing and TANTRANSCO Specification for earthing (Annexure-1) Note -1- Only cleat for earthing of MS flat on structure , MS flat and rod electrode shall be supply by BHEL . Note-2- All other required material for earthing shall be in ETC contractor scope. Note -4- The supply of Hardware ( nut, bolt and washer) required for connecting flat on tower of structure , pad of equipment's, MOM box , junction box etc. For bolting of MS flat shall be in contractor scope. painting of MS flat shall be carried out as per customer /BHEL guidelines. Note -5- MS flat shall be painted by the MS Flat welding contractor .	1.153	KM	138536.04	159732.06
A21.3	Earthing works with 75x12 MM Flat laying at over Height (45m apprx.) for tower	0.495	KM	210112.99	104005.93
A22	Balance Earthing Works: Completion of connection of flat to treated earth for Tower & Equipment inclusive of removal of gravel , excavation as required and backfilling.	228	Mtrs	164.57	37521.16
A23	Balance Earthing Works: Welding of already laid flat ( at Ground level - Flat to riser connection ) inclusive of removal of gravel, soil and backfilling and painting at welding point	60	Nos	182.00	10919.79
A24	Balance Earthing Works: Welding @ Height 6 M for 400 kV yard equipment ( Flat to Flat connection is currently connected by bolt ) (1 Set = 1 no. 3 Ph 400kV Equipment)	72	Set	1790.78	128935.80
A25	Balance Earthing Works: Verification of Welding connection @ Height 9 M for 765 kV yard equipment ( Flat to Flat connection is currently connected by bolt at some places ) (1 Set = 1 no. 3 Ph 765kV Equipment)	153	Set	3171.00	485163.00
A26	Balance Earthing Works: Completion of Welding connection @ Height 9 M for 765 kV yard equipment ( Flat to Flat connection is currently connected by bolt at some places ) (1 Set = 1 no. 3 Ph 765kV Equipment)	76.5	Set	8148.00	623322.00
A27	Balance Earthing Works: Painting works for 400 kV EQP ( wherever painting deteriorated ) for flat and clamp fixing as per site requirement for already executed work (1 Set = 1 no. 3 Ph 400kV Equipment)	36	Set	840.00	30240.00
A28	Balance Earthing Works: Painting works for 765 kV EQP ( wherever painting deteriorated ) for flat and clamp fixing as per site requirement for already executed work (1 Set = 1 no. 3 Ph 765kV Equipment)	76.5	Set	945.00	72292.50
A29	Balance Earthing Works: CB ( Replacement of bolt at CMB & MOM box )	48	Per Box	532.00	25536.17
A30	Balance Earthing Works: Flat to Equipment connection via flexible cable including hardware as required	22	PER EQP	357.00	7854.00
A31	Balance Earthing Works: Deployment of Skilled Manpower ( Welder/ Fitter ) inclusive welding Machine, welding rod and other consumable as required for miscellaneous balance works (works other than those listed in the BOQ)	60	Man Day	945.00	56700.00
A32	Balance Earthing Works: Deployment of Semi-Skilled Manpower for miscellaneous balance works (works other than those listed in the BOQ)	60	Man Day	735.00	44100.00

A33	AAC Bull Conductor: Conductor complete with Tee connectors for droppers to equipment's connections, PG clamps for busbar jumpering, Twin/Quad bundle spacers etc to complete to complete the stringing work are included in the scope	5.3152	KM	113418.12	602840.01
A34	ACSR Bersimis conductor: Conductor complete with Tee connectors for droppers to equipment's connections, PG clamps for busbar jumpering, Twin/Quad bundle spacers etc to complete to complete the stringing work are included in the scope	1.8634	KM	87377.99	162820.14
A35	Balance Conductor Works: Completion of Partially completed works 765 kV yard - Connection of conductor to Al Tube / Equipment via clamps & connector with cutting of extra conductor & spacer fixing as per drawing/ instruction of EIC where conductor is already laid but connection pending	33	Points	5070.23	167317.57
A36	Balance Conductor Works: Completion of Partially completed works 400 kV yard - Connection of conductor to Al Tube / Equipment via clamps & connector with cutting of extra conductor & spacer fixing as per drawing/ instruction of EIC where conductor is already laid but connection pending	6	Points	3097.50	18585.00
A37	Balance Conductor Works: Completion of Partially completed works 400 kV yard - Cutting of extra conductor Length as per drawing/ instruction of EIC where conductor is already laid and connected to Al tube / Equipment via clamp and connector but extra length cutting is pending	45	Points	2520.00	113400.00
A38	Balance Conductor Works: Completion of Partially completed works 400 kV yard - spacer fixing as per drawing/ instruction of EIC where conductor is already laid and connection is done without spacer fixing	42	Points	1890.00	79380.00
A39	4.5" Al Tube (ETC of Al.Tube includes Aluminium welding and bending to be included. Welding sleeve and tube will be supplied by BHEL.)	175	M	485.44	84951.30
A40	4.0" Al Tube (ETC of Al.Tube includes Aluminium welding and bending to be included. Welding sleeve and tube will be supplied by BHEL.)	344	M	384.83	132379.80
A41	3.0" Al Tube (ETC of Al.Tube includes Aluminium welding and bending to be included. Welding sleeve and tube will be supplied by BHEL.)	211	M	346.34	73078.27
A42	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 the earthing connection/stringing work are included in the scope	400	M	57.18	22873.20
A43.1	Laying of 450 mm wide, 2.5 M long 2 mm thick Ladder type GI Ladder type Cable trays: including bends, tees, elbow, reducers, stiffeners coupler plates, bolting to racks, structure etc. to complete. Minor modification work by cutting welding wherever required shall also be part of work. It may be noted that cable tray shall be welded with cable rack assembly	150	No's	97.09	14564.03
A43.2	Laying of 300 mm wide, 2.5 M long 2 mm thick Ladder type GI Ladder type Cable trays: including bends, tees, elbow, reducers, stiffeners coupler plates, bolting to racks, structure etc. to complete. Minor modification work by cutting welding wherever required shall also be part of work. It may be noted that cable tray shall be welded with cable rack assembly	300	No's	97.09	29128.05
A43.3	Cable tray & Rack angle rectification work in patches where tray not welded to angle support / angle support not properly welded to insert plate in trench and other related miscellaneous work for rectification and rectification at turning etc	200	Point	157.50	31500.00
A44.1	Laying of 150 mm wide, 2.5 M long , 2mm thick G.S. steel perforated Cable trays with coupler plates ,hardware , fixing and clamping arrangement with lattice type support equipment's structure etc. to complete. Fixing and clamping hardware required for fixing of perforated tray with lattice structure shall be in ETC contractor scope. (Used for cabling on CT structure)	75	No's	52.56	3942.23
A44.2	Laying of 100 mm wide, 2.5 M long, 2mm thick G.S. steel perforated Cable trays with coupler plates ,hardware , fixing and clamping arrangement with lattice type support equipment's structure etc. to complete. Fixing and clamping hardware required for fixing of perforated tray with lattice structure shall be in ETC contractor scope. (Used for cabling on CVT structure)	75	No's	52.56	3942.23
A45	Cable Rack work includes welding of GI racks on inserts of trench walls in trenches in switchyard and control room/SPR . Cable rack assembly will be of 1/2/3/4 tier. Welds area of Cable racks and supports shall be painted after installation with two coats of metal primer (comprising of red oxide and zinc chromate in a synthetic medium) followed by two finishing coats of aluminium paint. The red oxide and zinc chromate shall conform to IS 2074. Note - GI cable rack shall be supply by BHEL.	1	MT	35591.38	35591.38

A46	Completion of balance work in 765kV, 3-Ph SF6 CB (like ladder alignment, perforated tray fixing, CRM testing etc using fitters and 80 feet manlift) (at present 765kV CB is already installed)	2	Sets	33454.06	66908.12
A47	Completion of balance work in 765kV, 3-Ph Knee type Isolator (like welding of mechanical interlock using fitters and 80 feet manlift, CRM testing, meggering and any other miscellaneous works) (at present 765kV Isolator is already installed)	12	Sets	7984.50	95814.05
A48	Fitters required for testing activities connection at height (for works other than those mentioned in BOQ like numerical relay testing, connecting leads during primary injection, bus bar stability etc)	180	Man Day	945.00	170100.00
A49	Electricians required for testing activities (for works other than those mentioned in BOQ like numerical relay testing, connecting leads during primary injection, bus bar stability etc)	180	Man Day	945.00	170100.00
A50	Completion of balance work in 400kV HDB Isolator (like Alignment and measurement of CRM and anyother miscellaneous work), operating rods needs to be fitted in 05 no's of MOM/EOM boxes	45	Sets	7578.98	341054.28
A51	Fixing and tightening of balance bolts in terminal connectors of 765kV equipments, clamping devices and clamps using 80 feet manlift and fitters with necessary tools.	17	No. of Bays	26425.00	449225.06
A52	Fixing and tightening of balance bolts in terminal connectors of 400kV equipments, clamping devices and clamps using fitters with necessary tools.	14	No. of Bays	9450.00	132300.00
A53	Disposal of cable drum scrap , cable scrap , earthing flat material , structure , conductor scrap and other erection material scrap by moving to open store / other designated area within site premises as directed by EIC	1	Lot	241500.00	241500.00
A54	765kV , 1 Ph , Bus support Insulators (Solid core Post insulator) with corona ring complete with terminal connectors without support structure.	3	No's	6608.55	19825.66
A55	Supply and laying of Fire proof sealing material for cable entry ( make of fire sealing material subject to customer approval)	10	sq mtr	769.64	7696.40
A56	Supply and laying of Water proof sealing material for cable entry ( make of water proof sealing material subject to customer approval)	10	sq mtr	769.64	7696.40
A57	Supply and laying of Fire break material for cable/cable tray ( make of fire break material subject to customer approval)	20	sq mtr	769.64	15392.79
A58	Supplying of insulating Rubber mats 2000x1000x10mm (Class-A as per IS: 15652-2006) and laying in front of Panels	80	sets	1169.84	93586.92
A59	Manufacturing and supply of LC / Key board (Rack) of size 3000 mm , length 1500 mm height made out of 75 x 25 mm aluminium frame embedded with 12mm pre laminated wood particle board using screws rear 2 Nos. of plain glass of 5mm thick fixed with metal roller moving on aluminium channel should be provided on front with locking arrangements. Glass pieces should be fastened on the glass shutter for opening and closing. Wall clamps made out of 6mm M.S.plate should be provided on top & bottom as per drawing and as directed by the field Engineer including cost of all materials.Single line diagram & other required details to be written in finished surface of board with good quality enamel paint.	2	sets	17909.63	35819.26
A60	Supply and fixing of LC / Key Board of size 1800X900X100 mm (Inner size) made out of 10mm Novapan Sheet with Glass doors,Lock with duplicate keys, Key Hocks and drawing of Electrical layout and details as directed by the field engineer	14	sets	13748.29	192476.07
A61	Supply of required size (M12/M16/M20 upto 150mm long) of Anchor Fastner /Bolts and fixing in Concrete/wall/ceiling wherever required.	5	kg	194.17	970.83
A62	Supply and fixing of 12/25x3mm flexible braided copper for electrical connection including the cost of suitable copper lugs for crimping of at both end s/any other purpose as directed by field engineer Note - It is being used for interlinking panel earthing and for providing connectivity wherever necessary / other purpose	150	kgs	1265.41	189811.13
A63	Supply of gauntlets	10	Nos.	1350.26	13502.58
A64	Supply of First aid box	5	Nos.	1350.26	6751.29
A65	Supply of Godrej make 6 lever Navtal lock with triplicate keys with ring & key token as directed by the Engineer	700	Nos.	575.40	402780.00
A66	Supply and erection of Vinyl Sticker cutting/Printing on Vinyl Sticker/Foam board to be used for main equipment's, slogan, name board & any other purpose of required sizes as directed by the field engineer.	20	Sqm	675.13	13502.58
A67	Labour charges for writing details in Finished Surface boards including cost of enamel paint (Dulex,Asian,Berger preferred) and other Condsuables as directed by the field Engineer	40	Sqm	330.81	13232.52

A68	Labour charges for drawing layout and writing details in LC/Key board including cost of enamel paint (Dulex,Asian,Berger preferred) and Other consumables as directed by the field Engineer.	9	Sqm	330.81	2977.32
A69	Labour charges for second finish coat of enamel Painting of bottom of sub station structure and panel bottom frame, Transformer tank/Recator tank, MOM box and wherever required including cost of paint (Dulex,Asian, Berger preferred) wherever required & as directed by the field Engineer	1000	Sqm	61.44	61435.50
A70	Supply and erection of 3-4 mm thick PVC foam type board to be used for main equipment's,slogan,battery name board & any other purpose of required sizes as directed by the field engineer.	90	Sqm	1134.21	102078.90
A71	Supply & fixing of nut type CBTM 5 or equivalent terminal block in panel/box as required and as directed by the field Engineer	250	Nos.	236.29	59073.00
A72	Supply of sand drum made of oil drum of size 580 mm dia. & 420 mm height with conical cover made out of tin sheet provided with handle & painted with white & red enamel paint in side & out side respectively and drum shall be written as Fire in English & Tamil in white enamel paint	5	Nos.	2405.95	12029.75
A73	Supply and fixing of AC 3 phase 4 pole 415V ISI mark 30A changeover switch of reputed make panel mounting such as SWITRON,SALZER,KAYCEE as required and directed by the field Engineer.	2	Nos.	1154.85	2309.71
A74	Supply and fixing of AC 3 phase 4 pole 415V ISI mark 60A changeover switch of reputed make panel mounting such as SWITRON,SALZER,KAYCEE as required and directed by the field Engineer.	2	Nos.	1443.57	2887.14
A75	Fabrication, supply and fitting of AC junction box out of 14 SWG (2.00 MM)MS sheet where ever required as directed by field engineer. The box shall be vermin proof , shall have sturdy hinges provision for mounting MCB and MCCB detachable gland plates and locking arrangements including cost of all materials 500W x 250D x600H	2	Nos.	4330.71	8661.43
A76	Labour charges for removing rust,primer coat first and second coat painting including backside and writing details in M.S boards/including cost of enamel paints (Dulex,Asian,Berger is preferred)and other consumables as directed by the field engineer.	100	Sqm	72.18	7217.70
A77	Supply and fixing of MDS Make Industrial (outdoor)type 8 way 3 phase and neutral A.C Distribution boards(typed47508 RO) suitable for MDS make loadstar type MCB as directed by the field Engineer	2	Nos.	7699.04	15398.08
A78	Supply and fixing of MDS Make Industrial (outdoor)type 8 way Single phase and neutral A.C Distribution boards(typed47508 RI) suitable for MDS make loadstar type MCB as directed by the field Engineer	2	Nos.	7699.04	15398.08
A79	Supply and fixing of reputed MDS make 3 phase 4pole , 30 A MCB of reputed make such as MDS,STANDARD,HAVELLS,SCHENIDER with ISI mark in panels/box for A.C/PT circuits wherever required as directed by the field Engineer.	2	Nos.	7699.04	15398.08
A80	Supply and fixing of reputed MDS make 3 phase 4pole , 60 A MCB of reputed make such as MDS,STANDARD,HAVELLS,SCHENIDER with ISI mark in panels/box for A.C/PT circuits wherever required as directed by the field Engineer.	2	Nos.	11548.56	23097.12
A81	Supply and fixing of reputed MDS make 1 phase MCB 10/16A of reputed make such as MDS,STANDARD,HAVELLS,SCHENIDER with ISI mark in panels/box for A.C/PT circuits wherever required as directed by the field Engineer.	2	Nos.	673.67	1347.34
A82	Supply and fixing of Hylem board 10 mm thick for fixing of fuse units wherever required as directed by the field Engineer.	9	Sqm	336.83	3031.47
A83	Supply & fixing of ISI mark bakelite HRC/rewireable 16A fuse holder in panels/boxes for AC/DC/PT circuits wherever required as directed by the field Engineer.	5	Nos.	336.83	1684.15
A84	Supply & fixing of ISI mark bakelite HRC/rewireable 32A fuse holder in panels/boxes for AC/DC/PT circuits wherever required as directed by the field Engineer.	5	Nos.	216.53	1082.66
A85	Supply & fixing of ISI mark bakelite HRC/rewireable 63A fuse holder in panels/boxes for AC/DC/PT circuits wherever required as directed by the field Engineer.	5	Nos.	433.07	2165.36
A86	Supply & fixing of ISI mark bakelite HRC/rewireable 100A fuse holder in panels/boxes for AC/DC/PT circuits wherever required as directed by the field Engineer.	5	Nos.	577.43	2887.13
A87	Supply & fixing of ISI mark porcelain rewirable 16/20A fuse unit of reputed make in panels,boxes for AC Circuits wherever required as directed by the field Engineer	5	Nos.	144.35	721.77
A88	Supply & fixing of ISI mark porcelain rewirable 100A fuse unit of reputed make in panels,boxes for AC Circuits wherever required as directed by the field Engineer	5	Nos.	240.60	1202.99

A89	Supply & fixing of ISI mark porcelain rewirable 200A fuse unit of reputed make in panels,boxes for AC Circuits wherever required as directed by the field Engineer	5	Nos.	433.07	2165.36
A90	Supply & fixing of mounting channel suitable for CBTM 5 terminal block in pannel /box as required and as directed by the field Engineer.	20	m	481.19	9623.88
A91	Supply and fixing of disconnected type terminal block suitable for CT Circuits in panels/box as required & as directed by the field Engineer	100	Nos.	144.35	14435.40
A92	Labour charges for cutting of chequered plate to the required size, painting with two coats of red oxide paint and enamel paint and placing them on cable trench in side control room including cost of all sundries ie,gas cylinder,cotton waste,T & P's,etc., but excluding the cost M.S. plate,paint and including unloading & loading of material at site	50	Sqm	330.81	16540.65
A93	Supply of Discharge rod for 2 kV cable as required by the field engineer with teak wood & copper flats etc.,	15	Nos.	2197.82	32967.27
A94	Supply of Earth rod as required by the field engineer complete with clamp, earth conductor /wire , teak wood & copper flats etc. Earth rod shall be suitable for earthing of 4.0" Al tube/Bersimis conductor of 400kV switchyard located at 8 m above the finished ground level . Provision of tightening from ground shall be also provided .	9	Nos.	17013.20	153118.82
A95	Supply of Earth rod as required by the field engineer complete with clamp,earth conductor /wire , teak wood & copper flats etc. Earth rod shall be suitable for earthing of 4.5" Al tube/AAC Bull conductor of 765kV switchyard located at 14 m above the finished ground level. Provision of tightening from ground shall be also provided .	9	Nos.	19488.20	175393.80
A96	Electrical lifting platform (battery operated vertical movement 20 meter , horizontal)-Only Unloading and storage	1	No.	3849.52	3849.52
A97	Storage & handing over of Essential/ Mandatory spares/ Maintenance equipments and Instruments to Customer. Refer enclosed Annexure-4 for list of spares.	1	Lot	119229.21	119229.21
B1	Balance works of 500 MVA, 765/400/33kV, 1-Ph, interconnection Autotransformer. (i) Bushing monitoring system erection. (ii) Dry out and oil circulation: Dry air circulation, oil preparation, oil filling and HOC. oil testing : BDV and moisture content of storage tanks. Oil testing: BDV, moisture, IFT, tan delta, resistivity , particle count of maintank and DGA before charging. (iii) Testing: Standard ICT equipment testing like Tandelta of bushings, winding resistance test, PI during HOC, (All the pre comissioning Low voltage tests) vector group test, SFRA, particle count test, final comissioning and handing over. Note -1- Supervision of ETC of 500 MVA, 765/400/33kV ICT is in ICT OEM scope. Note -2- Refer Annexure -8 for ETC of ICT Note -3 - Power supply to be arranged by DG set of 250KVA rating (i.e) DG set with Diesel is in the scope of ETC contractor. Necessary T&P like, storage tank of 35kL and 60KL capacity, 12KL filtration machine with 1 or 2 micron filter during oil preparation and 0.5 or 0.25 micron filter during HOC to clear particle count is in the ETC contractor scope. (At present 500 MVA, 765/400/33kV, 1-Ph, ICT is installed with auxiliaries, viz turrets, bushings, radiator bank, conservator tank, individual MK etc required for installation of ICT)	2	No.	878178.63	1756357.26
B2	Balance works of 500 MVA, 765/400/33kV, 1-Ph, interconnection Autotransformer. (i) Bushing monitoring system erection. (ii) Hot Oil Cirulation (HOC). Oil testing: BDV, moisture, IFT, tan delta, resistivity , particle count of maintank and DGA before charging. (iii) Testing: Standard ICT equipment testing like Tandelta of bushings, winding resistance test, PI during HOC, (All the pre comissioning Low voltage tests) vector group test, SFRA, particle count test, final comissioning and handing over. Note -1- Supervision of ETC of 500 MVA, 765/400/33kV ICT is in ICT OEM scope. Note -2- Refer Annexure -8 for ETC of ICT Note -3 - Power supply to be arranged by DG set of 250KVA rating (i.e) DG set with Diesel is in the scope of ETC contractor. Necessary T&P like, storage tank of 35kL and 60KL capacity, 12KL filtration machine with 1 or 2 micron filter during oil preparation and 0.5 or 0.25 micron filter during HOC to clear particle count is in the ETC contractor scope. (At present 500 MVA, 765/400/33kV, 1-Ph, ICT is installed with auxiliaries, viz turrets, bushings, radiator bank, conservator tank, individual MK etc required for installation of ICT)	1	No.	693806.57	693806.57

B3	<p>Balance works 80 MVAR, 765kV, 1-Ph, Reactor:</p> <p>(i) Cabling, Bushing monitoring system erection.</p> <p>(ii) Hot Oil Circulation (HOC). Oil testing: BDV, moisture, IFT, tan delta, resistivity , particle count of maintank and DGA before charging.</p> <p>(iii) Testing: Standard 80MVAR Reactor equipment testing like Tandelta of bushings, winding resistance test, PI during HOC, (All the pre comissioning Low voltage tests) vector group test, SFRA, particle count test, final comissioning and handing over.</p> <p>Note -1- Supervision of ETC of 765kV , 80MVAR Reactor is in Reactor OEM scope.</p> <p>Note -2- Refer Annexure -9 for ETC of Reactor</p> <p>Note -3- Power supply to be arranged by DG set of 180KVA rating (i.e) DG set with Diesel is in the scope of ETC contractor. Necessary T&amp;P like, 12KL filtration machine with 1 or 2 micron filter during oil preparation and 0.5 or 0.25 micron filter during HOC to clear particle count is in the ETC contractor scope.</p> <p>(At present 80 MVAR, 765kV, 1-Ph, Reactor is installed with auxiliaries, viz turrets, bushings, radiator bank, conservator tank, individual MK etc required for installation of Reactor)</p>	16	No.	574028.55	9184456.85
B4	<p>145kV Neutral grounding Reactor( NGR) air core type , single phase along with pedestal support insulator complete with terminal connectors with support structure ( Neutral of star connection using IPS tube to connect with NGR and other end earthed through 33kV CT)</p> <p>Note - Supervision of ETC of 145kV, NGR shall be in NGR supplier scope</p>	4	No.	68741.44	274965.77
C1	<p>80 MVAR, 765kV, 1-Ph, Reactor along with Marshalling Kiosk, terminal connectors, accessories, online complete tan delta bushing monitoring system . Work includes erection of all auxiliaries, viz turrets, HV and Neutral bushings, terminal connectors, dry air circulation, filling of oil, oil filtration, Oil testing, laying of cable from Reactor auxiliaries to Individual MK and from Individual MK to Commom MK etc and its terminations (approximately 1500 terminations) as required to complete the installation of Reactor including testing &amp; Commissioning etc .</p> <p>Note -1- Supervision of ETC of 765kV , 80MVAR Reactor is in Reactor OEM scope.</p> <p>Note -2- Refer Annexure -9 for ETC of Reactor</p> <p>Note - 3- Power supply to be arranged by DG set of 180KVA rating (i.e) DG set with Diesel is in the scope of ETC contractor. Necessary T&amp;P like 50T crane for the erection of 765kV Bushing, storage tank of 35kL/60KL capacity, Dry air machine, 12KL filtration machine with 1 or 2 micron filter during oil preparation and 0.5 or 0.25 micron filter during HOC to clear particle count is in the ETC contractor scope.</p> <p>Oil testing : BDV and moisture content of storage tanks. Oil testing: BDV, moisture, IFT, tan delta, resistivity , particle count of maintank and DGA before charging.</p> <p>Testing: Standard 80MVAR Reactor equipment testing like Tandelta of bushings, winding resistance test, PI during HOC, (All the pre comissioning Low voltage tests) vector group test, SFRA, particle count test, final comissioning and handing over</p> <p>* Unloading is already completed. Contractor need not quote for unloading</p>	2	No.	878963.91	1757927.83

C2	<p>Balance works of 500 MVA, 765/400/33kV, 1-Ph, interconnection Autotransformer.</p> <p>(i) Cabling: Cabling from protective devices of ICT, turret CT's to Individual MK's, from individual MK's to common MK. Cooler bank circuits to Cooler control cabinet (Approximately 3000 terminations for one set). Bushing monitoring system erection.</p> <p>(ii) Dry out and oil circulation: Dry air circulation, oil preparation, oil filling and HOC. oil testing : BDV and moisture content of storage tanks. Oil testing: BDV, moisture, IFT, tan delta, resistivity , particle count of maintank and DGA before charging.</p> <p>(iii) Testing: Standard ICT equipment testing like Tandelta of bushings, winding resistance test, PI during HOC, (All the pre comissioning Low voltage tests) vector group test, SFRA, particle count test, final comissioning and handing over.</p> <p>Note -1- Supervision of ETC of 500 MVA, 765/400/33kV ICT is in ICT OEM scope.</p> <p>Note -2- Refer Annexure -8 for ETC of ICT</p> <p>Note -3 - Power supply to be arranged by DG set of 250KVA rating (i.e) DG set with Diesel is in the scope of ETC contractor. Necessary T&amp;P like, storage tank of 35kL and 60KL capacity, 12KL filtration machine with 1 or 2 micron filter during oil preparation and 0.5 or 0.25 micron filter during HOC to clear particle count is in the ETC contractor scope. (At present 500 MVA, 765/400/33kV, 1-Ph, ICT is installed with auxiliaries, viz turrets, bushings, radiator bank, conservator tank, individual MK etc required for installation of ICT)</p>	3	No.	924271.65	2772814.94
C3	<p>145kV Neutral grounding Reactor( NGR) air core type , single phase along with pedestal support insulator complete with terminal connectors with support structure ( Neutral of star connection using IPS tube to connect with NGR and other end earthed through 33kV CT)</p> <p>Note - Supervision of ETC of 145kV, NGR shall be in NGR supplier scope</p>	2	No.	68741.44	137482.88
D1	390kV , 1 Ph, Gapless type Metal Oxide Surge Arrester complete with surge counter, leakage current meter, insulating base, connecting cable and terminal connectors without support structure	3	Nos.	4734.58	14203.73
D2	400kV , 1 Ph, Capacitive Voltage Transformer complete with terminal connectors without support structure.	3	Nos.	13263.20	39789.60
D3	400kV , 1 Ph , Bus support Insulators (Solid core Post insulator) with corona ring complete with terminal connectors without support structure.	3	Nos.	2691.51	8074.52
D4	Galvanised steel Lattice Structures including hardware for Towers, beams & equipment's support	5	MT	6087.33	30436.67
D5	Dismantling of 390kV , 1 Phase, Gapless type Metal Oxide Surge Arrester complete with surge counter, leakage current meter, insulating base, connecting cable and terminal connectors without support structure	3	Nos.	4734.58	14203.73
D6	Dismantling of 400kV , 1 Ph, Capacitive Voltage Transformer complete with terminal connectors without support structure.	3	Nos.	13263.20	39789.60
D7	Dismantling of 400kV , 1 Ph , Bus support Insulators (Solid core Post insulator) with corona ring complete with terminal connectors without support structure.	3	Nos.	2691.51	8074.52
E1	<p>Reimpregnation of 500 MVA, 765/400/33kV, 1-Ph , interconnection Autotransformer (as per Annexure-10)</p> <p>Note -1 - Power supply to be arranged by DG set of 250KVA rating (i.e) DG set with Diesel is in the scope of ETC contractor.</p>	1	Nos.	298970.77	298970.77
E2	<p>Reimpregnation of 80 MVA, 765kV, 1-Ph Reactor (as per Annexure-11)</p> <p>Note - 1- Power supply to be arranged by DG set of 180KVA rating (i.e) DG set with Diesel is in the scope of ETC contractor.</p>	1	Nos.	230404.52	230404.52
<b>Total Amount (Rs.) - Excluding GST</b>					<b>27274681</b>



## BOQ: STANDARD TECHNICAL NOTES & SCOPE

<u>Following also forms the scope of ETC work in addition to above, but not limited to this.</u>	
1	Refer <b>Consolidated T&amp;P and Manpower list</b> as per <b>Annexure-2</b> to be arranged by ETC
2	Verification, handling, shifting to & from stores, proper storage, assembly, installation, pre-commissioning test and commissioning tests (As per Customer/BHEL FQP) are included in the scope. Necessary skilled electrician & labour to be provided by ETC contractor to OEM during testing & commissioning. The storage instructions of the equipment manufacturer/ Employer shall be strictly adhered to. Customer/BHEL Field Quality Plan shall be followed alongwith the provision of Technical Specification for storage.
3	All the drawings and documents as per <b>Annexure-5</b> shall be followed for ETC work.
4	Erection guidelines shall be followed for ETC work.
5	Bidder Supplied Material - Bidder to offer items from Customer approved make only (as applicable). Bidder to supply material of proven design and make, which have already been extensively used and tested. Bidder to obtain approval from BHEL Engineer incharge / Customer prior to supply. Quantity of supply items are provisional and shall be finalised during contract stage. Qty of supply item may vary upto any extent and and even may get deleted.
6	All <b>consumables</b> required for successful erection testing & commissioning of present scope of work is in bidders scope, such as (not limited to) Welding Electrodes, Low hydrogen content welding electrode, Ferrules, Cable Lug, cable ties, , Paint, bitumen compound, Zinc riched enamel paint, red oxide and zinc chromate ..etc complete in all respect.
7	<b>ETC of Power / Control / Instrument Cable:</b> Scope includes Cable Laying tagging , dressing, ferruling, lugging, installation of cable gland, soldering, tapping, jointing, crimping, termination, and drilling/ cutting holes in cable gland plates and minor civil works for breaking of trench & repair- laying can be either on trays, hanger, supports, underground, buried in ground or through GI/PVC pipe over/under ground, through wall etc. All erection materials viz. Cable Lug, ferrules, cable ties / straps, Al. tags, route markers, GI / PVC wall sleeves with rubber / nylon bushes and flexible steel conduits etc shall be supplied by bidder. excluding supply of Cable Gland which are covered separately (as a separate BOQ item / free supply by BHEL). Machine ferruling shall be adopted. Extra holes closing in glands plates with GI sheet shall be in ETC contractor scope Refer Annexure-6 for cable details and its laying. Technical specification of cable tagging intervals, and lugs as per Customer /field approval shall be follow.
8	<b>CABLE LUG:</b> Supply of cable lug is in bidders scope. cable lugs shall be tinned copper solderless crimping type conforming to IS-8309 & 8394 for all control Cables and cables with copper wire. For Aluminium Bimetallic lugs for power cables as required shall be used depending upon type of cables and terminations. Solderless crimping of terminals shall be done by using corrosion inhibitory compound. The cable lugs shall suit the type of terminals provided. The bidder shall cover the exposed part of all cable lugs whether supplied by him or not with insulating tape, sleeve or paint. Bidder to supply cable lug from manufacturer's authorised representative / dealer. Make of cable lug is to be approved by Customer.
9	<b>Cable TAGS &amp; Markers</b> - Bidder to supply and install cable tag & markers. The tag shall be of aluminium with the number punched on it and securely attached to the cable conduit by not less than two turns of 20 SWG GI wire conforming to IS:280. Cable tags shall be of rectangular shape for power cables and of circular shape for control cables.
10	<b>Cable Gland:</b> Tin/ Nickel, Nickel/chromium - Plated (coating thickness not less than 10 microns) Customer approved make brass cable glands, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. Bidder to offer the gland from authorised representative of manufacturer. Cable gland shall be subject to customer approval prior to dispatch. Cable glands shall match with the sizes of different HT/LT/Control cables.
11	Power and control cables shall be securely fixed to the trays/supports with self locking type nylon ties with de-interlocking facility at every 5 metre interval for horizontal run. Vertical and inclined cable runs shall be secured with 25 mm wide and 2 mm thick aluminium strip clamps at every 2m.
12	Vertical run of cables on equipment support structure shall be supported on ladder/perforated cable trays of suitable width which shall be suitably bolted/clamped with the equipment support structure. Tray shall be supplied by BHEL.

**BOQ: STANDARD TECHNICAL NOTES & SCOPE**

13	<p>Earthing works - works including cutting, bending, bolting/ clamping to structure, Painting, welding with MS Flat/40 mm dia MS rod riser etc. equipment's to be earthed includes all switchyard equipment's, towers, lattice structure, cable trenches, fence, electrodes for neutral of LT transformer/ ICT Transformer/ /NGR/ Reactor/DG Set, Control Room equipment's, SPR equipment's using necessary Connectors for earthing flats. Earthing work to be done as per Drg. no. TB-4-394-316-012, Rev-01 for equipment's earthing and TANTRANSCO Specification for earthing (Annexure-1)</p> <p>Note -1- Only cleat for earthing of MS flat on structure, MS flat and rod electrode shall be supply by BHEL.</p> <p>Note-2- All other required material for earthing shall be in ETC contractor scope.</p> <p>Note -4- The supply of Hardware (nut, bolt and washer) required for connecting flat on tower of structure, pad of equipment's, MOM box, junction box etc. For bolting of MS flat shall be in contractor scope. painting of MS flat shall be carried out as per customer /BHEL guidelines.</p> <p>Note -5- MS flat shall be painted by the MS Flat welding contractor.</p>
14	<p><b>Insulating Rubber Mats</b> - The scope covers supply and laying of insulating mats of class-A conforming to IS: 15652-2006. These insulating mats shall be laid in front of all floor mounted ACDB, CRP, SAS (As applicable under present scope) in control room building/ Switchyard panel room. The insulating mats shall be made of elastomer material free from any insertions leading to deterioration of insulating properties. It shall be resistant to acid, oil and low temperature. Upper surface of the insulating mats shall have small aberration (rough surface without edges) to avoid slippery effects while the lower surface shall be plain or could be finished slip resistant without affecting adversely the dielectric property of the mat. The Insulating mat shall be of pastable type, to be fixed permanently on the front of the panels except for the chequered plate area which shall not be pasted as per requirement. The insulating mats shall generally be fixed and joints shall be welded as per recommendations in Annexure-A of IS:15652. Width of insulating mats shall generally be of 1.5 meters or as per site requirements. Length shall be supplied as per site requirements.</p>
15	<p>Cable ends shall be kept sealed to prevent damage. In cable vault, fire resistant seal shall be provided underneath the panels. Wherever cable pass through floor or through wall openings or other partitions, GI/PVC wall sleeves with bushes having a smooth curved internal surface so as not to damage the cable, shall be supplied, installed and properly sealed by the Contractor at no extra charges.</p>
16	<p>All welding done at site for equipment and structures, shall be painted with zinc rich paint immediately to avoid corrosion.</p>
17	<p>Supervision of testing and commissioning of Relay / Protection / SAS / Automation / Bus Bar Panels (as applicable) is in the scope of BHEL/ panel supplier. Necessary manpower support, tools, tackles and testing equipment to be in scope of ETC contractor</p>
18	<p>Minor Civil works such as modification of civil foundations, making holes in the trenches/ control room building, finishing holes after erection, grouting, fixing of trench material, Removing and Replacing of RCC Trench Cover will be in the scope of ETC contractor.</p>
19	<p>Removal of gravel, if gravelling is already 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.</p>
20	<p>Quoted rates are deemed to be inclusive of miscellaneous works viz erection of clamps and connectors and Accessories / Auxiliaries supplied with above main equipments.</p>
21	<p>All paint, welding electrodes &amp; other consumable by contract supplies shall be part of ETC works. Paint /welding electrode make etc. is subject to BHEL/CUSTOMER site incharge approval.</p>
22	<p>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.</p>
23	<p>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 &amp; Mounting of phase color discs &amp; Danger plates shall be as per IS-2551; 1982 &amp; IS 5; 1978.</p>
24	<p>Welding of Aluminium tubes (supply of welding sleeve excluded) as per <b>Annexure-7</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.</p>
25	<p>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.</p>
26	<p>Supervision of erection, Testing &amp; commissioning of one no. Isolator of each type shall be done by supplier. Necessary manpower support, tools, tackles etc shall be in the scope of ETC contractor.</p>

**BOQ: STANDARD TECHNICAL NOTES & SCOPE**

27	Testing instruments (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). Bidder to submit valid calibration certificate during commencement of testing / commissioning works.
27.01	DCRM (OPERATIONAL ANALYZER )
27.02	Contact Resistance Measurement kit (CRM)
27.03	Capacitance and Tan delta measurement Kit
27.04	Dew Point Measurement kit
27.05	5kV/1kV Megger
27.06	Primary current Injection Kit
27.07	Secondary current/Voltgae Injection kit
27.08	1Ph Variac
27.09	Multimeters
27.10	Clamp on meter
27.11	Relay test kit
28	The scope of supply items as mentioned in the above BOQ are tentative. Items shall be supplied by Contractor as per exact site requirements only.
29	Man Lifters for ETC of 765kV equipment's shall be in ETC contractor scope.
30	For scope of supply items in ETC contractor scope following should be followed - (1) The approval of makes shall be obtained from BHEL/Customer. (2) Drawings and MQP shall be submitted for approval in line with specification and relevant IS. (3) Quality - Inspection & dispatch clearance shall be given by BHEL/Customer.

**List of Annexures**

Annexure -1 - Switchyard Erection and Earthing

Annexure -2 - Consolidated T&P and Manpower list

Annexure -3 - Fire Proof Sealing & Fire Breaks

Annexure -4 - Mandatory Spares List

Annexure -5 - Drawings List

Annexure -6 - Cabling

Annexure -7 - Procedure for Welding of Aluminium Buses

Annexure -8 - ETC of ICT

Annexure -9 - ETC of Reactor

Annexure -10 - 500MVA, 765/400/33kV, 1-Ph, Interconnection Autotransformer reimpregnation procedure

Annexure -11 - 80MVAr, 765kV, 1-Ph, Reactor reimpregnation procedure