

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Package- A: ERECTION, TESTING & COMMISSIONING OF ELECTRICAL PKG OF MAIN PLANT AREA-Unit#1 & COMMON SYSTEMS (Except AHP, CHP, GHP & LHP) at 2X660 MW NTPC Talcher TPP

Package- B: ERECTION, TESTING & COMMISSIONING OF ELECTRICAL PKG OF MAIN PLANT AREA-Unit#2 including AHP, CHP, GHP & LHP at 2X660 MW NTPC Talcher TPP

BHARAT HEAVY ELECTRICALS LIMITED



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Chapter – I: Project Information

1. PROJECT INFORMATION	
	<p>Project Name 2x660 MW NTPC Talcher TPS</p> <p>Talcher Thermal Power Project is situated near Talcher town in Angul district of Orissa. Talcher TPS was taken over by NTPC on 03.06.1995. The present proposal is for expansion of TTPS by adding 2 units of 660 MW.</p>
1.1	 <p>LOCATION MAP: 2X660MW Talcher Thermal Power Project</p>
1.2	<p>Plant Site Location The proposed site is at a distance of about 4 km from Talcher town and about 25 km from district headquarters Angul in Odisha state, India.</p>
1.3	<p>Nearest Town/ City The proposed site is at a distance of about 4 km from Talcher town and about 25 km from district headquarters Angul in Odisha state, India.</p>
1.4	<p>Nearest Railway Station Talcher is on Talcher-Cuttack section of North Eastern Railway (renamed East Coast Railway) at about 2 Km. However, a small railway station named 'Talcher Thermal' is located near project boundary.</p>
1.5	<p>Nearest Airport Bhubaneshwar</p>
1.6	<p>Nearest Seaport Kolkata – 424km</p>
1.7	<p>Daily Ambient Temperature Mean of daily minimum temperature = 15.1°C Mean of daily maximum temperature = 39.8°C</p>

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Chapter – I: Project Information

1.8	Wind Speed	Design wind speed is 50 m/sec as per IS: 875 Part III
1.9	Seismic Zone	The project site lies in zone III as defined in IS: 1893.
Note: The Bidder shall acquaint himself by a visit to the site, with the conditions prevailing at site before submission of the bid. The information given here in under is for general guidance and shall not be contractually binding on the Owner. All relevant site data / information as may be necessary shall have to be obtained / collected by the Bidder.		

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Chapter – II: Scope of Works

2.	Scope of Works
2.1	<p>Name of the Package- A: ERECTION, TESTING & COMMISSIONING OF ELECTRICAL PKG OF MAIN PLANT AREA-Unit#1 & COMMON SYSTEMS (Except AHP, CHP, GHP & LHP)</p> <p>Providing labour, supervision, T&Ps, consumables, etc for receipt from store/ storage yard, watch & ward, transportation to site {from inside or outside plant boundary (Approx 3 km away)}, pre-assembly (as required), erection, testing, commissioning, trial run, handing over, etc, as required and receipt, storage, etc of self-supplied materials, etc for total scope defined in tender and terms & conditions of tender, taking into account of all clarifications, confirmations, agreements till date for complete work of generator transformer, station transformer, Unit auxiliary transformer, Unit Transformers, Station Aux. Transformers, other misc transformer, HT/ LT bus duct, DG set, associated equipment/ items/ panel, cable tray & accessories; cabling; various panel, motor; earthing and lightening protection, HT/ LT switch gear, other misc equipment; etc for Main Plant Area-U#1 & Common Systems of 2X660MW Talcher Thermal Power Project, Angul, Odisha. (Illumination Package Excluded)</p> <p>The work under these specifications broadly covers the complete work of handling at storage yard/ stores, transportation to work site {from inside or outside plant boundary (Approx 3 km away)}, calibration, pre-assembly, Minor Civil job (as per requirement), erection, testing, pre-commissioning, and handing over of Main Plant Electrical System, Cabling package of Unit#1 and BOP/common areas, Turbine, Pipe Rack, Transformer Yard, FGD, ESP and other related areas for unit-1 and common area readiness which are not specifically mentioned in this TCC.</p> <p>Name of the Package- B: ERECTION, TESTING & COMMISSIONING OF ELECTRICAL PKG OF MAIN PLANT AREA-Unit#2 including AHP, CHP, GHP & LHP</p> <p>Providing labour, supervision, T&Ps, consumables, etc for receipt from store/ storage yard, watch & ward, transportation to site {from inside or outside plant boundary (Approx 3 km away)}, pre-assembly (as required), erection, testing, commissioning, trial run, handing over, etc, as required and receipt, storage, etc of self-supplied materials, etc for total scope defined in tender and terms & conditions of tender, taking into account of all clarifications, confirmations, agreements till date for complete work of generator transformer, station transformer, Unit auxiliary transformer, Unit Transformers, Station Aux. Transformers, other misc transformer, HT/ LT bus duct, DG set, associated equipment/ items/ panel, cable tray & accessories; cabling; various panel, motor; earthing and lightening protection, HT/ LT switch gear, other misc equipment; etc for Main Plant Area-U#2 and AHP, CHP, GHP & LHP of 2X660MW Talcher Thermal Power Project, Angul, Odisha. (Illumination Package Excluded)</p> <p>Scope of Consortium Partner in Package-A and Package-B: Consortium Partner has to execute (including Installation, Erection, Testing & Commissioning) of following equipments /Items covered under Package-A and Package-B:</p> <ol style="list-style-type: none">Power Transformer above 5 MVA rating along with associate systemsHT Bus Ducts (IPBD & SPBD) along with associate systems

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2.2	<p>The main components of Package-A & Package-B are:</p> <ul style="list-style-type: none"> a) Cable Tray & Accessories. b) Power Cables (HT & LT). c) Electrical/Cabling work d) Control Cables. e) HT Straight through joints and Termination Kits. f) Junction boxes and Push buttons. g) Structural Steel h) 33kV/11kV/ 3.3kV/ 0.415kV Switchgear/ PCC/ MCC. i) AC/ DC Starter panel/ Local starter boxes/ Power distribution boxes/ Marshalling boxes etc. j) Control & Relay Panels. k) 220V DC Battery System. l) DAVR & Variable Frequency Drive m) Station Lighting. n) Above Ground Earthing, Below Ground Earthing and Lightning Protection systems. o) LT Bus Duct (NSPBD). p) 11/ 3.3kV Segregated Phase Bus Duct (SPBD). q) Isolated Phase Bus Duct (IPBD). r) Oil Filled Power Transformers (GT, UT, UAT, ST, SAT, CHP, AHP and Other Aux Transformers). s) Dry type transformers. t) Soot Blower System. u) Only Testing & Commissioning of certain items as mentioned in the BOQ erected by other agencies (Electrical Hoists, HVR Transformers etc.) v) Other Misc. associated equipment w) BOP and other common areas
2.3	<p>The broad areas for E&C work include:</p> <ul style="list-style-type: none"> i) Boiler & its auxiliaries ii) Turbine & its auxiliaries iii) Generator & its auxiliaries iv) FGD Area v) Piping vi) DM Plant vii) CHP/AHP viii) BOP & Common areas ix) All other areas of Plant
2.4	<p>BHEL is operating web based computerized Suvidha/ SDD/IPMS/SCMS/E-store etc system that includes, inter-alia, issue of materials, daily progress reporting, Contractor's running monthly billing and material reconciliation through a computerized data management system. Contractor shall install necessary hardware to hook-up with the BHEL's system and use the same for his scope of work. The contractor shall also provide adequate and suitable manpower for coordinating, data gathering in suitable format, computer operations for implementation of Suvidha/SDD/ IPMS/ SOMS at site.</p>

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	<p>Contractor may tie up with separate suitable agency/agencies for carrying out Bus Duct, Relay Testing and Integrated Testing. However before deploying such agencies on job, the Contractor shall obtain approval of BHEL Construction Manager in writing.</p> <p>Supply & erection of consumable like conduit accessories & fittings, conduit boxes, saddles, clamps, flexible conduit, fixing hardwares, anchors, wedges, nuts & bolts, concrete inserts etc consumables/materials required for mounting the fixtures, consumable and other incidental materials required to complete the installation, testing & commissioning of complete lighting system for successful operation, & to the satisfaction of purchaser/ customer. Supply scope of these items shall form part of the installation rates quoted for the item.</p> <p>E&C of scope shall be completed as per approved drawings & instructions received from BHEL Engineers.</p>
2.5	CABLE TRAYS/ CABLE DUCTS AND ACCESSORIES
1.	Cables shall run in cable trays mounted horizontally or vertically on cable tray support system which in turn shall be supported from floor, ceiling, overhead structures, trestles, pipe racks, trenches or other building structures.
2.	This scope of works also includes Base plate for single/double channel, Flat Plate.
3.	Horizontally running cable trays shall be clamped by bolting to cantilever arms and vertically running cable trays shall be bolted to main support channel by suitable bracket/ clamps on both top and bottom side rails at an interval of 2000mm in general. For vertical cable risers/ shafts cable trays shall be supported at an interval ranging from 1000mm to 1500mm in general. Fixing of cable trays to cantilever arms or main support channel by welding shall not be accepted. Cable tray installation shall generally be carried out as per the approved guidelines/ drawings.
4.	The cantilever arms shall be positioned on the main support channel with a minimum vertical spacing of 300mm unless otherwise indicated.
5.	Spacing between cable trays shall normally be kept 300mm for cable laying convenience and effective heat dissipation. Where direct heat radiation exists, heat isolating barriers shall be adopted.
6.	The contractor shall fix the brackets/ clamps/ insert plates using anchor fasteners. Minimum size of anchor fasteners shall be M8x50 and material shall be stainless steel grade 316 or better. Anchor fastener shall be fixed as recommended by manufacturer and as approved by site engineer. For brick wall suitable anchor fasteners shall be used as per the recommendations of manufacturer.
7.	All cable way sections shall have identification, designations as per cable way layout drawings and painted/ stenciled at each end of cable way and where there is a branch connection to another cable way. Minimum height of letter shall be not less than 75mm. For long lengths of trays, the identification shall be painted at every 10meter and at each end of cable tray & branch connection floor/ wall opening. Risers shall additionally be painted/ stenciled with identification numbers at every floor.
8.	In certain cases, it may be necessary to site fabricate portions of trays, supports and other non-standard bends where the normal prefabricated trays, supports and accessories may not be suitable. Fabricated sections of trays, supports and accessories to make the installation complete at site shall be neat in appearance and shall match with the prefabricated sections in the dimensions. They shall be applied with one coat of red lead primer, one coat of oil primer followed by two finishing coats of aluminum paint.
9.	Various types of sheet metal, galvanized cable tray, i.e., Perforated, ladder type, seal metal duct, solid bottom tray, shall be provided in standard lengths along with accessories like hardware, bends, reducers,

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	coupler plate, tray covers, trefoil clamps and tray clamps etc.
10.	Installation of cable tray/ cable duct shall include cutting, laying, jointing, supporting, drilling holes in the support, providing tees/ reducers/ bends/ clamps as per tray route layout, Fabrication of bends/ tees/ reducers from straight length, fixing of tray covers, welding of tray on support, cleaning and application of paint (refer clause no. 2.29 for details) on weld joints. Installation of tray/ duct covers, wherever provided, will be done as a part of tray erection and no extra rates will be payable.
11.	Mentioned fabrication cable trays quoted in BOQ sl no. E1E.1 to E1E.9, are payable for the bends which are supposed to be supplied by BHEL.
12.	Fabrication of tee/ reducers from straight length of tray is within the scope of work and rate quoted shall be inclusive in unit rate (in running meter).
13.	Cable trays/ ducts have to be routed underground in cable trench, over head on structure, valves, floors etc. for various applications such as cable laying, copper tubes, conduits, thermocouple, temperature gauge capillary etc.
14.	As per the BOQ Main Cable tray and support shall be installed in Cable cellar, Boiler floors, All floors in B-C, C-D, and Mill, ID-Fan, PA-Fan, ID-Fan, ESP, Soot Blower area, BOP and other associated systems. Looping Trays shall be laid from JB to Field which is also under the scope of the contractor.
15.	Cable trays where ever is required by the other BHEL vendor (from BHEL Equipment to BHEL Equipment) are included in this contract as sizes mentioned in BOQ. Cable tray routing shall be done by the agency as per the drawing provided by PEM or Concerned BOP agency.
16.	Installation of cable racks and supports structure shall be carried out in all the required areas. Steel embedment shall be provided in the cable trenches, ceiling slabs and concrete blocks for installing the cable racks and support structures.
17.	Ladder & perforated type cable trays shall be used in cable trenches and vertical risers.
18.	Perforated cable trays shall be used in higher elevations in Boiler and TG area.
19.	Cable racks in the trenches and control room are to be shared with other contractors installing cables in different areas wherever required. Contractor shall cooperate with the other contractors in sharing the cable trays and proper dressing and clamping the cables.
20.	Cable trays in boiler & ESP area shall be supported from the boiler and ESP structures. The same shall be coordinated with Boiler/ ESP contractor.
21.	Cable trays in these areas shall be in vertical formation to avoid dust accumulation. No cable trenches shall be provided in Boiler/ ESP area.
22.	Cable tray philosophy shall be as per enclosed cable erection philosophy.
2.6	METAL CHANNEL FLEXIBLE BOLTABLE CABLE SUPPORT SYSTEM (ESP/ BOILER/ BOP Area/ As per the drawing provided by BHEL-PEM for main route to AHP/ CHP etc.)
1.	Flexible GI cable support system, consisting of single/ double channels, base plates, and cantilever arms are as per BOQ. Wherever necessary, the base plate beam clamps will be supplied for bolting. Otherwise, the base plates are to be welded to the racks or beams if necessary, at 90°.
2.	Wherever supplied, GI cable trays shall be of bolted construction only with fixing screws and coupler plates.
3.	Angle fittings, flat plate fittings, clamps for single & double channels, fasteners etc. will be supplied for fixing trays and cantilever arms and for this no separate erection charges will be paid. Quoted Rates shall be accommodated in support channel and cantilever arm erection.
4.	Metal channel boltable GI cable support shall be supplied. Each cable rack assembly comprises of sub components such as single or double channel, base plate for single/ double channel, angle fitting,

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	clamps, cantilever arm, anchor fastener, associated hardware (spring loaded nuts, bolts and washers) etc.
5.	Channel shall be supplied in standard length of six meter. Contractor shall cut the channel and assembly the rack as per site requirement. Cantilever arm is to be fixed on channel support with spring loaded nuts/ bolts as per installation drawing.
6.	Base plate/ angle fitting shall be continuously welded all around to steel members/ plate insert if provided. Brackets/ clamps shall be welded to steel surface with channel as applicable in position to ensure alignment of clamps/ channels. Weld thickness shall be 6 mm minimum. In case steel surface is not available for welding, anchor bolts is to be used for fixing the base/ angle fitting.
7.	Main support for longitudinal cable tray run in the cable vaults shall be fixed at both ends at top as well at bottom as out lined above.
8.	Galvanization damaged due to welding/ cutting shall be re-painted with cold galvanizing paint (refer Clause no. 2.29 for details).
9.	Unit rate for "Single/ Double Channel" shall include cutting channel in required lengths, fixing of angle fittings/ base plate/ clamps/ brackets/ fasteners/ cantilever arms/ welding etc. as required as per type of installation.
10.	The Nuts & bolts should be galvanized type.
2.7	<p>CABLE LAYING (POWER/ CONTROL/ INSTRUMENTATION SHIELDED/ UNSHIELDED CABLES/ PLUG-IN CABLES/ COAXIAL/ UTP/ STP/ DATA HIGHWAY, ARMOURED/ UN-ARMOURED, SINGLE-CORE/ MULTI-CORE, PVC/ HR PVC/ FRLS/ TEFILON/ PTFE/ XLPE INSULATION, OPTICAL FIBER)</p> <p>1. Cable installation shall be carried out as per Indian Standard (IS)1255 and other relevant standards and regulations.</p> <p>2. For Cable unloading, pulling etc. following guidelines shall be followed in general:</p> <p>3. Cable drums shall be unloaded, handled and stored in an approved manner on hard and well drained surface so that they may not sink. In no case shall be drum be stored flat i.e. with flange horizontal. Rolling of drums shall be avoided as far as possible. For short distances, the drums may be rolled provided they are rolled slowly and in proper direction as marked on the drum. In absence of any indication, the drums may be rolled in the same direction as it was rolled during taking up the cables. For unreeling the cable, the drum shall be mounted on suitable jacks or on cable wheels and shall be rolled slowly so that cable comes out over the drum and not from below. All possible care shall be taken during unreeling and laying to avoid damage due to twist, kink or sharp bends. Cable ends shall be provided with sealed plastic caps to prevent damage and ingress of moisture.</p> <p>4. While laying cable, ground rollers shall be used at every 2-meter interval to avoid cable touching ground. The cables shall be pushed over the rollers by a gang of people positioned in between the rollers. Cables shall not be pulled from the end without having intermediate pushing arrangements. Pulling tension shall not exceed the values recommended by cable manufacturer. Selection of cable drums for each run shall be so planned so as to avoid using straight through joints. Care should be taken while laying the cables so as to avoid damage to cables. If any particular cable is damaged, the same shall be repaired or changed to the satisfaction of Engineer in Charge.</p> <p>5. Cables shall be laid on cable trays strictly in line with cable schedule. Where specific cable layouts are not shown on drawings, Contractor shall route these as directed by the Engineer in Charge</p> <p>6. Power and control cables shall be laid on separate tiers in line with the approved guidelines/ drawings. The laying of different voltage grade cables shall be on different tiers according to the voltage grade of</p>

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	<p>the cables. In horizontal tray stacks, H.T. cables shall be laid on top most tier and cables of subsequent lower voltage grades on lower tiers of trays. Single core cable in trefoil formation shall be laid with a distance of four times the diameter of cable between trefoil center lines and clamped at every two meters. All multicore cables shall be laid in touching formation. Power and control cables shall be secured fixed to trays/ support with cable clamps/ ties with self-locking arrangement. For horizontal trays arrangements, multicore power cables and control cables shall be secured at every five-meter interval. For vertical tray arrangement, individual multicore power cables and control cables shall be secured at every one meter. After completion of cable laying work in the particular vertical tray, all the control cables shall be binded to trays/ supports by cable clamps/ ties with self-locking arrangement at every five-meter interval and at every bend. Fibre Optical cable shall be laid in trenches/ trays or as decided by BHEL.</p>
7.	Bending radii for cables shall be as per manufacturer's recommendations and Indian Standard (IS)1255.
8.	Where cables cross roads/ rail tracks, the cables shall be laid in hume pipe/ HDPE pipe.
9.	No joints shall be allowed in trip circuits, protection circuits and CT/ PT circuits. Also joints in critical equipment in main plant area shall not be permitted. Vendor shall identify and accordingly finalize the cable drum length.
10.	In each cable run some extra length shall be kept at suitable point to enable one LT/ two HT straight through joints to be made, should the cable develop fault at a later stage. Control cable termination inside equipment enclosure shall have sufficient lengths so that shifting of termination in terminal blocks can be done without requiring any splicing.
11.	Wherever few cables are branching out from main trunk route troughs shall be used.
12.	Where there is a considerable risk of steam, hot oil or mechanical damage cable routes shall be protected by barriers or enclosures.
13.	The installation work shall be carried out in a neat workman like manner & areas of work shall be cleaned of all scraps, water, etc. after the completion of work in each area every day. Contractor shall replace RCC/ Steel trench covers after the Installation work in that particular area is completed or when further work is not likely to be taken up for some time.
14.	Separation: At least 300mm clearance shall be provided between HT power & LT power cables. minimum 200mm clearance between LT power & LT control/ instrumentation cables.
	Segregation of Cables
15.	All cables associated with the unit shall be segregated from cables of other units. Interplant cables of station auxiliaries and unit critical drives shall be segregated in such a way that not more than half of the drives are lost in case of single incident of fire. Power and control cables for AC drives and corresponding emergency AC or DC drives shall be laid in segregated routes. Cable routes for one set of auxiliaries of same unit shall be segregated from the other set.
16.	In switchyard, control cables of each bay shall be laid on separate racks/ trays.
17.	Cable tags shall be provided on all cables at each end (just before entering the equipment enclosure), on both sides of a wall or floor crossing, on each duct/ conduit entry, and at every 20 meters in cable tray/ trench runs. Cable tags shall also be provided inside the switchgear, motor control centers, control and relay panels etc. where a number of cables enter together through a gland plate. Cable tag shall be of rectangular shape for power cables and control cables. Cable tag shall be of 2 mm thick aluminum with number punched on it and securely attached to the cable by not less than two turns of 20 SWG GI wire conforming to IS:280. Alternatively, the Contractor may also provide cable tags made of nylon, cable marking ties with cable number heat stamped on the cable tags. The cable tag requirements mentioned above shall prevail over Tag requirements mentioned elsewhere in this document for HT power, LT power

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	& control cables.
18.	While crossing the floors, un-armoured cables shall be protected in conduits up to a height of 500 mm from floor level if not laid in tray.
19.	The termination and connection of cables shall be done strictly in accordance with cable termination kit manufacturer" instructions, drawings and/ or as directed by Engineer in Charge.
20.	Cable jointer shall be qualified to carryout satisfactory cable jointing/ termination. Contractor shall furnish for review documentary evidence/ experience reports of the jointers to be deployed at site.
21.	Work shall include all clamps, fittings etc. and clamping, fitting, fixing, plumbing, soldering, drilling, cutting, taping, preparation of cable end, crimping of lug, insulated sleeving over control cable lugs, heat shrinking termination (where applicable), Elastimold termination (wherever applicable), connecting to cable terminal, shorting and grounding as required to complete the job to the satisfaction of the Engineer in Charge. Apart from termination and straight through joints of HT cables, everything is included in cable laying.
22.	The equipment will be generally provided with undrilled gland plates for cables/ conduit entry. The Contractor shall be responsible for punching of gland plates, painting and touching up. Holes shall not be made by gas cutting. The holes shall be true in shape. All cable entry points shall be sealed and made vermin and dust proof. Unused openings shall be effectively sealed by 2mm thick aluminium sheets.
23.	Control cable cores entering control panel/ switchgear/ MCC/ miscellaneous panels shall be neatly bunched, clamped and tied with self-locking type nylon cable ties with de interlocking facility to keep them in position. Supply of cable tie is under contractor's scope.
24.	All the cores of the control cable to be terminated shall have identification by providing ferrules at either end of the core, each ferrule shall be indelible, printed single tube ferrule and shall include the complete wire number and TB number as per the drawings. The ferrule shall fit tightly on the core. Spare cores shall have similar ferrules with suffix sp1, sp2, ---etc. along with cable numbers and coiled up after end sealing.
25.	All cable terminations shall be appropriately tightened to ensure secure and reliable connections.
26.	Cable laying includes cutting to the required length, laying in overhead cable racks/ underground cable trenches/ pipes/ flexible conduits, dressing/ clamping in tray, drilling of holes in gland plates in panels and junction box, glanding, splicing, dressing of spliced wire inside the panel and JBs, providing printed ferrules (ferrule printing machines to be provided by contractor for printing necessary cross ferruling details)/ providing PVC numerical/ alphabetical/ printed ferrules (contractor to arrange adequate numbers of his own ferrule printing machine), termination by using crimp type copper tinned/ aluminium lugs, insulated/ un-insulated, termination (crimp, soldering, etc.), plug-in connections with insert type crimping, continuity checking, providing identification PVC/ aluminium cable tags (at both the ends and at appropriate intervals (approximately 30meter) throughout the route length and also at each bend), continuity checking, insulation resistance checking, high voltage test on HT cables. Laying of Optical fiber cables on cable trays/ cable trench shall necessarily be done using flexible conduit.
27.	The erection contractor shall supply consumables like aluminum tags, lugs and ferrules.
28.	Buried cable routes shall have marker projecting 150mm above ground and shall be spaced at an interval of 30m along the route and at every bend.
29.	No single core cable shall pass through a GI conduit/ pipe or duct singly except DC single core cables. AC single core cables shall pass through GI conduit/ pipe in trefoil formation only, or through PVC pipes confirming to IS: 4985.
30.	Entry to the panels and JBs may be at top, sides or bottom. All cables are required to be properly

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	supported and clamped near to the JB/ panel.
31.	LT Power cables of cross-sectional area less than 95 sq. mm. and all control and Instrumentation cables shall be clamped in bunches by means of cable nylon ties.
32.	Wherever cable glanding is not possible, either due to the gland plate size limitations or more number of cable entries, prefab plug-in cables, etc., for such cases cables may have to be lifted inside the panel by either making cut-out in gland plate and providing rubber profile for sharp edge protection or alternatively, providing 4" or 6" PVC pipe coupling gland and these pipe coupling gland shall be supplied by contractor within the quoted rate of cable laying.
33.	Copper tinned lugs of various types (pin, ring, fork, snap-on) up to 4 sq. mm conforming to IS: 694 for cables, PVC cable ties, PVC ferrules, PVC button and tapes, cable identification tag of PVC/ metal as per site requirement, clamping and dressing material such as suitable cable ties/ clamps etc. with hardware, PVC sleeves etc. shall be supplied by the contractor within the quoted rates for cable laying. However, trefoil clamps with hardware for single core power cable shall be supplied by BHEL. No separate payment for erection of this trefoil clamp will be entertained and is included in the cable laying. The quality of material shall be got approved from BHEL Engineer prior to their use on job.
34.	Trefoil clamps for single core cables to be supplied shall be pressure die cast aluminum or fibre glass or nylon and shall include necessary fixing accessories like G.I. nuts, bolts, washers, etc. Trefoil clamps shall have adequate mechanical strength to withstand the forces generated by the peak value of maximum system short circuit current.
35.	All care should be taken to avoid abrasion, tension, twisting, kinking, and stretching of cables during installation. Rollers are to be used during pulling of cable for long length.
36.	Cable shielding – all signal cables are supplied with bare shielded copper wire/ with braided wire shield. Generally, shield wire is kept isolated at instrument/ field device end and continuity is maintained through JBs and grounded at panel end only. While terminating the shield wire either in either panel or JBs, PVC sleeves are to be used to avoid two-point earthing.
37.	Spare holes in the panels/ Instruments/ Actuators/ Motors/ JBs etc. shall be sealed by suitable method by contractor. (The cost of work and Materials such as aluminium sheet or Adhesive tape/ Plugs etc. shall be within the quoted rates for laying of cables).
38.	Insulation test of the various circuits shall be done.
39.	Wherever cables run through ducts, conduits, valves, etc., they shall be sealed using fire/ weather proof compound. In addition to this, cable entry in panels, MCCs, instruments, electrical actuators etc., are also required to be sealed. The required material for doing so shall be included by contractor in the cabling scope.
40.	When cables pass through floors, walls etc., it shall be passed through a pipe for mechanical protection and the pipe ends sealed suitably.
41.	All the cables will be properly laid in cable trays, dressed and clamped with aluminum flats. The cable will be terminated at both ends with suitable lugs and printed ferrules and will be glanded properly. Suitable equipment and consumables for ferrule printing has to be arranged by the contractor at his own cost. For cable identification, the contractor shall provide at his cost aluminium tags at regular intervals (20 m) through each run of cable.
42.	Cable lugs/ ferrules for power cables shall be tinned copper solderless crimping type suitable for aluminium compacted conductor cables. Cable lugs and ferrules for control cables shall be tinned copper type. The cable lugs for control cables shall be provided with insulating sleeve and shall suit the type of terminals provided on the equipment. Cable lugs and ferrule shall conform to DIN standards.

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43.	All electrical connections shall be tested for polarity and proper connections.
44.	The checking of operation of individual equipment and instruments to which the cabling/ wiring connected shall also be done by the contractor.
45.	Where power and control cables are to be laid in the same route, suitable barriers to segregate them physically shall be employed.
46.	Space equal to the diameter of cable shall be provided between power cables of six over 50 mm in diameter.
47.	Care shall be taken to avoid short bending and kinking of conductor damaging insulation and stressing the cable beyond pulling force recommended by the manufacturer. Cable shall be protected at all times from mechanical damage.
48.	The minimum radius of formed bend of an insulated cable shall be 12d for un-armoured cables and 15d for armoured cables where 'd' is the overall diameter of the cables or as per the datasheet, whichever is higher.
49.	No cable shall be laid in ducts or trenches where other services such as oil pipes, steam or water pipes are laid.
50.	Where cabling passes through brickwork or concrete work, the contractor shall provide suitable local protection against mechanical damage wherever necessary.
51.	The layout of all cables shall be arranged to give adequate clearance from other services and cables shall be routed to avoid hot zones. No extra cost shall be considered for rework.
52.	Jointing of cables shall be avoided as far as practicable. However, jointing if at all necessary, shall be done by crimping type cable joints after getting approval of BHEL Engineer.
53.	The cable schedules indicating cable sizes, tentative cables routing information will be furnished by BHEL at site to the contractor. Required steel inserts on cable trenches, ceilings of the platforms in TG hall for erecting the cables will be provided by BHEL. The contractor shall design number of cable/ racks to accommodate the cables on racks/ trays properly.
54.	Many of the cable trays and cables have to be laid in cable trenches. For this purpose, the cover of the trenches has to be opened for working in site and whenever the cables are to be laid in existing cable tray, all safety precautions have to be observed. After completing the work, the trenches have to be cleaned and covers put back into position. Contractor shall also carry out de-watering from the trenches if required and arrange pumps etc., at his cost.
55.	Cables to be laid for exhaust fan and its starter box shall be laid on the wall/ beam/ ceiling for that spacer, cleat and clamp material shall be supplied by the bidder. Cable laying rate shall be inclusive of hardware items.
56.	Looping wire at terminal block of panels and electrical actuator as shown in the inter-connection diagrams or as required is to be done by contractor at no extra cost. Re termination of control cable in panel or equipment side due to any reason will not be paid extra. Agency shall provide the electrician during commissioning of equipment after cable termination work if necessary.
57.	Sharp bends of cable trays shall be avoided in all type of cable trays.
58.	Contractor shall carefully plan the cutting schedule of each cable drum in consultation with BHEL site engineer such that wastage is minimized. Recovery will be made in case the wastages are exceeding the wastage allowances fixed in this contract.
59.	Testing and electrical measurement of cable installations shall conform to the requirement of IS: 1255.
60.	The rate of laying for LT power, control and signal cable is inclusive of glanding, trefoil clamps and termination at both ends. Glands & Lugs above 4 sq. mm shall be supplied by BHEL & lugs up to 4 sq.

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	mm shall be in vendor's scope. The LT Power Cable straight through Jointing Kit (if required) shall be in vendor's scope of supply. The rate for erection for all these items will be part of laying rates. No separate rate is applicable on this account.
61.	The unit rates for the HT cable termination and unit rates for laying of HT cables are exclusive of each other. Glands & termination kits for HT cables (3.3kV and above) shall be supplied by BHEL/ BHEL's Customer.
62.	Cleaning and rectification work due to rusting in electrical equipment are under the contractor's scope.
63.	Apart from above, Cable Erection Philosophy should be strictly followed.
64.	General Notes
a	Applicability of new size of cable tray, cable, etc for a project of such magnitude may be inevitable. To derive rates of such new items of installation of cable tray, laying of cable, cable termination, etc, which are not covered in BOQ of Chapter-X, following guidelines shall be applicable for this tender. Decision of BHEL shall be final & binding on bidder.
b	For new size cable tray, width of cable tray will be taken into reference and rate of installation of cable tray of nearest higher width will be pro-rated to derive the rate for installation of new cable tray.
c	To derive the rate for laying of new size cable, OD of cable will be taken into reference and rate of laying of cable of nearest lower OD will be pro-rated to derive the rate for laying for new cable.
d	Rate for termination of new size cable and other items will be derived based on mutually agreed modality and on approval of BHEL.
2.8	JUNCTION BOXES AND PUSH BUTTONS
a	Different types of junction boxes are to be erected by the contractor as per attached BOQ. The junction boxes are to be located at the locations jointly decided at site during erection. The junction boxes are to be erected on the frames fabricated at site. The installation of Junction Boxes/ Push Buttons (JB/ PB) should be checked for correctness and their functions.
b	Junction boxes shall be mounted at a height of 1200mm above floor level or as specified in the drawings and shall be adequately supported/ mounted on masonry wall by means of anchor fasteners/ expandable bolts or shall be mounted on an angle, plate or other structural supports fixed to floor, wall, ceiling or equipment foundations.
2.9	STRUCTURAL STEEL FABRICATION AND INSTALLATION (INSTRUMENT/ JUNCTION BOX FRAME/ CABLE TRAY & MISC STRUCTURES FABRICATION)
1.	Structural steel material like MS angles, channels, beams, flats, plates etc. shall be supplied in running meter and the same shall be used for misc. fabrication if required. and the same shall be used for fabrication of panel base frame, cable tray supports, canopies for instruments/ panels/ drives/ JBs/ Push Buttons etc., Instrument/ Junction box frames, Impulse Pipe/ Instrument Air Pipe supports and instruments etc.
2.	This shall include cutting into size, conduiting of end connections, if required, welding, grinding of excess weld deposits, drilling of holes for mounting of device/ instrument, installation at location, leveling, alignment, providing bracings, painting etc. No gas cut holes will be permitted. Contractor to follow the BHEL supplied welding schedule and welding procedures.
3.	All the fabricated supports/ frames for instruments, trays, pipes, electrical equipment, etc., shall be painted after sand blasting and surface preparation as per painting specifications. Paints and other associated items are in the scope of the contractor.
4.	In case, structural cable trays, bends, tees, reducers etc., are required to be fabricated from structural steel and installed, unit rate applicable for fabrication and installation of structural steel shall be applicable

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	in such instances.
5.	Frame installation at site may involve mounting either on concrete floor by grouting/ using anchor fasteners or on steel structure by welding etc. All consumables including anchor fasteners shall be arranged by the contractor. Where required, as part of work, concrete floors may have to be chipped out to reinforcement depth for anchoring the frames. Wherever grouting is required, contractor shall arrange all the required material including cement/ grout mix, shuttering etc., necessary labour and meet all other requirements as part of work. All consumables including anchor fasteners shall be arranged by the contractor.
6.	In certain packages, galvanized members of junction box frames and instrument racks shall be supplied in cut to sizes and frame assemblies are required to be done as per drawing by bolting/ welding. The installation rate as quoted shall include the assembling of the frames.
7.	Gas cutting of tray/ impulse pipe support and holes in frame is not permitted. Only hacksaw cutting/ drilled hole shall be permitted.
2.10	11kV/ 6.6kV/ 3.3kV HT SWITCHGEAR, 415V LT SWITCHGEAR/ MCC & DC DISTRIBUTION BOARD/ PANELS/ STARTER BOX ETC.
1.	Checking of installation for correctness.
2.	Mechanical functional checking/ adjustment of individual breaker.
3.	Measurement of Insulation resistance of individual breaker, complete switchgear board and combined insulation resistance of individual breaker with cable connected to drives.
4.	Testing of Protection Relay, Thermal over relay, Power transducers, Energy/ Ammeters, Voltmeters, Power factor, frequency, tri-vector meters & metering etc. in static & dynamic condition relay.
5.	Conducting test such as Insulation Resistance measurement, Ratio, polarity, magnetization characteristic, winding resistance on CT and PT.
6.	Checking of electrical control & protection interlock of individual breaker and integration with other system. Write-up on mechanical Interlocking Scheme for safe opening of rear covers & earthing interlocks for 33kv and 3.3/11kV HV Switchgear enclosed. Also, Vendor to assist during commissioning of online temperature monitoring system and online temperature monitoring system for sensor & HMI mounted.
7.	Calibration of energy meters, tri-vector meters, voltmeters, ammeters, power current & voltage transducers etc.
8.	Providing assistance for checking the electrical operation of individual breakers from remote panels/ MMI package (Metso DNA system).
9.	Other than the above, minor testing/ checks will also be involved in the generator area, which are also in the scope of the contractor. Any instruments/ tools etc. required for carrying out the above shall be arranged by the contractor within the quoted rates.
10.	The scope of Testing and Commissioning of electrically operated actuators for valves, dampers, gates, soot blowers, Hoists etc., will include meggering, providing loop wire on actuator terminal block, adjustments of mechanical/ electrical or electronic position transmitters, setting of limit/ torque switches, cable checking, internal wiring checking, local/ remote operation from MCC & MMI package (Metso DNA system), replacement of limit/ torque switches if required.
11.	Contractor shall cut/ open work, if needed, as per BHEL Engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over.
12.	Contractor has to repeat any test free of cost, even if already conducted, whenever required to prove and check the healthiness of system before power flow, such test could be primary injection and primary

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	injection in CTs. CVT, Insulation resistance of system/ individual equipment, functional tests or any other tests as required by BHEL/ BHEL's client.
13.	Electrical control panels, electronic control panels, HT/ LT switchgear, 415V LT MCC, are normally supplied in suite of either one/ two/ three or loose shipping sections with integral base frame or loose base frame. These panels may have to be installed as stand-alone or in-group consisting of number of panels in each row, depending upon the plant layout and foundation arrangement.
14.	The panels shall be transported from stores to the place of installation in vertical position. Care shall be taken such that the switches, lamps, instruments etc. mounted on the panel do not get damaged during transit.
15.	Installation of panel shall include fixing of base frame, leveling, alignment, fixing of anti-vibration pads, removal of side covers, fixing of cubical interconnection hardware, interconnection of bus bar/ bus bar jointing, wiring interconnection, welding and grouting of panels and base frames, mounting of panel canopy wherever supplied as part of panel, drilling of gland plates, sealing of panels/ cable entries. Where the base frame is not supplied as part of panel supply, the contractor shall fabricate the base frame from structural items at site. Payment for such fabrication will be affected on measured quantity at the rate applicable for structural steel fabrication and installation. Proper sealing of all the holes and cable entries (even if the cable has been laid by others) in the panel is in the contractor's scope.
16.	Panels have to be shifted to their locations through floor openings, temporary openings like floor grills, door etc. Which shall be a part of work and no claim whatsoever will be entertained with regard to non-availability of opening as per shortest route etc. Panels have to be erected at different locations and elevation in powerhouse building, LT & HT Switchgear room, unit control room etc.
17.	Panel and instruments once erected in position should be properly protected using necessary care to prevent ingress of dust/ moisture. This will have to be periodically cleaned and surroundings have to be kept tidy. These panels have to be regularly cleaned and surroundings tidy as per the instruction of BHEL Engineer till handing over of the set to customer is to be carried out by the contractor free of cost.
18.	Whenever the panels are to be mounted on cable trenches, channel supports have to be provided across the cable trench over which the base frame of panel shall be mounted. For such work, structural steel fabrication & installation rate shall be applicable.
19.	Normally the panels shall be supplied with meters, relays, electronic modules, and contactors, push buttons etc. mounted and pre-wired. However, if such devices are supplied loose/ separately for safety in transit, contractor shall mount the same as part of panel installation work and terminating the wires on devices. No extra payment shall be made for this.
20.	Supplier's instruction manuals, packing slips, door keys etc. received along with the panels will be handed over to BHEL's Engineer on opening of the panels.
21.	Minor civil works like drilling, chipping, punching holes and opening in concrete floors, slabs and brick walls, grouting, related to Rack, support installation, minor civil works required for installation of control panels, Junction boxes etc., shall be included in the erection cost of such items. Also, all miscellaneous civil works like chipping away and making good as necessary in floor slab/ wall for cabling/ earthing etc., as required are included in the scope for which no separate payment is applicable. The scope also includes supply of grouting material, if any.
22.	For the panels erected by other agencies, commissioning/ calibration work and troubleshooting has to be carried out by the contractor as part of testing and commissioning work as per the quoted rates.
23.	No separate payment shall be made for replacement of any devices like electronic modules, relays, conductors, terminal block, push buttons etc. which are found defective during pre-commissioning/ post-commissioning of any equipment/ item.

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24.	Interposing Relays (24/ 48V DC) along with mounting base shall be supplied separately for mounting in the various feeders of 11kV/ 6.6kV/ 3.3kV HT switchgear boards and 415V MCC Board/ Switchgear Panel Boards for unidirectional/ bi-directional drives, solenoid valves. 2 Nos. interposing relay are required to be mounted in each feeder. Internal wiring for these relays shall be pre-wired in the feeders, wires to be terminated on relay terminals (approximately quantity is 1000 Nos.) Contractor shall mount the same and terminate the wire as part of panel installation work and no extra payment shall be made for this work.
25.	The Erection, Testing and commissioning of 11kV/ 6.6kV/ 3.3kV HT Switchgear, 415V LT Switchgear/ MCC & DC Distribution Board/ Panels/ Starter Box etc. shall be in line with the Approved Field Quality Plans.
26.	General Notes
a)	Accepted unit rates for each SWGR/ panel shall remain firm regardless of any change in width, height, type, weight or other parameter, as furnished in tender. Decision of BHEL shall be final & binding on bidder.
b)	For variation in length within of SWGR/ panel, accepted unit rates shall remain firm.
c)	For any new panel, supplied by BHEL and not indicated in BOQ, rate of the new panel shall be arrived as per following philosophy.
d)	Length of new SWGR/ panel = A.
e)	Length of existing nearby SWGR/ panel as indicated in tender/BOQ = B
f)	Accepted unit rate for that existing SWGR/ panel = Rs C.
g)	Derived Rate for new SWGR/Panel to be considered for the purpose of additional payment/ recovery = Rs (A/B)*C
2.11	BATTERY/ BATTERY CHARGER
i.	Lead Acid/Ni-Cd (or similar type) Batteries will be supplied loose along with battery interconnection in the series/ parallel links/ bus bar, lugs, steel/ wooden battery stand either assembled or knocked down condition, cables and associated charger.
ii.	Battery charging/ discharging is a continuous process and skilled manpower shall be deployed by the contractor round-the-clock.
iii.	Contractor shall arrange suitable load, cables, safety equipment and consumables for discharging the battery during charging and discharging cycle at his cost.
iv.	Contractor shall provide skilled manpower for periodic maintenance after the battery are fully charged for the activities such as checking of electrolyte level, specific gravity, topping up with distilled water and cleaning till the set is handed over to customer and record of the same shall be maintained and submitted before handing over of the system.
2.12	ABOVE GROUND EARTHING
i.	All equipment shall be earthed by two separate and distinct connections. Earthing terminals will be available in all equipment supplied by BHEL. Earthing terminals will be available in all the equipment supplied by BHEL. Above ground earthing shall be carried out as per the approved drawing & Philosophy furnished by BHEL Engineer.
ii.	The contractor shall carry out above ground earthing for all Electrical equipment, which may be erected by him, or some other agency. Different type of earthing materials shall be supplied and the contractor shall lay and connect the earthing materials as per site requirement/ as per the drawings. Unit rate for earthing material shall be paid on running meter basis.
iii.	Parts of all electrical equipment and machinery not intended to be live shall have two separate and

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	distinct earth connections each to conform to the stipulation of the Indian Electricity Rules and apparatus rated 240V and below may have single earth connections.
iv.	The earthing conductors shall be of mild steel/ GI strip/ wires. All connections from equipment to main earthing conductors shall be made as per the earthing drawing/ as per instruction of BHEL Engineer. Suitable "Copper (CU)" Lugs are to be supplied for earthing with GI wire by the agency wherever is required.
v.	A continuous earthing conductor shall be installed in all cables trays and securely clamped to each tray section by suitable connectors to form a continuous earthing system. When two or more trays supporting power, cables run on parallel a continuous earthing conductor shall be provided on one tray only with tap-offs to the control cable trays. All valve and damper motor and rapping motors will be earthed to this conductor.
vi.	All joints in the earthing system shall be welded type. Earthing connections to all equipment including motors shall be bolted type.
vii.	Earthing connections shall be free from tinning scale paint, enamel, grease, rust or dirt at the time of making joint.
viii.	Metallic sheaths, screens/ shields and armour of all multicore cables shall be bonded and earthed.
ix.	Earthing conductors along their run-on columns, beams, walls etc. shall be supported by suitable cleats at intervals of 750mm/ 1000 mm.
x.	Welded joints on GI earthing conductors shall be painted (Refer clause no. 2.34 for details.)
xi.	For different floors in a building, localized internal earthing ring shall be formed and connected to the ground earthing through vertical risers. The earthing mat shall be common to both power and lighting installations.
xii.	The runway conductors at different building elevation shall be inter connected between the main risers along the column/ wall and shall also be connected to the nearest riser/ structure columns and the distance between earthing point shall not exceed 30 meters.
xiii.	Generally, risers are provided near the structure/ equipment foundation, in case risers are not visible and buried below the foundation level, contractor shall carry out necessary earth excavation for connecting the above ground earthing strips. Wherever welding is involved necessary protective coating shall be applied on weld joints.
xiv.	If the equipment is not available at the time of earthing conductor laying tap connections from the main earthing conductor shall be brought out up to slab equipment foundation level with at least 200mm spare length left for further connections to equipment earthing terminals.
xv.	Entire system shall be earthed in accordance with the provisions of the relevant IEC recommendations/ IS code of practice IS 3043: 2018 (or latest) and Indian Electricity Rules, so that the values of the step and contact potentials in case of faults are kept within safe permissible limits.
xvi.	If any outer shops and buildings as well as the electrical sub-stations and electrical rooms are also in contractor's scope, a ring main earthing system will be provided. Ring main earthing systems shall again be interconnected as a network to power plant main earthing mat. Internal earthing ring in the electrical equipment room shall be provided by the contractor irrespective of whether equipment of the area is in their scope or not.
xvii.	A minimum of two spare earth rings will be provided in each floor of the building for earthing future building. All tray tiers of each section shall be connected to the runway conductor at an interval of about 10 meters.
xviii.	Each RCC steel column of the building will be interconnected to the floor-earthing grid in basement/

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	ground floor.
xix.	For protective earthing separate conductor shall be used for flow of earth fault current.
xx.	Contractor shall carry out minor civil i.e., chipping of floor (where earth strip is to be laid on floor), removal of topsoil for laying earth strip in switchyard area etc.
2.13	BELLOW GROUND EARTHING
i.	Treated Earth Pits: As per PEM Specification Preparation of Treated earth pit includes supply of all items (except the electrode rod/ pipe 3-meter-long with funnel) including charcoal; salt, civil chamber with cover (as per the drawing) is in the scope of the contractor. The contractor shall also connect this pit to the earth grid (by other agency) at nominal distances of 5 to 10 meters by 40 mm rods, which are also in the scope of the contractor.
ii.	Earth electrode: As per PEM specification, Earth electrode shall be made of 40mm diameter MS rod/ Pipe tapering of one end of electrode rod and buried as per the drawing. Civil works are also to be carried out by the contractor. The contractor shall also connect this pit to the earth grid (by other agency) at nominal distances of 5 to 10 meters by 40 mm rods, which are also in the scope of the contractor.
2.14	LIGHTNING PROTECTION SYSTEM
i.	Lightning Protection system consists of Air Terminal, Base Plate, Disconnection Link with JB and Fastener.
ii.	Requirement clamp, support etc. shall be the part of the installation of system, no extra payment shall be entertained.
iii.	Though concrete Block shall be a part of civil, if it is not supplied than same shall be casted at site on cost plus basis as per the approved drawing.
iv.	Building wise drawing shall be furnished for execution of Lightning Protection system.
v.	Any changes shall be done as per instruction of Engineer in consultation with BHEL-PEM.
vi.	The Disconnecting Link shall be made at the height of 1500 mm above ground level.
vii.	The Down conductor shall be laid on the wall/ structure column and fixed at the specified interval as per instruction of BHEL/as per the approved drawing.
viii.	Apart from above, Typical Lightning Protection Details should be strictly followed.
2.15	11/ 3.3kV/ 0.433 KV (SEGREGATED/ NON-SEGREGATED/SANDWICH) PHASE BUS DUCT
i.	Segregated/ Non-Segregated phase bus duct shall be supplied in loose shipping section along with hardware & other items. Each section shall be complete with Al alloy enclosure and conductor with epoxy bus support insulators arrangement. However other items such as silica gel breathers, inspection windows, rubber bellows, flexible & solid copper/ aluminium connector, bi-metallic strips, GI pre-fabricated supporting structure, wall frame assembly, set of hardware etc. shall be supplied loose. Galvanized iron earth bus shall be provided for enclosure continuity. All bolted joints shall have cadmium plated high tensile steel hardware.
ii.	Each set of SP bus duct is meant for interconnection from low voltage side of Unit, Unit Auxiliary and Station Transformer to 11kV/ 3.3kV switchgear board and bridging bus duct between the switchgear boards.
iii.	The bus duct consists of rectangular conductor made of aluminium alloy supported on post insulator and housed in aluminium sheet metal rectangular enclosure. The bus bar/ enclosures has bolted joints.
iv.	The bus duct shall be supported either from bottom of the concrete slab with embedded insert plate/ TG building supporting structural members and pocket provided on foundations. The bus duct assemblies, supporting structures shall be pre-fabricated and to be assembled as per lay out drawing. The erection and testing requirement shall be similar to the isolated phase bus duct, except the welding of bus bar

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	and enclosures.
v.	Each set of bus duct shall be supported with supporting structure, which shall be fabricated from standard steel section and hot dip galvanized. All structure & bus duct assemble shall be erected as per drawings.
vi.	Pre-treatment consisting of degreasing, de-rusting etc. shall be done on all fabricated parts before painting of cubicles, cabinets, marshalling boxes and galvanization of steel structures.
vii.	Except for supporting steel structures which shall be galvanized, all equipment including bus duct enclosure shall be finished with an under coats of high quality primer followed by two coats of synthetic enamel paint which shall have a thickness not less than 50 microns.
viii.	The Bus Duct erection and commissioning shall be in line with the drawings released for construction.
ix.	The bus duct shall include 90 Deg edge & flay bellow, wall frame assembly, end flange, adopter box, Al Flex, Cu Flex, Rubber bellow, Bus duct support structure, Phase cross over etc.
2.16	ISOLATED PHASE BUS DUCT 21/24kV, 24000A MAIN RUN, 14000A DELTA RUN, & 2800A TAP-OFF RUN
i.	Generator isolated bus duct is connected to low voltage side of single-phase power transformers and main bus duct shall have tee off connection for unit transformer, LAVT cubicles, excitation transformer and air pressurization equipment. Bus duct consist of round/ octagonal/ box hollow aluminum alloy conductor and supported inside aluminum enclosure with post insulator. Flexible connections and expansion joints are provided at terminals and intermediate point to alleviate stresses. Ring type protection current transformer will be mounted inside the bus duct.
ii.	Isolated phase bus duct shall have tap connection for potential transformer, surge protector etc. housed in a metal clad cubicle, UAT and NG cubicle/ resistor cubicle. Various electrical tests have to be performed before and after erection.
iii.	Bus duct enclosure/ conductor is a continuous welded type. Conductor, enclosure, makeup pieces, shunts pieces etc. have to be welded at site.
iv.	The scope for Erection and testing of Isolated Phase Bus Duct shall include Transportation of material from stores/ storage yard {from inside or outside plant boundary (Approx 3 km away)}, preparatory work such as erection of supporting structure, placement of sub-assemblies/ equipment's, alignment, edge preparation of conductor/ enclosure, welding of conductor/ enclosure, welding of shunt pieces & make up pieces, installation of seal off bushing & wall frame assemblies, shorting links, earthing, LAVT cubicle, copper flexible, copper rubber bellows, weldable/ bolted flexible, installation of air pressurizing unit and its associated piping work and cable etc., testing and commissioning.
v.	The Scope Would Include Neutral and Phase Bus Duct IR Value Measurement, Bus Duct Mounted CT's Testing, Loop Testing of CT Secondary Cabling by Secondary and Primary Injection of Bus duct, Contact Resistance Measurement for All Bus Duct Joints, HV Testing of Phase and Neutral Bus duct, Space Heater Circuit Testing and Charging, LAPT Cubicle IR Value Measurement, PTS Testing. Surge Capacitor Testing, LA Meggering, Pt Secondary Circuit Checking by Secondary and Primary Injection Testing, LAVT Cubicle Space Heater and Illumination Circuit Testing, Testing of Neutral Grounding Transformer for Ratio, IR Value and Resistance; Testing of Neutral Grounding Resistor for IR Value and Resistance, Space Heater and Illumination Circuit Charging for NGT/ NGR Cubicle, Bus duct Charging, LAVT Cubicle Charging.
vi.	Pre-fabricated G.I. supporting members shall be supplied in loose condition and are to be erected as per lay out drawing. Foundation pockets and embedded plate inserts shall be provided as per lay out drawing (on floor for bottom support and on bottom of concrete slabs). Contractor shall weld the supports on insert plate and shall carry out grouting including supply of grout materials after complete alignment/

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	bolting of structural members. If any modification required in supporting structure due to site conditions, the same shall be carried out without any extra cost. All welded joints shall be applied cold galvanizing zinc paint. Supply of Paints, primers etc. are in the scope of the supplier, within the quoted rates.
vii.	Required aluminum welding of conductor, enclosures, shunt, make up pieces, aluminum flexible etc. as detailed in drawings has to be carried out by contractor. MIG/ TIG welding shall be applicable. Contractor shall arrange necessary welding equipment/ accessory in sufficient number, filler wire, argon gas and other required consumables at his cost.
viii.	During erection of bus duct/ enclosure, makeup pieces and shunts, if any modifications needed to match the alignment shall be part of work and no extra payment shall be made.
ix.	All bolted joints and flanges shall be tightened with torque wrench to the approved torque. Wherever there are bolted joints, the same shall be cleaned and a layer of anti-oxidation paints shall be applied. Necessary paints etc. to be arranged by contractor within the quoted rates.
x.	Top chamber/ adapter box for line and neutral side, hood assembly at UT hood assembly at excitation transformer and at LAVT cubicle end shall have drilled hole in flange. If there is any mismatch of the hole in above with respect to the counter flange/ welded studs provided on UAT, LAVT and excitation cubicle, the contractor shall drill new holes if required.
xi.	Proper sequence shall be followed during erection to avoid any mismatch and alignment problem.
xii.	Prior to installation of bus duct assemblies in position, various components like conductor, insulator shall be inspected and cleaned and insulation resistance to be measured and recorded. If any insulator is found damaged, the same shall be replaced.
xiii.	Electrical test on current transformers and potential transformers shall have to be carried out prior to installation & during pre-commissioning. The tests are insulation resistance measurement, winding resistance, magnetization characteristic, ratio test, water ingress and air leak test on assembled bus ducts.
xiv.	Minor civil work such as chipping, leveling of foundation, providing pockets, drilling/ enlargement of holes in structure, bus bar etc. Which are incidental to the erection of bus duct shall not be treated as extra.
xv.	All miscellaneous items such as disconnecting links, flexible, shorting bars, hardware's, conduit for wiring, marshaling box, CTs and PTs wiring through conduit, earthing materials, bus bar fish plates etc. are part of bus duct installation. Hence separate breakup quantity is not given in BOQ.
xvi.	Round makeup pieces for main and tee off duct shall be supplied in two halves and it involves but circumferential and horizontal welding at parting plain.
xvii.	Air tightness and water tightness test have to be carried out on completion of bus duct installation. In case of any leakages, contractor has to rectify and bring to the required level of air tightness/ water tightness without any extra cost.
xviii.	High voltage test of bus duct is to be carried out as per the instruction of BHEL engineer. Contractor shall arrange necessary test equipment/ instrument for conducting various electrical tests at his own cost.
xix.	Contractor has to carry out final painting as per standard colour code recommended by BHEL. Paints and consumables shall be in contractor's scope.
xx.	On welding joints, DPT test is required to be conducted.
xxi.	Shunt pieces shall be supplied in two halves and to be welded between two-phase bus duct at transformer end. The shunt pieces to be welded on both the side on matching plain and bus duct circumference and horizontal plain
xxii.	Contractor shall conduct 20 % radiography and 100% NDT test on welded joints.
xxiii.	Any Enclosed/ attached drawings are for estimation and tendering purpose only. Contractor has to

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	ascertain quantum of work involved. The BOQ as furnished in this tender specification for Isolated Phase Bus Duct & Segregated Phase Bus Duct are tentative/ approximate. Contractor has to ascertain the quantum of work involved and quote the lump sum value, as called in the rate schedule, without any additional compensation for any variation in length or numbers of joints.
xxiv.	One end of the enclosure to be earthed to the station earth at shunt location where all three-phase enclosure are shorted. Wherever shunts are not provided, each phase should be earthed separately.
xxv.	In case of bolted bus duct, phase split covers, rubber bellows, clamping earth straps to be connected to maintain the electrical continuity and in turn enclosure gets earthed at one point.
xxvi.	All other equipment such as LAVT, NG transformer/ resistor cubicle, air pressurization, CT chambers, junction boxes, etc. to be earthed at two points to the earth grid.
xxvii.	Pre-treatment consisting of degreasing, de-rusting etc. shall be done on all fabricated parts before painting of cubicles, cabinets, marshalling boxes and galvanization of steel structures.
xxviii.	Except for supporting steel structures which shall be galvanized, all equipment including bus duct enclosure shall be finished with an under coats of high-quality primer followed by two coats of synthetic enamel paint which shall have a thickness not less than 50 microns.
2.17	POWER TRANSFORMERS & LT AUXILIARY TRANSFORMERS
i.	Contractor shall transport the transformer tanks & accessories of LT power transformer and other transformers as mentioned above from BHEL stores/ Storage yard to respective foundation of unit.
ii.	Single Phase 265MVA, 420/ 21kV, OFAF cooled YNd11, Generator Transformer (GT), 130/65/65 MVA, 3-phase 400/11.5/11.5kV Station Transformer, 40MVA 21/11.5kV Unit Transformer , 25MVA, 34.5/11kV Common Service Aux. Transformer , CHP, AHP, FGD Auxiliary, Miscellaneous Transformer shall be made available to the contractor 80 to 120meters (approximately) away from the respective foundation, further unloading, transport and shifting of power transformers to the foundation shall be in the scope of this work. The shifting operation may require dragging either on ground with suitable arrangement or dragging after fixing of wheels on rail track. It may also require turning of transformer at suitable locations en-route to foundation. The contractor shall arrange wooden sleepers, winches, jacks, rails, crane, plates etc. at his cost for this operation. However, all loose accessories shall have to be shifted from stores/ storage yard.
iii.	The transformers shall be handled in such a manner so that no jerk is transferred to the core, winding and internals of the transformer.
iv.	Transformers are generally supplied in partly assembled condition either filled with oil up to the core end winding level or gas filled. Accessories, like radiators, conservator tank, pipes, fittings, hardware's, gaskets, Buchholz relay, marshaling box, relief vent, valves, pumps, cooling fans, cables, bushings, radiator headers/ fans, rollers, tap changer drive unit, cables of various sizes for interconnection from marshaling control box to field devices, bushing turrets and oil in Barrels shall be supplied loose.
v.	Placement on plinth, alignment with respect to the foundation and lay out drawings.
vi.	Internal inspection to verify the intactness of core and winding, tap changer leads, off-load switch/ on load tap changer, measurement of core and core bolt insulation.
vii.	In case transformers are supplied partly oil filled/ gas filled, after internal inspection, the transformer shall be kept under vacuum (for a period to be decided by site engineer) and treated oil to be filled up to required level.
viii.	Each drum of oil to be tested for BDV and if BDV is less, then each drum should be filtered separately. This treated oil to be filled in the transformers and auxiliaries.
ix.	Contractor shall arrange storage tank of approx. 10 kl capacity, internally sand blasted and with one coat

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	of oil resistance paint. Oil from drums to be transferred in storage tank and filtration to be carried out to achieve the required BDV/ withstand value. This treated oil to be filled in the transformers and auxiliaries. However, for low capacity transformer, a separate storage tank for mass filtration may not be required.
x.	All the accessories shall be assembled/ mounted as per OGA drawings and these should be thoroughly cleaned by spirit prior to installation.
xi.	Drying out of transformer and filtration of oil in cooling bank, pipeline, diverter tank of tap changer etc. to be done with ultra-vacuum filtering machine of adequate capacity. Drying out process shall be carried out round-the-clock and contractor shall deploy trained manpower for this purpose.
xii.	During dry out process, contractor has to plot the curve for insulation resistance value/ time/ oil temperature. Hourly reading to be recorded till completion of the dry out.
xiii.	The criteria for deciding completion of drying out shall be breakdown value of oil, PPM value of contaminants in oil, resistivity of oil, insulation resistance value and polarization index. The contractor shall carry out minimum two cycles of dry out for achieving the required dew point or as per the BHEL Standards.
xiv.	Filter machine capacity if found to be inadequate, or in case of failure of an existing machine, alternative arrangement is required to be done to meet the required result and time. It is to be particularly noted that that as per exigencies of site working contractor will have to arrange more oil filtration machines as per site requirement.
xv.	Due to unforeseen reasons the commissioning of transformer is delayed after first drying out and if required, the contractor shall carry out the oil filtration of assembled transformer. For full re-filtration, payment will be made at 25% of quoted price of Transformer.
xvi.	Contractor shall arrange required testing equipment for carrying out electrical test like voltage ratio, turn ratio, vector group, magnetic balance, winding resistance measurements, and BDV value of oil, Tan Delta Measurement of Bushings & Winding, insulation resistance, measurement of oil PPM, Acidity, Resistivity, SFRA and TAN Delta Test. The Contractor shall arrange to carry out DGA Test of Oil Sample before and after first successful charging of Generator Transformer and Station Transformer. The contractor shall arrange oil sample testing for PPM/ Resistivity or any other tests applicable for oil sample at approved testing laboratory/ BHEL Bhopal at his own cost including all incidental expenses.
xvii.	Contractor shall discuss and finalize installation and testing activity procedure with BHEL/ customer prior to starting the work.
xviii.	Tests are also required to be conducted on Current Transformer, Potential Transformer & prior to/ after installation. Contractor shall also carry out oil processing/ filtration to achieve the desired results before charging and handing over of the entire system.
xix.	Contractor should have valid electrical contractor license to carry out installation of high voltage equipment.
xx.	Internal inspection on receipt of Transformer at site in presence of supplier is made mandatory. There may be time gap between first inspection and second inspection (which may be just before assembly of transformer accessories). Nitrogen cylinders of appropriate purity shall be arranged by contractor as a part of scope of work within the quoted rates for transformer.
xxi.	Process of Nitrogen (Use only dry Nitrogen gas to IS: 1747 with -60 Dew point) purging of transformer winding before proceeding for oil filling/ filtration is made mandatory by BHEL. Contractor shall arrange adequate number of nitrogen cylinders of appropriate purity. The purging process will be declared as completed on successful achievement of dew point measurement. It may be required to repeat the process till acceptable value of dew point is achieved.

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xxii.	Due to unforeseen reasons, if already tested and erected HV Bushing of Generator Transformer and Station Transformer need to replace at site, the contractor shall carry out the dis-mantling and replacement work of HV Bushing @20% of quoted price in case of 1-Phase Generator Transformer and @15% of quoted price in case of Station Transformer for replacement of one HV bushing.
xxiii.	Due to Unavailability of Civil Foundation or Rail Cum Road for GT/ ST/ UT/ UAT/ SAT/CHP/ AHP, if the transformers were unloaded more than the distance mentioned in TCC, the contractor shall carry out the dragging work up to their actual scope of distance @0.1% of quoted price of GT/ ST/ UT/ UAT/ SAT/ CHP/ AHP per meter.
xxiv.	Following notes/ tests/ jobs for power transformer shall also be carried out by Contractor.
xxv.	Verify the Air cell of the Conservator and its MOG before erection. If possible, remove the Air cell from conservator and thoroughly check the conservator and MOG and its Float.
xxvi.	Insure the Conservator Prismatic Gauge Glass hardware are in order to avoid leakage/ Spillage of oil from that portion.
xxvii.	Oil pressure test on fully erected Transformer to be conducted
xxviii.	All components dispatched separately should be cleaned inside and outside before being fitted
xxix.	Assembling of bushings is carried out according to bushings installation manual available. In case of draw rod/ lead connection of bushing with transformer lead, half connector joints to be insulated with 3 layers of crepe paper after making proper.
xxx.	Individual radiator/ cooler and pipework to be flushed with compressed air followed by carrying out Pressure test on individual radiator/ cooler Bank to check any leakages/ damages before start of Erection at site.
xxxi.	The lower and upper shut-off valves for radiators/ coolers and possible headers shall be open during evacuation and oil-filling. If coolers are placed on suspension beams, which are mounted at right angle to the tank, the suspension beams shall be supported against the ground during the evacuation. Also radiators mounted on the tank wall shall be supported in a similar way. The hose for filling of oil is connected to the bottom valve of the transformer which must not be opened until the hose has been de-aerated and completely filled with oil.
xxxii.	All shorting links on tanks, turrets and fittings to be provided as per OGA
xxxiii.	Oil Sampling shall be done as per IS 9434/ IEC: 60567.
xxxiv.	Oil filling in the conservator and also draining whenever required must be done very slowly. During oil filling, pressure in the air cell should not exceed 0.1kg/ sq.cm (1.5 psi).
xxxv.	Check the CCU unit and also verify the outputs are working or not. also calibrate the CCU unit with the WTI/ OTI.
xxxvi.	Proper Tightness of the adjustable Resistor screw of WTI.
xxxvii.	Contact resistance of all the bolted joints in the neutral formation & grounding path.
xxxviii.	The Erection, Testing and Commissioning of GT, ST, UAT, and other auxiliary transformers shall be in line with the Approved Field Quality Plans and as per instruction of Site Engineers/ Manufacturers.
2.18	NAS FILTRATION & PARTICLE COUNTING OF OIL TYPE TRANSFORMER (420kV & ABOVE): Procedure to be followed for Hot oil circulation/ drying out, oil rinsing, particle reduction and particle counting as follows: After completion of the hot oil circulation in main tank and cooler/ radiator system separately, the valves between main tank and cooler/ radiator system to be opened to allow the mixing of oil. The oil rinsing shall be carried out by connecting transformer to the oil rinsing plant connected with particle counter. Initially the oil inlet is connected to the lower portion of the tank and the outlet to the upper portion and

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	<p>start rinsing plant for circulation and creating turbulence of oil for approx. 1 hour. Thereafter the connection to be reversed (Oil inlet to the top of tank and oil outlet to the bottom of tank) and start rinsing plant. This process to be continued till the 2 consecutive readings of particle content of the insulation oil is achieved as per below:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">If measured with particle counter which works on ISO4402 and ISO 4406:1987</td><td style="width: 50%;">≥ 2 microns should be <10000 particle/ liter.</td></tr> <tr> <td>If measured with particle counter which works on ISO 11171 and ISO 4406:1999</td><td>≥ 4 microns should be <15000 particle/ liter.</td></tr> </table> <p>It is recommended to use 35–40 kl/ hour capacity of pump in the rinsing plant.</p>	If measured with particle counter which works on ISO4402 and ISO 4406:1987	≥ 2 microns should be <10000 particle/ liter.	If measured with particle counter which works on ISO 11171 and ISO 4406:1999	≥ 4 microns should be <15000 particle/ liter.
If measured with particle counter which works on ISO4402 and ISO 4406:1987	≥ 2 microns should be <10000 particle/ liter.				
If measured with particle counter which works on ISO 11171 and ISO 4406:1999	≥ 4 microns should be <15000 particle/ liter.				
2.19	<p>SOOT BLOWER SYSTEM</p> <p>i. Soot blower system comprises of motor control center having various feeders of motor starters, micro-processor-based PLC/DDCMIS panel with mimic diagram and control station, push button boxes, junction boxes, wall blowers/ LRSB with drive mechanism, integral control box with limit switch and internal wiring, inter connecting cables between field blowers and MCC, PLC/DDCMIS panel etc. The scope of work for testing, commissioning covers the items/ devices as per rate schedule and the testing, commissioning of blowers shall be carried out in close co-ordination with mechanical agencies who shall be erecting these blowers and contractor shall obtain clearance from BHEL Engineer prior to start of work. The contractor shall carry out the following works under testing & commissioning: -</p> <p>ii. Pre-commissioning checks and tests on MCCs, blowers, PLC panels, energization of MCC and its feeders, wiring checks, insulation resistance measurements, testing of thermal over load relays etc.</p> <p>iii. Adjustment of limit switches, torque switches, internal wiring checks, minor wiring modification to suit to system requirements for wall/ LRSB blowers.</p> <p>iv. Electric operation of each blower from local, MCC and PLC panels and from Unit control board.</p> <p>v. Providing loop on terminal block of MCC individual feeders & blowers.</p> <p>vi. During pre-commissioning/ post-commissioning of soot blower system, the component like TB's, limit switch, torque switch, over load relay, contactors etc. if found defective, contractor shall replace such components without any extra payment.</p>				
2.20	<p>DIGITAL AUTOMATIC VOLTAGE REGULATOR ALONG WITH BRUSHLESS EXCITATION SYSTEM</p> <p>System comprises of excitation transformer, field breaker panels, regulation, field flashing, thyristors, DAVR, Mounting of Local Instrument, Checking healthiness of diodes/ Fuses, Exciter Heater/ Blower, actuator commissioning, Dummy load test of DAVR, Checking from Control desk & Field related inputs/ outputs to commission the excitation system fully operational, field breaker panels/ cubicle along with copper bus bar/ flexible connectors including internal wiring, and associated inter connecting cables. No separate item rate is applicable. Rate quoted by contractor shall be inclusive of all above related to Excitation system.</p>				
2.21	<p>ELECTROSTATIC PRECIPITATOR (ESP)</p> <p>i. ESP shall have flue gas passes and each pass comprises of HT rectifier transformer (silicon oil filled), electronic controller, ESP Switch board and its bus duct, drives for Rapping/ Collecting/ Gas damper screen, heating element for hoppers/ shaft and supporting insulator housing, ash level indicator and EP management system (software based) including computer interface and associated interlock and protection.</p> <p>ii. Contractor to perform all the works of ESP area as per the instruction of BHEL engineer.</p>				

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iii.	Contractor to perform Hopper Heater conduiting, earthing and dressing work for each hopper.
iv.	HT rectifier transformer shall be erected by mechanical agencies. Scope of work covered under this contract is oil filtration of transformers and erection and testing of various devices as listed in rate schedule. Contractor shall provide silicon oil filter machine as a part of scope. Contractor has also to provide operator round-the-clock for oil filtration and other necessary testing equipment. Contractor shall utilize power supply for filter machine from the source, which is given for the construction purpose, and shall arrange required cables.
2.22	CONTROL & PROTECTION RELAY PANELS & ASSOCIATED EQUIPMENT SUCH AS SPBD/ NSPBD, GT, UNIT & STATION TRANSFORMER, HT/ LT MOTORS AND OTHER ASSOCIATED EQUIPMENT ETC.
i.	Integrated Electrical testing/ commissioning of Control and Protection Relay Panels & associated equipment, etc. shall involve various activities like relay testing/ setting, simulation checks, testing of energy meters, on/ off line functional checks on integrated system.
ii.	Relay testing in static condition Transformers, HT/ LT Drives, and associated system by secondary current injection at different current and recording the time duration.
iii.	Relay setting and checking the stability of protection relays in static and dynamic condition during the OCC (Open Circuit Characteristic) & SCC (Short Circuit Characteristic).
iv.	Testing and checking of control and protection interlock scheme in static condition and simulation of protection device contact from internal and external devices of all electrical panels.
v.	Measurement of Insulations, Winding Resistance, Polarization Index of winding of HT/ LT Drives & associated equipment/ system, DC resistance test & Impedance test during pre-commissioning stage/ commissioning stage/ post commissioning stage.
vi.	Measurement of Insulations, Winding Resistance, Polarization Index of winding of Generator & associated equipment/ system, DC resistance test & Impedance test on rotor, Brushless excitation system at the time of rotor insertion as well as during pre-commissioning stage/ commissioning stage/ post commissioning stage.
vii.	Functional checks/ testing of synchronizing schemes, other electrical panels during the static and dynamic by simulation/ back charging of generator transformer conditions.
viii.	Monitoring & recording the various parameters during open circuit and short circuit conditions test on generator & associated field equipment like generator transformer, unit auxiliary transformer. Recording and monitoring measurement.
ix.	Testing of protection current transformer for ratio test by primary injection, magnetization characteristic, polarity test, and IR measurement. Functional checks of relays of protection system by primary injection.
x.	Testing of potential transformer for ratio test by voltage ratio, polarity test, insulation resistance measurement etc., testing of surge capacitors, PT isolator in PTPS cubicle etc.
xi.	Measurement of Insulation resistance of individual equipment and connected together.
xii.	Calibration of energy meters, tri-vector meters, voltmeters, ammeters, current & power transducers etc.
xiii.	Providing temporary shorting link on bus duct or any other location while testing & normalization after the test.
2.23	ELECTRICAL HOIST
i.	Electrically operated hoist of capacity varying from 2 MT to 40 MT are provided for maintenance purpose of ID/ FD/ PA fans, Mill area, Air Heater, ESP and other area in boiler. Mechanical erections of hoist components such as runway beams, hoist carriage, drive unit, etc. shall be done by another agency. The scope of work covered in this tender specification for erection & commissioning is installation of DSL

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	system and associated accessories. The scope of work for the contract in this package is as under:
ii.	TEE IRON TYPE DSL SYSTEM: - It consists of tee iron guide for cable trolley and associated supporting structural members, trailing cable, cable guide trolley, dog chain, switch fuse unit, limit switch, etc.
iii.	TAUT WIRE TYPE DSL SYSTEM: - It consists of end bracket, galvanized wire rope, turn buckle/ straining bolt, real insulator/ cable guide trolley, cable, switch fuse unit, rope clamps, leather bands, dog chain, limit switch etc. DSL system shall have to be erected at higher elevation. Contractor shall take all safety measures while carrying out the work.
	Installation of tee iron & other structural steel member, unit rate for fabrication & installation shall be applicable and other items unit rate shall be paid, however cable dressing, fixing of leather bands, rope clamps and any incidental work such as making approaches for executing the work, scaffolding etc. shall be part of work.
	Commissioning & testing of electrical hoists shall include panel wiring check, IR measurement, functional check, over load relay testing, trial run, providing assistance during load test, replacement of component if required etc. However, preparatory work for load test and arrangement of load etc. shall be done by another agency.
2.25	GENERATOR SYSTEM TESTING
i.	Generator stator winding resistance and PI value measurement/ check.
ii.	Generator rotor winding resistance, impedance, IR value measurement before and after rotor insertion.
iii.	Generator Bushing HV test.
iv.	Main exciter winding resistance, IR value measurement/ check.
v.	PMG winding resistance, IR value measurement/ check.
vi.	Testing and commissioning of generator and exciter accessories viz., heaters, blowers, stroboscope, diodes, enclosure lighting, potential measurement of bearings (TE &EE) etc.
vii.	Meggering during drying out of generator.
viii.	Meggering of generator bushing and its accessories. This test has to be conducted many times during erection and commissioning stages.
ix.	Commissioning of Stroboscope, Exciter Drier, Heater and Generator Air drier.
x.	Assistance in commissioning of H2 Drier Equipment.
xi.	Other than the above, minor testing/ checks will also be involved in the generator area, which are also in the scope of the contractor. Any instruments/ tools etc. required for carrying out the above shall be arranged by the contractor within the quoted rates.
xii.	The scope of Testing and Commissioning of electrically operated actuators for valves, dampers, gates, soot blowers, Hoists, Cranes, Chain pulley etc., will include meggering, providing loop wire on actuator terminal block, adjustments of mechanical/ electrical or electronic position transmitters, setting of limit/ torque switches, cable checking, internal wiring checking, local/ remote operation from MCC & MMI package (Metso DNA system), replacement of limit/ torque switches if required.
xiii.	Contractor shall cut/ open work, if needed, as per BHEL engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over.
xiv.	Contractor has to repeat any test free of cost, even if already conducted, whenever required to prove and check the healthiness of system before power flow, such test could be primary injection and primary injection in CTs. CVT, Insulation resistance of system/ individual equipment, functional tests or any other tests as required by BHEL/ BHEL's client.
xv.	Other than the above, minor testing/ checks will also be involved in the generator area, which are also in

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	the scope of the contractor. Any instruments/ tools etc. required for carrying out the above shall be arranged by the contractor within the quoted rates.
2.26	GENERAL GUIDELINES FOR ERECTION AND COMMISSIONING
i.	Contractor shall abide by the safety/ security rules and regulations as per the requirement of NTPC and BHEL. Contractor shall obtain information about all safety and security norms of NTPC well in advance. BHEL will not admit any claims whatsoever on account of Contractor's non-familiarization of site safety and security regulations.
ii.	The intent of specification is to procure services according to the most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for proper and efficient execution of this work shall not relieve the contractor of the responsibility of providing such facilities to complete the work without any extra compensation.
iii.	The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, supervision, engineering and construction management. The contractor should ensure proper planning, successful & timely completion of the work to meet the overall project schedule. The contractor must deploy adequate quantity of tools & plants, measuring instruments, calibrating equipment, modern/ latest construction aids etc. He must also deploy adequately trained, qualified and experienced engineers, supervisory staff and skilled personnel. The manpower deployment identified by contractor should match requirement of sophistication involved with the items mentioned in the BOQ.
iv.	The work under this scope being quite sophisticated and also quite extensive, for proper planning, monitoring, reporting, etc. of ongoing works, the contractor shall establish his own computer (1no.) and printer (1no.) at his site office, along with suitable operator(s), consumables, etc. Non-establishment of above equipment will attract penalty @Rs 10,000/- (Rs Ten thousand only) per month.
v.	BHEL uses its own software SOMS (Site Operation and Management System)/SUVIDHA Portal/ or any other software for total project execution and billing. The contractor shall also provide adequate and suitable manpower for updating/ entries into these systems in BHEL computers at site.
vi.	The work to be carried out under the scope of this specification covers the complete work of loading, handling, transporting, unloading, preassembly, erection, calibration, testing, air flushing, pre-commissioning tests, commissioning of systems, trial run of various auxiliaries, achieving various activities till handing over of the unit to BHEL's customer, providing maintenance team to cater to guarantee responsibilities and maintenance thereafter.
vii.	The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The contractor and his personnel shall cooperate with personnel of BHEL, BHEL's customer, customer's consultants and other contractors, coordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work or the project as a whole.
viii.	Contractor shall erect, align and commission all the equipment and auxiliaries as per the sequence & methodology prescribed by BHEL depending upon the technical requirements. Availability of materials and fronts will decide this. BHEL Engineer's decision regarding correctness of the work and method of working shall be final and binding on the contractor. No claims for extra payment from the contractor will be entertained on the ground of deviation from the methods/ sequences adopted in erection of similar sets elsewhere.
ix.	The services, tests and support to be provided by the agency for the work mentioned in the various sections of this tender are indicative and not exhaustive, but not limited to these for the completion of the work in all respects.

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x.	Plant materials should not be used for any temporary supports/ scaffolding/ preparing pre-assembly bed etc.
xi.	The contractor shall have total responsibility for all equipment and materials in his custody at contractor's stores, or any loose, semi-assembled, assembled or erected by him at site. He shall effectively protect the finished works from action of weather and from damages or defacement and shall also cover the finished parts immediately on completion of work as per BHEL Engineer's instructions. The machined surfaces/ finished surfaces should be greased and covered.
xii.	At all stages of work, equipment/ materials in the custody of contractor, including those erected, will have to be preserved as per the instructions of BHEL.
xiii.	The contractor shall make all fixtures, temporary supports, steel structures required for jigs & fixtures, anchors for load and guide pulleys required for the work (including those specifically included in BHEL scope). However, necessary steel will be provided from the scrap/ surplus materials available at site.
xiv.	The work shall conform to dimensions and tolerances specified in various drawings that will be provided during the erection. If any portion of the work is found to be defective in workmanship or not conforming to drawings or other specifications, the contractor shall dismantle and re-do the work duly replacing the defective materials at his own cost, failing which the work will be done departmentally or by engaging other agencies and recoveries will be effected from contractor's bills towards expenditure incurred including 30% departmental charges.
xv.	The terminal points decided by BHEL shall be final and binding on the contractor for deciding the scope of work and effecting payment for the work done.
xvi.	During the course of erection, testing and commissioning of Electrical work, certain rework/ modification/ rectification/ repairs/ fabrication etc., will be necessary on account of feedback from various thermal power stations or units already commissioned and/ or units under erection and commissioning and also on account of design discrepancies and manufacturing defects and site operation/ maintenance requirements. This will also include modifications/ re-works suggested by BHEL/ customer/ other inspection group. Contractor shall carryout such rework/ modification/ rectification/ fabrication repairs etc. promptly and expeditiously. Claims of contractor, if any, for such works will be dealt as per clauses 2.15 of GCC.
xvii.	In case any rework/ repair/ rectification/ modification/ fabrication etc. is required because of contractor's faulty workmanship which are noticed during the commissioning of, at any stages, the same shall be rectified by the contractor at his cost. If during the commissioning any improvement/ repair/ rework/ rectification/ fabrication/ modification due to design improvement is required, the same shall be carried out by the contractor promptly and expeditiously. Claim if any, for such work from the contractor shall be governed by clause no. 2.15 of GCC.
xviii.	Daily log sheets indicating the details of work carried out, man-hours, consumables used etc., shall be maintained by the contractor and counter-signed by BHEL Engineer every day.
xix.	Contractor shall prepare Marked-Up drawings incorporating modifications and deviations from original drawings or prepare fresh sketch for actual installation/ connection details if need be, that can be converted to "As-built" drawings.
xx.	All transport equipment, handling equipment, tools, tackles, fixtures, equipment, materials, manpower, supervisors/ engineers, consumables, electrodes including oxygen, acetylene argon etc. gases, primers, paints etc.; except otherwise specified as BHEL scope of free issue; required for this scope of work shall be provided by the contractor. All expenditure including taxes and incidentals in this connection will have to be borne by him unless otherwise specified in the relevant clause. The contractor's quoted rates should be inclusive of all such contingencies. Electrodes shall be baked/ dried in the electrode drying oven

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	(range 375–425°C) to the temperature and period specified by BHEL Engineer before their use. Necessary drying oven/ portable oven shall be provided by the contractor at his cost.
xxi.	Equipment/ instruments required to be erected for this work, though not limited to but are generally as per rate schedule. For any items or class of work not specified herein but required for total completion of work, the same shall be carried out as per BHEL requirement. However, the payment of these items/ class of work shall be regulated as per the General Condition of the contract.
xxii.	Overhauling, cleaning, revisioning, servicing of equipment/ instruments, valves etc. during erection and commissioning stages will be arranged by the contractor. However, gaskets/ packing for replacement will be provided by BHEL free of cost. All equipment shall be preserved and protected before and after erection as per the advice of BHEL Engineer.
xxiii.	The glands & lugs shall be supplied either loose or fitted with the equipment. Contractor shall take care of this aspect at the time of receipt of the equipment from BHEL stores. Contractor shall account for the quantities received with the equipment and shall hand over the same to cabling agency under intimation to BHEL Engineer. Contractor shall extend all necessary help & co-ordinate with the cabling agency during the course of work.
xxiv.	The contractor shall collect all scrap materials periodically from various levels of powerhouse, working area of the power station, auxiliary and piping around power station and collect the same at one place earmarked for the same. Loads of scraps are to be shifted to a place earmarked by BHEL. Failure to collect the scrap is likely to lead to accidents and as such, BHEL reserves the right to collect and remove the scrap, if there is any failure on the part of contractor in this respect. 1% value of each RA bill will be earmarked against compliance of the above, to be released only on satisfactory collection and deposit of scrap as stated above. In case of failure of contractor to comply with this requirement, BHEL will make suitable arrangement. In such case, any expenditure over and above the withheld 1% amount will also be recovered suitably from the RA bills of vendor.
xxv.	All works such as cleaning, leveling, aligning, trial assembly, dismantling of certain equipment/ components for checking and cleaning, surface preparation, fabrication of sheets, tubes and pipes as per general engineering practice and as per BHEL Engineer's instructions at site, cutting, gouging, weld depositing, grinding, straightening, chamfering, filing of cut outs/ openings for mounting of console inserts, modules, indicators, recorders, chipping, drilling of holes, reaming, scrapping, cable laying, dressing, lapping, fitting up etc. as may be applicable in such erection works are treated as incidentals to erection work and are necessary to complete the work satisfactorily shall be carried out by the contractor as part of the work within the quoted rates.
xxvi.	All equipment shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc. shall be used for unloading and/ or handling of the equipment without the specific written permission of the BHEL Engineer. The equipment from the storage yard shall be moved to the actual site of erection/ location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage/ loss of such equipment at site.
xxvii.	Contractor shall provide necessary resources for completion of such work within the stipulated time schedule. Value of such work shall be included while computing the total value of work finally executed for all contractual purposes, particularly for contract variation purpose.
xxviii.	The contractor should take all reasonable care to protect equipment and materials under his custody either in his stores or at site. Copper tubing, brass fittings, brass valves etc. forming an integral part of equipment or system are liable to greater damages/ pilferages/ theft/ losses. It will be responsibility of contractor to arrange for adequate security round the clock for protection from such damages/ pilferages/ theft/ losses.

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xxix.	Housekeeping in the erection and preassembly area is as important as well-planned and orderly work. The access to site for inspection approaches by BHEL and customer engineers and leading of the material shall be made available by the contractor at all times. The shifting and re-shifting of erection materials, tools and plants and clearance of restrictions, filling of ditches, undulation near preassembly, boiler area and switch yard area is the responsibility of the contractor. Contractor should visit the site and acquaint himself with all restrictions and difficulties that he may encounter during erection/ commissioning stages.
xxx.	The contractor shall ensure that all the packing materials and protection devices used for the various equipment during transit and storage are removed before the equipment are erected in position.
xxxi.	All pipes and tubes, equipment, instruments issued to contractor and kept at site for erection shall be covered with plastic caps/ steel caps or shall be closed with suitable plugs by the contractor.
xxxii.	Contractor shall calibrate, erect, commission all the equipment, cabinets/ panels and cabling etc. as per sequence prescribed by BHEL at site. The sequence of erection/ commissioning methodology will be decided by the BHEL Engineers depending upon the availability of materials/ work fronts etc. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the methods of erection/ commissioning adopted in erection/ commissioning of similar jobs or for any reasons whatsoever.
xxxiii.	Descriptions of certain packages appearing in the rate schedule are available in this section and also in Appendix-I (Chapter-XIII), to give general idea to bidder about the type of equipment to be erected, calibrated, tested and commissioned.
xxxiv.	BHEL reserves right to recover from the contractor any loss, which arises out of undue delay/ discrepancy/ shortage/ damage, or any other causes due to contractor's lapse during any stage of work. Any loss to BHEL due to contractor's lapse shall have to be made good by the contractor.
xxxv.	The contractor shall take delivery of the components, equipment's, chemicals, lubricants etc. from the BHEL stores/ storage area after getting the approval of BHEL engineer on standard indent forms of BHEL. Complete and detailed account of the materials and equipment's after usage shall be submitted to the BHEL and reconciled periodically.
xxxvi.	The contractor shall take delivery of equipment, materials from the storage yard/ stores/ sheds of BHEL/ customer. He shall also make arrangements for verification of equipment, transportation up to site of work {from inside or outside plant boundary (Approx 3 km away)}, safe custody, watch and ward of equipment after it has been handed over to him till these are fully erected, tested and commissioned and taken over by the customer. The contractor should note that the transport of equipment's to erection site, assembly yards etc. should be done by the prescribed route without disturbing the other works and contractors and in the most professional manner. Special equipment's such as measuring and control equipment's, panels, electronic items, SF6 breakers, switches, cables, conduits etc. shall be stored when taken over by the contractor in appropriate manner as per BHEL's instructions.
xxvii.	Contractor shall plan and transport equipment's, components from storage to erection site and erect them in such a manner and sequence that material accumulation at site does not lead to congestion at site of work. Materials shall be stacked neatly, preserved and stored in the contractor's shed and at work areas in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work areas/ site to enable other agencies to carry out their work or for any other reason, contractor shall do it most expeditiously. No claim for extra payment for such work will be entertained.
xxviii.	For any class of work for which no specifications have been laid down in these specifications, work shall be executed as per the instructions of BHEL.
xxix.	Bidder to ensure security of equipments/Panels/items, even if doors and windows are mounted or not in

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	panel room.
2.27	STATUTORY LICENCES AND OTHER RELATED REQUIREMENTS
i.	The contractor should have the applicable Contractor Electrical License for Applicable Voltage System to work in Orissa State.
ii.	Contractor should have obtained valid Electrical Contractor-ship License to carry out the Erection, Testing & Commissioning work on High/ Low Voltage electrical equipment from the appropriate statutory authority of concerned state or Central Electricity Authority, as the case may be. All fees and expenses in this regard shall be to the contractor's account.
iii.	Supervisory Competency Certificate of Applicable Voltage for equipment erection, testing & commissioning classes as defined in this tender specification, issued by applicable appropriate State or Central Statutory Authority. During the execution of work minimum two persons should be posted at site who have valid Supervisory Competency Certificate.
iv.	Contractor shall arrange inspection of concerned Statutory Authority for the installation, testing & commissioning of High/ Low voltage equipment covered under this tender specification and obtain their approval in appropriate format prior to charging of the equipment.
v.	Contractor shall be responsible for all necessary Liasioning work with Statutory Authority towards the certification of installation/ works. BHEL/ BHEL's Customer shall provide technical assistance, drawings & documents for submission to Statutory Authority. Contractor shall provide all logistical services in this regard.
vi.	All necessary certificates and licenses, permits & clearances required to carry out this work from the respective statutory authorities are to be arranged by the contractor expeditiously at his cost in time to ensure smooth progress of work.
vii.	If the contractor does not have these licenses and statutory requirements, then the contractor has to arrange them to work in the concerned state (Orissa) where the project is being executed within 6 weeks of mobilization at site for carrying out the works covered under this contract.
2.28	COLLECTION OF MATERIALS
i.	The contractor shall take delivery of equipment, materials from the storage yard/ stores/ sheds of BHEL/ customer. He shall also make arrangements for verification of equipment, safe custody, watch and ward of equipment after it has been handed over to him till these are fully erected, tested and commissioned and taken over by the customer. The contractor should note that the transport of equipment to erection site, assembly yards etc. should be done by the prescribed route in the most professional manner without disturbing other ongoing works of various contractors. Special equipment such as laboratory equipment, measuring and control equipment, electronic items, SF6 Breakers, gauges, panels, console inserts, switches, transmitters, controllers, cables, conduits etc. shall be stored when taken over by the contractor in appropriate manner as per BHEL's instructions. The contractor should also note that while taking delivery of materials from BHEL stores (open/ closed), it may be necessary to handle other items which could be blocking the exit route of the materials. This aspect shall be taken care of in the quoted rates and no extra payment shall be done in this regard. It shall be the contractor's responsibility to arrange necessary cranes/ tractors, trailer, trucks, slings, labor, etc., for transport of equipment.
ii.	Note: - Damaged cable drums or any damaged items also to be shifted within the quoted rates. No extra compensation for difficulty in shifting due to damaged drums shall be made in this regard.
iii.	The distance between storage area and erection site is approx. 3-4km. However, this location may change at the discretion of the BHEL's customer. Contractor shall plan and transport equipment, components from storage to erection site and erect them in such a manner and sequence that material

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	accumulation at site does not lead to congestion at site of work. Materials shall be stacked neatly, preserved and stored in the Contractor's shed and at work areas in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work areas/ site to enable other agencies to carry out their work or for any other reason, same shall be done by Contractor most expeditiously as incidental to work.
iv.	The panels shall be transported from stores to the place of installation in vertical position. Care shall be taken such that the switches, lamps, instruments etc. mounted on the panel do not get damaged during transit.
v.	Contractor shall plan and transport equipment/ components from storage yard/ sheds to erection site and erect them in such a manner and in a sequence that material accumulation at site should not lead to congestion. Materials shall be stacked neatly, preserved and stored in the contractor's shed and work areas in an orderly manner. It may be specifically noted that the space available may be limited and accumulation of material may lead to the necessity of shifting and restacking the materials to enable other agencies to carry on with their work or to comply with customer's requirements. If required, the contractor shall arrange shifting of surplus material expeditiously (no claim for extra payment for such work will be entertained) failing which the same will be arranged by BHEL and all charges together with departmental charges will be recovered from his bills.
vi.	The contractor shall take delivery of the components, equipment, chemicals, lubricants etc. from the storage area/ sheds of BHEL/ customer after getting the approval of BHEL/ customer on standard indent forms to be specified by BHEL/ customer. Complete and detailed account of the materials and equipment after usage shall be submitted to the BHEL and reconciled periodically.
vii.	The contractor shall handover all the damaged, unused materials, package materials, containers, special transporting frames, gunny bags, parts/ materials remaining extra over the normal requirement with proper identification tags in a packed condition to BHEL stores. In case of any misuse or use over actual design requirements, BHEL reserves the right to recover the cost of parts/ materials used in excess or misused. Decision of BHEL Engineer in this regard will be final and binding on the contractor.
viii.	Equipment/ instruments etc., under the scope of erection and commissioning are generally dispatched from BHEL's Manufacturing Units/ vendor's works to erection site well before the start of erection. Sometimes, such dispatched materials may get stuck up with transporters/ railways. The contractor shall provide support/ manpower for necessary chase up for removal of such bottlenecks in transportation. Also, for smaller items, it could be necessary to depute his person to personally carry certain items from works to site. Requirement of such activities; which will be decided by BHEL Engineer; and chase up activities, if required, shall be performed under authorization by BHEL. The above services shall be provided within the quoted rates.
ix.	The contractor shall make suitable security arrangements including employment of security personnel and ensure protection of all materials/ equipment in their custody and installed equipment's from theft/ fire/ pilferage and any other damages and losses.
x.	For CHP, AHP, LHP & GHP area, round the clock Watch & Ward of electrical building during equipment erection & commissioning is in Vendor scope till commissioning/ handing over of buildings.
2.29	GUIDELINES FOR HANDLING AND STORAGE
i.	After unloading at site, the package of the equipment shall be inspected for external damage. In case the package is damaged, package number and details of damage should be noted. The details of damage should be reported to concerned site Engineer.
ii.	Cases should be opened/ unpacked using correct nail pullers. While opening the planks, care should be taken to see that equipment inside is not damaged. Cases should not be unpacked in areas where they

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	are exposed to rain, water/ liquid splashing, dust or other harmful materials like chlorine gas, sulphur dioxide etc.
iii.	After opening the case, all supports provided for transport are to be removed with due care.
iv.	Immediately after unloading at site, the electronic equipment should be kept in a covered area. Handling and lifting of package should be done without jerks or impacts. Packing case should not be dropped or slid along the floor under any circumstances. Suitable forklift should be used to move the case to its final position. All above points are to be strictly followed as electronic equipment may get damaged due to vibration and shock.
v.	Hinged frames should not be opened when equipment is not secured to floor as this is likely to cause it to topple over. The hinged frame can be opened only if the equipment is still fixed on to bottom wooden pallet.
vi.	The equipment should preferably be stored in its original package and should not be unpacked until it is absolutely necessary for its installation or advised by BHEL Engineer. The equipment should be best protected in its cases. It should be arranged away from walls.
vii.	The wooden pallet provided for packing itself can be retained on raised platform to protect equipment from ground damps, sinking into and to circulate air under the stored equipment. This will also help in lifting the package with fork-lifter.
viii.	Periodic inspection of silica gel placed inside the equipment is necessary. It has to be replaced or regenerated when de-colorization takes place.
ix.	Due care should be taken to ensure that the equipment is not exposed to fumes, gases etc., which can affect electrical contacts of relays and terminal boards.
x.	The storage room and the equipment should be checked at regular interval to ensure protection from termites, mould growth, condensation of water etc., which can damage the equipment.
xi.	All the equipment, materials and goods kept in the store room should be identified and registered in a book. Inspection report should be recorded. Any discrepancy observed should be communicated to site Engineer.
xii.	The packing material shall be retained if the cubicle is to be repacked after inspection.
xiii.	All sub-assemblies should be kept in a separate place where they are easily accessible.
xiv.	Sub-assemblies should have a protective cover in case they are stored without wooden packing/ case to prevent accumulation of dust. Silica gel packets should also be kept along with it.
xv.	Sub-assemblies should not be stacked one above the other.
xvi.	The loose items supplied for the main equipment falls into various categories like tools, cables, prefabricated cables, console inserts, recorders, VDU/ CRT, other display units, printers, sensors and transducers, cable glands, cable ducts, frames, racks, etc. These are to be categorized and stored separately.
xvii.	All the electronic modules shall be handled by qualified personnel only.
xviii.	Electronic modules should only be touched when it is absolutely essential to do so.
xix.	Before touching any electronic module, the operator should discharge the static electricity by earthing himself or better still, ensure constant discharge by wearing an earthed wrist strap.
xx.	The operator should not wear clothing made entirely from synthetic fibres, but a mixture containing at least 65% cotton.
xxi.	The PCB should always be held by front panel or by module frame and electronic components/ connectors should never be touched.
xxii.	The electronic modules should not be placed close to television sets or CRT units.

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xxiii.	Soldering irons and any other tools used must be grounded.
xxiv.	All modules using CMOS components are packed in antistatic bags when transported loose to avoid ESD failures. The antistatic bags must always be used to transport modules at site from one place to the other.
2.30	MEASUREMENTS, WASTAGE & CUTTING ALLOWANCE
i.	The contractor shall not waste any materials issued to him. In case it is observed at any stage that the wastage/ excess utilization of materials is not within the permissible limits, recovery for the excess quantity used or wasted will be effected with departmental charges from the contractor. Decision of BHEL on this will be final and binding on the contractor.
ii.	For all payment purposes, measurement shall be made on the basis of the execution of drawings/ physical measurements/instruction from BHEL engineer. Physical measurements shall be made by the contractor in the presence of the BHEL Engineer.
iii.	The measurement for cable, impulse pipes/ tubes, GI pipe, conduits, flexible conduits, trays etc., shall be made on the basis of length actually laid.
iv.	All the surplus, scrap and serviceable materials, out of the quantity issued to the contractor shall be returned to BHEL in good condition and as directed by the BHEL Engineer.
v.	All materials returned to stores should carry aluminium tag indicating the size and type. Power cables more than 15 meters' length and control cables more than 5 meters' length is termed as serviceable material and shall be returned size wise and category wise to the owner's stores/ yard. Cable of serviceable length being returned to the stores in drums shall have their free ends sealed and the balance lengths on the drum(s) shall be noted and certified by the Engineer-in-charge. This shall be applicable only for the purpose of accounting the cables issued for installation.
vi.	While carrying out material reconciliation with contractor, all the above points will be considered. All serviceable material returned by the contractor shall be deducted from the quantities issued for the respective sizes and categories and the balance quantity will be taken as the net quantity issued to the contractor. Material reconciliation shall be done and allowable scrap quantity calculated as per wastage allowance percentage specified below. Any scrap/ wastage generated by the contractor in excess of the allowable percentage shall be charged at the rates decided by the Engineer whose decision shall be final and binding on the contractor.
vii.	The entire surplus, damaged, unused materials, packaging materials/ containers, special transporting frames, gunny bags, etc., shall be returned to BHEL stores by the contractor.
viii.	The contractor shall handover all parts/ materials remaining extra over the normal requirement with proper identification tags in a packed condition to BHEL stores. In case of any misuse or use over actual design requirements, BHEL reserves the right to recover the cost of parts/ materials used in excess or misused. Decision of BHEL engineer in this regard will be final and binding on the contractor.
ix.	The contractor shall ensure that all the packing materials and protection devices used for the various equipment's during transit and storage are removed before this equipment are erected in position.
x.	For all site-fabricated steel items such as supports, racks, frame, canopy etc. physical measurement shall be made and then converted to tonnage. For steel material supplied to the contractor, all scrap shall be returned to BHEL stores with due accounting.
xi.	Every month the contractor shall submit an account for all the materials issued to him by BHEL in the standard Performa prescribed for this purpose by the site-in-charge.
xii.	The erection contractor shall make every effort to minimize wastage during erection work. Cutting and wastage allowance shall be computed on length, weight of material actually used, measured and

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	<p>accepted. In any case, the wastage shall not exceed the following limits:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">S. No.</th><th style="text-align: center;">Item</th><th style="text-align: center;">%age Wastage of Erected Qty</th></tr> </thead> <tbody> <tr> <td style="text-align: center;">a)</td><td>Each iron/ steel fabricated section</td><td style="text-align: center;">2</td></tr> <tr> <td style="text-align: center;">b)</td><td>Each size of power Cables</td><td style="text-align: center;">1</td></tr> <tr> <td style="text-align: center;">c)</td><td>Each size of control Cables</td><td style="text-align: center;">2</td></tr> <tr> <td style="text-align: center;">d)</td><td>GI pipes</td><td style="text-align: center;">1</td></tr> </tbody> </table>	S. No.	Item	%age Wastage of Erected Qty	a)	Each iron/ steel fabricated section	2	b)	Each size of power Cables	1	c)	Each size of control Cables	2	d)	GI pipes	1
S. No.	Item	%age Wastage of Erected Qty														
a)	Each iron/ steel fabricated section	2														
b)	Each size of power Cables	1														
c)	Each size of control Cables	2														
d)	GI pipes	1														
xiii.	If the actual wastage is more than the specified figure, then equivalent price of the excess portion will be deducted from the contractor's bill.															
xiv.	The cable take-off from drums shall be planned strategically such that jointing in the run of cables and wastage are avoided. For this purpose, the exact route length between various equipment/ panels as per the cable schedule shall be measured and the route length recorded before laying of the cables. Depending upon the route length and the type of cable required for various destinations, the cable drums shall be suitably selected for cable laying. Any jointing shall have to be approved by BHEL Engineer. All the cut pieces/ bits of cables, which are not used, shall be returned to the purchaser for accounting towards wastage. The cables damaged by the contractor shall have to be replaced by the contractor at his own cost.															
xv.	NOTE:															
a)	Salvageable scrap shall mean lengths of pipes, multi-cables, other cables etc., that can be used one time or other at a later date and normally they are recovered from the cut-pieces of pipes, multicore cables, cables etc.															
b)	Non - Salvageable scrap means the lengths of tubes, pipes, multicore cables, cables etc., and they are from cut-pieces of tubes, pipes, multicore cables, cables etc., that cannot be used at all one time or other.															
c)	As per the contract material like cable tray and accessories, cables, tray supports shall be supplied by BHEL and customer. Reconciliation shall be done and duly submitted every month with joint signature to BHEL and Customer.															
2.31	FINAL PAINTING															
i.	<p>The contractor shall provide the Primer (ROZC as per IS:2074) for the scope of painting work for protection of site weld joints and gas cut locations. Contractor shall also arrange to provide the required thinner and other consumables, T&P etc. required for application of ROZC Primer. All paints and thinners shall be sourced only from NTPC/BHEL approved manufacturers. Some of them are as listed under:</p> <ul style="list-style-type: none"> • M/ s Asian Paints • M/ s Berger paints • M/ s Jenson & Nicholson • M/ s Shalimar Paints • M/ s Akzo Nobel • M/ s Kansai Nerolac Paints • Any other as approved by NTPC/BHEL 															
ii.	In order to have consistency in painting system, it is preferable that all the supplies are sourced from one single manufacturer.															
iii.	The contractor shall provide all the primer, paint, and other consumables like brush, cleaning agents etc. All T&Ps, manpower, supervision is in contractor's scope. Painting shall be carried out as per colour scheme approved by BHEL/ BHEL's customer.															

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iv.	Touch up paintings on damaged areas: Surface preparation by manual tools, wire brush/ emery paper etc. Minimum 6" peripheral area, adjoining to damaged area to be covered. If metal surface is exposed; it is to be painted with Zinc rich epoxy (70 micron) or suitable primer with existing paint scheme. If primer is intact, intermediate & top coat to be done with specified DFT in scheme.
v.	All the fabricated frames, instrument racks, Junction box frames, Push button frames, trays/ impulse pipes, supports, panel base frame, etc., wherever applicable shall be first painted with two coats of primer paint (red chromate zinc primer) and then two coats of epoxy-based paint of approved shade (decided by BHEL Engineer) after thoroughly cleaning the surface of dust, rust, scale, grease, oil, etc., by wire brushing, scrapping or any other suitable method like sand blasting/ shot blasting. The quoted rates should be inclusive of all these including supply of paints and consumables.
vi.	All metal parts of the equipment including supports, structures, etc., as applicable shall be painted after thoroughly cleaning the surface from dust, rust, greases, oils, scales, etc., by wire brush, scrapping, sand blasting/ shot blasting (as applicable) as specified in relevant erection documents. The above parts shall then be painted with specified two coats of specified paint over the shop primer/ paint. Also, where the shop primer/ paint has peeled off, the affected area shall be cleaned thoroughly by the specified method and then primer coat applied. Similarly, certain components may be supplied without any primer/ paint coat from shop. The surface of such items shall be cleaned as per specifications, coated with suitable primer and then coated with final paint coats. The dry film thickness after final coat should be as per specification. The color, shade etc. shall be as per specification. Painting schedule will be furnished at site.
vii.	Other equipment like JBs, Panels, transmitter racks, Local gauge boards etc., shall be painted with two coats of synthetic enamel paint/ any other approved by BHEL/NTPC.. The quoted rates should be inclusive of application of two final coats of synthetic enamel paint. All the consumables such as wire brush, other cleaning materials, painting implements, etc., is to be arranged by the contractor at his own cost. All equipment painting will be done by spray painting. The quoted rates should be inclusive of all these including
viii.	All the weld joints of GI cable trays and GI structural members shall be applied with red oxide and aluminium paint/ any other approved by BHEL/NTPC and then coated with bitumen.
ix.	All damaged surfaces of galvanized or un-galvanized faces of steel structures etc. shall be brushed up and painted with red primer paint followed by two coats of aluminium paint/ enamel paint to the satisfaction of Engineer. The contractor has to arrange all the materials for painting at his cost.
x.	Welded joints on GI earthing conductors shall be coated with one coat of bituminous paint/ any other approved by BHEL/NTPC. in case of buried earth grid or earth flats to be laid in cable trench. For site welded GI strips/ wires which are exposed these are required to be painted with one coat of cold galvanizing zinc paint. Contractor to arrange the required paints and other items at his cost.
xi.	In case of GI Structure, the cold galvanizing paint to be applied as touch up where ever needed. This is to be done as per instruction of BHEL Engineer.
xii.	The primer shall be compatible with the final coat paint schedule.
xiii.	Full (spray) painting of Dry-type & Oil-filled transformers, bus ducts with two coats of paint (any other approved by BHEL/NTPC) as per specification. For Transformers and Oil Tanker, External surface of transformer and accessories- Chemical resistant epoxy zinc phosphate primer, MIO (Micaceous iron oxide) as intermediate paint followed by polyurethane finish paint.
xiv.	Colour Banding, Legend and Identification Marking, Equipment nomenclature, Direction marking etc. shall be in scope of the contractor.

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xv.	Touch-up painting of 11kV, 3.3kV, 415V & 220 V DC switchgear, Control Panels or any other equipment/ devices wherever necessary. Treatment as per IS: 6005. Two coats of lead oxide primer followed by powder painting with final paint shade of RAL 9002/any other approved by BHEL/NTPC.
xvi.	The primer shall be compatible with the final coat paint schedule.
xvii.	Supply of paint, primers, other consumables etc. for above and any other scope in these specifications shall be in Contractor's scope.
xviii.	Irrespective to scopes of painting & supply of paint mentioned elsewhere it is to be noted that supply of paint, primers, other consumables etc. for all primer/ painting works to be done by the contractor, shall be in Contractor's scope. No dispute shall be entertained on the above matter.
2.32	TRANSFORMERS & BUS DUCTS
	Exposed metal surfaces of Transformers and Bus Ducts erected by the contractor shall be painted with two coats of Finish Paint after thoroughly cleaning the surface from dust, rust, greases, oils, scales, etc., by wire brush, scrapping, machine buffering, water washing and any other appropriate method as specified in relevant erection documents. Bus Ducts shall first be coated with two coats of Primer before application of Finish Paint. Colour Banding, Legend and Identification Marking, Direction marking etc. shall be in scope of the contractor.
2.33	STRUCTURAL
	Structural components may be supplied without any primer/ paint coat from shop. The surface of such items shall be cleaned as per specifications and then coated with two coats of Primer.
2.34	PANELS, JUNCTION BOXES
	Panels and Junction Boxes shall be Touch-up painted as and where original shop paint is peeled off. Necessary surface cleaning and preparation shall be done by the contractor as per relevant painting codes followed by two coats of Primer and two coats of Finish Paint.
2.35	WELDING, NON-DESTRUCTIVE TESTING ETC.
i.	Installation of equipment involves good quality welding, NDE checks etc.
ii.	Welder deployed for aluminium welding shall have experienced and approved by BHEL and BHEL's Customer after due qualification process/ testing.
iii.	Welding of all structural steel & aluminium shall be done only by the qualified and approved welders.
iv.	All the welders shall be tested and approved by BHEL Engineer/ BHEL's Customer before they are actually engaged on work even though they may possess IBR/ other certificates. BHEL reserves the right to reject any welder without assigning any reason.
v.	The welded surface shall be cleaned of slag and painted with primer paint to prevent corrosion. For this paint will be supplied by the contractor.
vi.	Welding electrodes have to be stored in enclosures having temperature and humidity control arrangement. This enclosure shall meet BHEL specifications.
vii.	Certain types of coated welding electrodes, prior to their use, call for baking for specified period and will have to be held at specified temperature for specified period. Also, during execution, the coated welding electrodes have to be carried in portable ovens.
2.36	INTEGRATED ELECTRICAL TESTING/ COMMISSIONING
i.	The brief scope of work under is defined as below, but not limited to the following. Contractor shall discuss & finalize testing procedure with BHEL Engineer In-Charge for the test to be conducted on Generator Control & Relay Panel testing. Drawing & documents shall be provided by BHEL at the time of testing. BHEL decision in this regard shall be final and binding on the contractor.
ii.	The contractor shall prepare all erection/ commissioning log sheets and protocols/ test certificates as per

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	field quality plan, and is signed by the concerned BHEL/ BHEL's Customer engineer and submit the same to BHEL engineer as per his instruction.
iii.	Contractor shall maintain the charged and commissioned equipment till the same is taken over by customer.
2.37	<p>CALIBRATION, TESTING & COMMISSIONING</p> <p>Calibration, testing & commissioning activity as specified in this technical specification and rate schedule against various equipment, devices, systems etc. are broadly classified below. However, there may be some overlapping between the activities (erection, calibration and testing, commissioning.) The classification of activity is only a guideline for understanding the total volume of work in each activity. The contractor shall have no claim for performing or providing manpower for such overlapping work, which is also within the scope of the work.</p>
	CALIBRATION
a)	Verification after drawing of material of various types, range of the field devices with respect to instrument schedule, data sheet or system document.
b)	Codification of instruments as per system tag numbers
c)	Calibration/ adjustment of instrument as per system requirement/ set values.
d)	Providing head correction in case of pressure measurement as per calculated values or actual measured value for the instrument, which are used for interlock protections/ monitoring. This is generally applicable for turbine/ generator, lube oil systems, lube oil system of fans etc.
e)	Verification of installation of instruments for range, type, tag number as per physical location of process point as per process, instrumentation diagram.
f)	Checking and ensuring the proper function of instrument.
g)	All the recorders shall be made functional with proper chart movement and ink marking.
h)	Preparation of computerized calibration certificates in the formats specified by BHEL Engineers and getting those signed by the customer is in the scope of the contractor.
	ERECTION CHECKS
a)	Withdrawal of material from store, verification, inspection as per shipping list, drawings and documents.
b)	Preservation, up keeping, safe custody of the erected equipment till handing over to the customer.
c)	Verification of installation as per drawing and document for the correctness of cabling, JBs, impulse pipe, various field device, panels, instruments etc.
d)	Continuity check and IR value check of cables.
e)	Verification of correction of cable termination with respect to instrument, electrical hook-up diagram, panel interconnection diagram, JB schedule.
f)	Checking earthing of the equipment and cable shield wire continuity.
g)	Energizing the functional group control panels and field devices.
h)	Flushing of impulse pipe before making the instruments process connections through.
i)	Any leakages, damages to impulse pipe, field device connections, air connections etc. Shall be fully attended by contractor.
j)	All cable glands/ piping/ tubing to be fixed as per installation requirement before commissioning.
	TESTING, COMMISSIONING & TRIAL OPERATION
a)	Checking/ verification of binary/ analogue input and output signal from field and panel and up to recording/ indicating instrument/ HMI monitors.
b)	Checking the operating electrical/ pneumatic drive through functional group panel, remote control desk,

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	HMI, CRT operation and repeatability and smooth operation to be checked.
c)	Checking the interlock, protection and alarm for various processes by simulation of field devices/ process changes.
d)	Adjustment of limit switches/ feedback position transmitter checking the actuator for correct Limit switch operation for correct position indication and repeatability shall be ensured.
e)	Motor IR value measurement, bearing/ winding RTD checking, drying out of motor after erection of equipment by mechanical agency, providing assistance for trial run of motor which includes monitoring temperature rise winding/ bearing during trial run.
f)	Contractor shall prepare calibration/ testing report/ protocols and get it signed from BHEL & Customer.
g)	During trial run of various systems, if the performance of any instrument is found erratic, un-satisfactory and requires re-adjustment, re-calibration etc., and the defect shall be attended by contractor.
h)	Observing and checking the performance of the various devices on load/ process variation. Any deficiencies/ defect noticed during the variable load conditions, the same should be attended properly.
i)	Check the operation of various controls in manual/ auto mode for smooth functioning.
j)	Clearing of all bad/ invalid signals noticed during commissioning.
k)	Providing necessary assistance for Trial Operation of the unit is in scope of this specification. Smooth operation and availability of all instrument/ controls of the systems installed under the scope herein, shall be ensured by the contractor. Contractor shall provide adequate number of skilled manpower and T&P for this purpose. Interruption in Trial Operation for reasons attributable to the Contractor shall result in re-start of the Trial Operation all over again; consequential extension in Time Schedule/ Contract Period shall be to the contractor's account.
l)	If any small wiring correction or minor modification in control panel wiring is noticed during the commissioning, it shall be carried out as a part of commissioning activity.
m)	The trial run of the complete facility as an integral unit shall be conducted for 720 continuous hours. During the period of trial run of 720 hours, the unit shall operate continuously at full rated load for a period of not less than 72 hours.
2.38	POST-COMMISSIONING
i.	Contractor shall rectify the defect observed/ informed by BHEL/customer after/ during the trial run.
ii.	Contractor shall submit the as- built drawing as per guidelines and instruction of BHEL Engineer.
iii.	After trial run/ handing over of the equipment, if due to unforeseen reasons, certain works crop up; the contractor shall provide all the assistance.
2.39	TROUBLESHOOTING DURING PLANT OPERATION
	During pre-commissioning/ commissioning stages when the plant will be under various stages of operation, it will be necessary to have continuous (day and night) presence of suitable manpower along with required tools to attend to any defects etc. that may arise during such operation. The contractor will be required to put such personnel in shifts in the designated areas. The bidder must also take this aspect into consideration.
2.40	TESTING, PRE-COMMISSIONING, AND POST COMMISSIONING
i.	The work is also inclusive of various commissioning activities of BHEL scope. The various activities, tests, trial runs may have to be repeated till satisfactory results are obtained and also to satisfy the requirements of customer/ consultant/ statutory authorities like boiler inspector, electrical inspector etc.
ii.	The contractor shall perform various activities during pre-commissioning, integrated testing, post-commissioning stages of equipment covered under this tender specification. It is responsibility of

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	contractor to arranged tools & plants, test equipment, experienced engineers and technicians. Contractor shall earmark separate manpower for respective commissioning areas and they shall not be disturbed/diverted for other work. The contractor's commissioning group shall work as per the instruction of BHEL Engineer and they shall coordinate day-to-day activity with other agency and BHEL/ Customer. The testing activity may have to be repeated till satisfactory results are obtained and also to satisfy the requirement of Customer/ statutory Authority.
iii.	The contractor shall simultaneously start testing & commissioning activities for equipment to match the mile stone activities of the project.
iv.	In case any malfunctioning and/ or defects are found during tests, trial runs such as loose components, undue noise or vibration, strain on connected equipment etc., the contractor shall immediately attend to these defects/ malfunctions and take necessary corrective measures. If any readjustment and realignment is necessary, the same shall be done as per BHEL Engineer's instructions.
v.	The pre-commissioning activities will start prior to light up of boiler and various trials, commissioning operations shall continue till the unit is handed over to customer. Simultaneous commissioning activities will be in progress in various areas, checking of equipment erected, making ready for trial runs, alkali flushing, chemical cleaning, mass flushing etc. All these works need specialized gangs including electrician/ instrument mechanics in each area. Contractor shall earmark separate manpower for various commissioning activities. This manpower shall not be disturbed or diverted. The mobilization of these commissioning gangs shall be such that planned activities are taken up in time and also completed as per schedule and the work undertaken round the clock if required. It is the responsibility of contractor to discuss on day to day/ weekly/ monthly basis the requirement of manpower, consumables, tools and tackles with BHEL Engineer and arrange for the same. If at any time the requisite manpower, consumables, T&P are not arranged then BHEL shall make alternate arrangements and necessary recoveries with overhead cost will be made from the bills of the contractor.
vi.	During pre-commissioning, commissioning, post commissioning and trial operation stages of various systems, certain category of manpower with T&P and consumables will have to be provided to BHEL Commissioning Engineers exclusively at their disposal. It shall be the responsibility of the contractor to provide engineers, electricians, technicians, helpers, fitters etc. along with necessary consumables, hand tools, calibration equipment etc., for the various commissioning activities in progress. During peak months there could be requirements of separate commissioning gangs simultaneously in even up to 12 to 15 areas. Contractor has to augment the manpower as and when required as per work demand and necessity at site. The quoted rates shall include this.
vii.	The mobilization of these commissioning groups shall be such that planned activities are taken up in time and also completed as per schedule and work undertaken round the clock if required. It is responsibility of contractor to discuss on day to day/ weekly/ monthly basis the requirement of manpower, consumables, tools & tackles/ testing equipment with BHEL Engineers and arrange for the same. If at any time the requisite manpower, consumables, testing equipment etc. are not arranged then BHEL shall make alternative arrangements and necessary recoveries with overhead cost will be made from the running bills.
viii.	Contractor shall cut open works if needed as per BHEL Engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over without any extra payment.
ix.	It shall be specifically noted that contractor manpower may have to be engaged round the clock simultaneously at different areas and hence considerable number of personnel and their overtime payment may be involved. This aspect must be considered by the contractor while quoting their rate. No additional compensation by for the same shall be payable, irrespective of number of persons engaged

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	or number of working hours per day.
x.	It is the responsibility of contractor to provide for necessary labor, tools and tackles and consumables till the completion of work under these specifications even in case erection, testing and commissioning of this work is delayed due to reasons not attributable to the contractor.
xi.	For electrical works, 415V and above, the contractor has to bring qualified electricians.
xii.	It shall be specifically noted that the contractor may have to work round the clock and in shifts during the pre-commissioning and commissioning period along with or without BHEL Engineers and hence considerable overtime payment is involved. The contractor's quoted rates shall be inclusive of all these factors.
xiii.	During the commissioning activities and carrying out various tests, if any of temporarily work such mounting of test equipment/ cabling etc. are required; the contractor shall carry out such work without any extra cost. The same shall be removed after completion of the activity.
xiv.	During this period, though BHEL/ client's staff will also be associated in the work, the contractor's responsibility will be to arrange for complete requirement of men and required T&Ps, consumables, scaffolding and approaches etc., till such time the commissioned unit is taken over for trial operations.
xv.	The contractor shall carry out any other tests as desired by BHEL Engineer on erected equipment covered under the scope of this contract during testing, pre-commissioning and commissioning, to demonstrate the completion of any part or whole of work performed by the contractor.
xvi.	The pre-commissioning activities will start in phased manner to meet the various milestones and shall continue till equipment are commissioned fully with all connected equipment/ devices or handed over to customer for regular operation. In this duration other erection activities such as cabling etc., shall be carried out by other agencies even though equipment are partially commissioned/ charged. In order to co-ordinate the work such as issue of safety permit, normalization and compliance of other requirement, contractor shall keep team of experienced engineer, supervisor, technician and helper in each shift as decided by BHEL Engineer. The team shall take instruction from BHEL Engineer for day-to-day work and shall not be diverted for other work. No extra payment shall be made for their services.
xvii.	Certain systems may be supplied with portable programming units, which are to be connected at various locations during pre-commissioning to handing over. Necessary cabling interconnecting the programming units and other connected panels has to be carried out by the contractor and are to be dismantled after work. For the purpose of testing, monitoring, commissioning, etc., these programming units will have to be repeatedly connected and disconnected at various locations. These will be considered as part of commissioning activities and no separate payment will be entertained for the above.
xviii.	The scope covers the erection, testing and commissioning of 1750 kVA and 1010 KVA DG system including control cable laying and termination between the DG AMF Panel, Battery Charger, and distribution board and battery. Installation of battery and connection to engine starter. DG Control Panels and CT erection are under the contractor's scope.
2.41	FOUNDATION, ERECTION, TESTING & COMMISSIONING OF PACKAGE SUB-STATION (PSS):
i.	Supply of materials as required for erection, testing & commissioning of 11kV/433V Package Substation.
ii.	Leveling of substation yard, supply and spreading of 40mm size stone aggregate of 75mm thick for an area of approx size 8m x 6m, supply and construction of Brick work with cement mortar 1:6 of 230 mm thick and 450 mm height all-round the substation yard, plastering the brick work in CM 1:6 , white washing etc complete. Dimension are tentative.
iii.	Supply and construction of foundation as per supplier foundation drawing for 500kVA. Package

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	Substation. Apprx size 4400 mm x 4400 mm x500 mm height (size may vary as per the drawing) from ground level and including excavation of plinth pit and base concreting and plastering, white washing etc. as per the instruction of BHEL site engineer.
iv.	Supply and fixing of 3.15mm GI chain linked wire fencing height 2m for the substation of size 8m x 6m including grouting of 3m height ISA 75 fabricated posts at an interval of 1.5m (2m vertical 0.5m slanting, 0.5m grouting) and three runs of barbed wire along with the fencing on the slanting angle post, fixing of mesh with post by 50x6mm MS flat with fasteners (2 nos./post) and earthing of fencing by 8 SWG GI wire and providing finish aluminum painting of all steel materials etc. Supplied structural steel materials are used for fencing posts.
v.	Supply and installation of 1m x 2m height MS gate made of MS Angle, channel/rolled sections including supply and fixing of hinges, locking arrangement etc including providing finish aluminum painting etc.
vi.	Supply and Erection of 3m long 50mm dia 3.6 mm thick medium class GI funnel type earth electrode with filling of bentonite earthing powder as per standard, four side brick work chambers with cement plastering, white washing and removable type RCC/ cast iron cover plate. Scope includes supply of required bentonite earthing powder, cement, brick, sand, RCC/cast iron cover plate. Minimum 06 earthpits per substation. Substation earthing shall be carried out by using supplied 50x6, 25x6 and 25x3 mm earth flats.
2.42	GATE PASS FORMALITIES
i.	The contractor shall make his own arrangements of gate pass for his vehicles, T&Ps etc. as prescribed and instructed by the NTPC /CISF at his own cost, each gate pass has to be endorsed by the NTPC / CISF before the pass can be used. In case of termination of the service of any of T&Ps or any vehicle during the contractual period, the contractor shall have to surrender the gate pass to the NTPC / CISF at the end of the project all the gate passes endorsed by the NTPC / CISF for use of the contractor's vehicle, T&Ps shall have to be returned.
ii.	Vehicles equipped with flame arrester will only be allowed inside the premises. Valid RC book, insurance, fitness certificate, road tax certificate, PUC, driving license, etc. is required for gate pass formalities of all vehicles. Goods carrying certificate is also required for goods category vehicles. Gate pass formalities may take some time, so contractor has to plan well in advance accordingly.
iii.	The contractor shall make his own arrangements of gate pass for his employees / workers as prescribed and instructed by the NTPC /CISF at his own cost, each gate pass has to be endorsed by the NTPC/ CISF before the pass can be used. In case of termination of the service of any of his employee during the contractual period, the contractor shall have to surrender the gate pass issued to the employees to the NTPC / CISF. At the end of the project all the gate passes endorsed by the NTPC / CISF for use of the contractor's employees shall have to be returned.
iv.	Police verification and medical fitness certificate of all workers / employees of agencies is must for gate pass formalities. Contractor has to arrange the same at his own cost. Gate pass formalities may take time, so contractor has to plan well in advance accordingly.
v.	PPEs and Dangri is must for all workers and staffs working inside NTPC premises. Contractor has to arrange all these for their worker and staffs at their own cost.
vi.	Deployed electricians should have valid qualification & valid electrical license for gate pass.
2.43	Interconnection Between Unit#1 & Unit#2:

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	Interconnection/termination/jointing of various equipment/systems/pipes/Busducts etc. at all above mentioned terminal points shall be in the scope of Package-A Vendor unless specified elsewhere in the tender document.
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3.0 FACILITIES IN THE SCOPE OF CONTRACTOR/ BHEL (SCOPE MATRIX)				
S. No.	Description	Scope/ to be taken care by		Remarks
		BHEL	Bidder	
3.1	ESTABLISHMENT			
	FOR CONSTRUCTION PURPOSE:			
1	Open space for office (as per availability)	Yes		Location will be finalized after joint survey with owner
2	Open space for storage (as per availability)	Yes		Location will be finalized after joint survey with owner
3	Construction of bidder's office, canteen and storage building including supply of materials and other services		Yes	
4	Bidder's all office equipment, office/ store/ canteen consumables		Yes	
5	Canteen facilities for the bidder's staff, supervisors and engineers etc.		Yes	
6	Firefighting equipment like buckets, extinguishers etc.		Yes	
7	Fencing of storage area, office, canteen etc. of the bidder		Yes	
	FOR LIVING PURPOSES OF THE BIDDER			
a)	Open space for labour colony (as per availability)		Yes	Agency has to make his own arrangement at his own cost.
b)	Labour Colony with internal roads, sanitation, complying with statutory requirements		Yes	
3.2	ELECTRICITY			
	Electricity for construction purposes only of Voltage 415/ 440V, 3phase, 50Hz	Yes		Free of cost at one point near the site at a distance of approx. 500 meter. Further distribution and Metering is in scope of bidder.
a)	Single point source	Yes		At a distance of 500 m from site (Distance is only tentative, it may vary up-to an extent depending on site condition)

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b)	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c)	Duties and deposits including statutory clearances if applicable		Yes	
	Electricity for the office, stores, canteen etc. of the bidder			
a)	Single point source	Yes		Chargeable basis. Single point as above for construction purpose, no separate point shall be given. Metering is in scope of bidder.
b)	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c)	Duties and deposits including statutory clearances if applicable		Yes	
	Electricity for living accommodation of the bidder's staff, engineers, supervisors etc.		Yes	Agency has to make his own arrangement at his own cost.
a)	Single point source		Yes	
b)	Further distribution including all materials, Energy Meter, Protection devices and its service		Yes	
c)	Duties and deposits including statutory clearances if applicable		Yes	
3.3	WATER SUPPLY			
	For construction purposes:			
a)	Making the water available from single point	Yes		Free of cost at one point near the plant boundary. Further distribution and Metering is in scope of bidder.
b)	Further distribution as per the requirement of work including supply of materials and execution		Yes	
	Water supply for bidder's office, stores, canteen etc.			
a)	Making the water available at single point	Yes		Free. Contractor has to make his own arrangements for distribution. Single point as above for construction purpose, no separate point shall be given.

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b)	Further distribution as per the requirement of work including supply of materials and execution		Yes	Contractor has to make his own arrangements for distribution.
	<u>Water supply for Living Purpose</u>			
a)	Making the water available at single point		Yes	No separate point shall be given.
b)	Further distribution as per the requirement of work including supply of materials and execution		Yes	Contractor has to make his own arrangements for distribution.
	LIGHTING			
a)	For construction work (supply of all the necessary materials) 1. At office/ storage area 2. At the preassembly area 3. At the construction site/ area		Yes	
b)	For construction work (execution of the lighting work/ arrangements) 1. At office/ storage area 2. At the preassembly area 3. At the construction site/ area		Yes	
c)	Providing the necessary consumables like bulbs, switches, etc. during the course of project work		Yes	
d)	Lighting for the living purposes of the bidder at the colony/ quarters		Yes	
3.4	COMMUNICATION FACILITIES FOR SITE OPERATIONS OF THE BIDDER			
a)	Telephone, fax, internet, intranet, e-mail etc.		Yes	
3.5	COMPRESSED AIR wherever required for the work.		YES	
a)	Supply of Compressor and all other equipment required for compressor & compressed air system including pipes, valves, Storage System etc.		Yes	
b)	Installation of above system and operation & maintenance of the same		Yes	
c)	Supply of the all the consumables for the above system during the contract period		Yes	
3.6	Demobilization of all the above facilities		Yes	
3.7	TRANSPORTATION			

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a)	For site personnel of the bidder		Yes	
b)	For bidder's equipment and consumables (T&P, Consumables etc.)		Yes	
3.8	ENGINEERING WORKS FOR CONSTRUCTION:	Yes		NOT APPLICABLE
a)	Providing the erection/ constructions drawings for all the equipment covered under this scope	Yes		
	Drawings for construction methods	Yes	Yes	In consultation with BHEL
b)	As-built drawings – where ever deviations observed and executed and also based on the decisions taken at site- example – routing of small bore pipes		Yes	Changes are to be marked in drawing & handover to BHEL on completion of work.
c)	Shipping lists etc. for reference and planning the activities	Yes		NOT APPLICABLE
d)	Preparation of site erection schedules and other input requirements		Yes	In consultation with BHEL
e)	Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments	Yes	Yes	In consultation with BHEL
f)	Weekly erection schedules based on S. No. d		Yes	In consultation with BHEL
g)	Daily erection/ work plan based on S. No. e		Yes	In consultation with BHEL
h)	Periodic visit of the senior official of the bidder to site to review the progress so that work is completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two months.		Yes	
i)	Preparation of preassembly bay		Yes	NOT APPLICABLE
j)	Laying of racks for gantry crane if provided by BHEL or brought by the contractor/ bidder himself		Yes	NOT APPLICABLE
k)	Arranging the materials required for preassembly		Yes	NOT APPLICABLE
l)	COIVD-19 Preventive Measure		Yes	

3.9	LAND
i.	Land will be provided free of cost by BHEL to the extent available/ considered necessary by BHEL to successful bidder for their temporary office & store. Contractor has to make his own arrangements for Land for Labour colony. Availability of land is very limited and successful bidder have to plan & use existing land considering use of land by other civil/ mechanical/ electrical successful bidders and storage of plant machineries & materials. The existing land shall be shared by all agencies deployed by BHEL at site.

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ii.	BHEL shall hand over such allotted land to the successful bidder on as is where is condition. Successful bidder shall arrange at his own cost cleaning and grading of area allotted, construction of their temporary office, stores, go-down, fabrication yards etc and also the watch & ward, etc as may be required.
iii.	All temporary roads for crane movement shall be constructed and maintained by BHEL.
iv.	Land, as available, shall be arranged by the successful bidder for labour colony outside plant boundary. BHEL shall reimburse lease rent of such land used for Labour Colony. Necessary vehicles from plant to labour colony to and fro, for transportation of laborer shall be arranged by the successful bidder. Successful bidder should visit the site to assess site condition regarding feasibility of use of land for the purpose. The successful bidder to construct temporary labour colony/ hutment, toilets as per attached technical specifications and drawings after obtaining approval of formalities from statutory body/NTPC Guidelines.
v.	Successful bidder shall provide adequate no of toilets in their labour colony and maintain minimum requirement hygiene as per safety regulations.
vi.	On completion of work, all the temporary buildings, structures, pipelines, cables, etc, shall be dismantled & leveled and debris shall be removed as per instruction of BHEL by successful bidder at their cost. In the event of failure to do so, same will be removed and expenditure thereof will be recovered from successful bidder. Decision of BHEL in this regard shall be final & binding. However, the scope of dismantling & leveling the area is limited only to successful bidder's site office, yard and other spaces occupied by successful bidder.
3.10	WATER
i.	BHEL will provide construction as well as potable water at one strategic point within plant premises, free of cost, to the successful bidder for their site office & store.
ii.	Further network for construction & potable water system for construction work shall be arranged by successful bidder at their own cost.
iii.	BHEL shall not be responsible for any inconvenience or delay caused due to any interruption of water supply and successful bidder shall claim no compensation for delay in work for such interruption. Successful bidder may make standby arrangement for water for which no separate payment shall be made by BHEL.
iv.	Successful bidder will have to arrange for storage of water to meet day-to-day requirement.
v.	Availability of water (construction as well as potable) in project site is limited. Successful bidder shall ensure that no water is wasted and shall take all necessary measures for any wastage & preservation of water. In this context, for proper utilisation & to avoid scarcity, successful bidder shall mandatorily construct storage facility of construction & potable water at site (Near work places). Any deviation from this shall lead to forthwith withdrawal of the facility.
vi.	Construction water, as available, may be provided for labour colony within the project premises free of cost. Successful bidder should visit site before quoting to assess site condition regarding feasibility of use of water source for the purpose. Further network for drinking water system for construction work shall be arranged by successful bidder at their own cost. Successful bidder shall take care of all precautions to avoid any sort of misuse, wastage of water. Any deviation from this shall lead to forthwith withdrawal of this facility.
vii.	Successful bidder shall make their own arrangement of potable water facility for labour colony, at their own cost.

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viii.	Bidder to note that use of construction/potable water from bore-well may be permitted if found suitable. Any statutory clearance required shall be obtained by the contractor.
3.11	ELECTRICITY
i.	BHEL will provide construction power free of charges at 415 V level at one/ two strategic point(s) within plant premises. Successful bidder shall make their own distribution arrangement to draw electricity. However, provision of suitable temporary lights at different floors/ working areas for execution of the work & safety of workmen shall be provided by successful bidder, within accepted rate. Illumination should be such that minimum illumination requirement as specified by local statutory body / international standard for general illumination is maintained.
ii.	Contractor shall be responsible for fulfilment of all requirements including statutory requirements in this regard. Contractor shall deploy and install required energy meter, cables, fuses, distribution boards, switchboards, bus bars, earthing arrangements, protection devices and any other installation as specified by statutory authority/act. Contractor shall also obtain approvals of appropriate authority and pay necessary fees, levies etc towards the clearance of such installations, prior to use. Sufficient power factor compensation equipment like capacitor shall be provided by contractor for reactive loads like welding machines etc. In case of any fine/penalty on account of low power factor, same shall be shared by contractor proportionately according to power consumption.
iii.	Contractor shall make necessary arrangements for onward distribution of construction power taking due care of surrounding construction activities like movement of cranes & vehicles, civil work, fabrication/construction/assembly/ erection etc and safety of personnel. It may become necessary to relocate some of the installations to facilitate work of other agencies or himself.
iv.	Contractor to note that till construction power is made available by BHEL (approx. within 3 months from start of work); contractor shall make his own arrangement like DG set etc. The contractor shall also take the approval/ permission of statutory authorities for his DG set installation. The Contractor has to make his own arrangement for the same as required to carry out the job under the scope of work within the quoted rate. Nothing extra shall be paid on this account of DG set up and running for construction and office maintenance etc.
v.	Contractor is advised to maintain the calibrated energy measuring instruments and use their system as efficiently as possible to maintain the HT side input energy meter reading and LT side outgoing energy meter reading to sub-contractors as equal. Successful bidder shall arrange energy meter for their office.
vi.	If any other voltage level (other than normally available) is required, the same shall be arranged by successful bidder from power supply as above. Successful bidder will have to provide at their own cost necessary calibrated energy meters (tamper proof, suitably housed in a weather proof box with lock & key arrangement) at point of power supply along with calibration certificate from authorized/ accredited agency for working out the power consumption. In case of recalibration required for any reason, necessary charges including replacement by calibrated meters is to be borne by successful bidder. Supply of electricity shall be governed by applicable Rules & Regulation. In case of any major deviation from normally accepted norms is observed, BHEL will reserve the right to impose penalty as deemed fit for such cases.

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vii.	Successful bidder shall have to provide earth leakage circuit breaker at each point wherever human operated electrical drives/ T&Ps are deployed.
viii.	The power supply will be from the available grid. BHEL shall not be responsible for any inconvenience or delay caused due to any interruption of power supply/ variation in voltage level and no compensation for delay in work can be claimed by the successful bidder due to such non-supply on the grounds of idle labour, machinery or any other grounds.
ix.	Successful bidder shall arrange sufficient illumination at their own work areas and energy meter for office.
x.	Successful bidder should ensure that the work in critical areas is not held up in the event of power breakdown. In the event of breakdown in the electric supply, if the progress of work is hampered, it will be the responsibility of the successful bidder to step up the progress of work after restoration of electric supply so that overall progress of work is not affected.
xi.	Successful bidder has to make arrangement at their own cost for illumination for their working area for execution of the work & safety of workmen. This system will include temporary pole lighting, portable lighting towers with DG back-up, within the quoted price. The illumination should be such that minimum illumination requirement as specified by Indian standards for general illumination is maintained.
3.12	CONSTRUCTION MANAGEMENT
i.	Based on the approved program, successful bidder shall submit a program of construction/ erection/ commissioning for the implementation. These programs would be amplified showing start of erection and subsequent activities and shall form the basis for site execution and detail monitoring. The three-monthly rolling program with the first month's program being tentative based on the site condition would be prepared based on these programs. Successful bidder shall also be involved along with BHEL/ customer to tie up detailed resources mobilization plan over the period of the contract matching with the performance targets.
ii.	The program would be jointly finalized by Site Incharge of successful bidder with BHEL/ customer as well as the site-planning representative. The erection program will also identify sequential events matching financial turnover.
iii.	Successful bidder is liable to furnish all documentary evidences towards payment of Works Contract Tax as and when required by BHEL.
iv.	The contractor shall maintain a site organization of adequate strength in respect of manpower, construction machinery and other implements at all times for smooth execution of the contract. This organization shall be reinforced from time to time, as required to make up for slippage from the schedule without any commercial implication to BHEL. The site organization shall be headed by a competent construction manager having sufficient authority to take decisions at site.
v.	The contractor should also submit to BHEL for approval a list of construction equipment, erection tools, tackle etc. prior to commencement of site activities. These tools & tackles shall not be removed from site without written permission of BHEL.
3.13	OTHER FACILITIES
i.	Adequate water less urinals shall be arranged by the contractor within quoted rates, at site of construction at different level and different areas like boiler structure, with proper disposal arrangement.

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ii.	Vendors have to comply requirements of HSE & Statutory requirement in line with BHEL HSE plan, NTPC Safety requirement, Jharkhand/ Central statutory requirement.
iii.	Vendors have to arrange labour rest sheds, drinking water facility, toilets, canteen facility as per local labour act/ BOCW act. Maintaining hygiene and disposal of debris, scraps, canteen items and area cleaning is included in vendor's scope.
iv.	Agency has to arrange trained scaffolding experts with accreditation from statutory agencies with proper experience and they will issue fitness certificates for safe use. Such kind of qualified scaffolding experts will vary as per job requirement. At the same time, training has to be given by these experts at regular intervals for their own workers for increasing no. of experts.
v.	Agencies HSE officers should have sufficient experience as per rule 209 of BOCW act central rule 1998. Agencies HSE officers will be part of BHEL HSE Team and they will be responsible for giving training on HSE issues in addition to normal field works and other normal site requirements.
vi.	Preparation of method statement, HIRA, Job Safety analysis, permit to work, lifting plans, and all supporting documents as required for starting & continuation of work/ job is in vendor's scope.
vii.	Hydras are not allowed for materials transport, only pick and carry cranes shall be deployed by the agency.
viii.	First aid centre will be maintained by BHEL and cost will be proportionately recovered from vendors.
ix.	Vendor has to arrange land within his quoted rate for making labour colony. Vendors labour colony has to be maintained with proper hygiene, drinking water, bathroom water, lighting arrangement, sewerage system. These facilities are to be regularly maintained including drains, surrounding, upkeep of labour colony. BHEL/ NTPC & local statutory authorities will visit labour colony from time to time and all healthy conditions are to be maintained by vendor.
x.	Scaffolding pipes, clamps, safety nets, floor grills for working platforms are to be made of good quality with proper certifications as per IS Codes.

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Chapter- V: T&Ps and MMEs to be deployed by BHEL on sharing basis

4.0 T&Ps and MMEs to be deployed by Contractor			
List of major testing & measuring equipment/ tools and tackles to be arranged/ brought by contractor for each Package			
S. No.	Description	UoM	Qty
1.	Capacitance & Tan Delta Kit		As per rqmt
2.	Capacitance Meter having range of 20 pF –100MF +/- 1%	Nos.	1
3.	CFB & ZFB kit or equivalent for testing of Relay & Distance Protection	Nos. Each	1
4.	Container for Transformer Oil Sampling	Nos.	As per rqmt
5.	DC power supply 0-250 V, 10 A make "Aplab" or equivalent (variable source)	Nos.	6
6.	DC Resistance Meter ($\mu\Omega$ Meter)	Nos.	1
7.	DC shunt 400 A 75 mV	Nos.	3
8.	Dead weight tester rated 400 kg/ cm ² and with weights and test gauge facility. Make 'Budenberg' or 'Ravika'	Nos.	2
9.	Decade resistance box	Sets	6
10.	Digital Tong Tester 0-1/ 5 A AC	Nos.	1
11.	Digital Tong tester AC 5/ 10 and 25/ 60/ 300 A of reputed make	Nos. Each	2
12.	Digital Tong tester DC 30/ 60/ 300 A	Nos.	2
13.	Equipment and consumables for LPI/ MPI test on impulse pipes	Sets	2
14.	Ferrule printing machine	Nos.	2
15.	Fire proof tarpaulin		As per rqmt
16.	Frequency source 45 to 55 Hz with 110V	Nos.	1
17.	Function Generator	Nos.	2
18.	Glass thermometer 0-120 °C, 0-200 °C and 0-600 °C	Nos. Each	2
19.	HV Test Kit AC: 0 –20 kV & DC: 0- 25 kV Preferably with dry type transformer	Nos. Each	As per rqmt
20.	Inclined manometer (+/-) 300 mm water column	Nos.	2
21.	Industrial type vacuum cleaner	Nos.	2
22.	Insulation Tester Hand Operated 250V/ 500V/ 1000V rated mains/ battery operated	Nos.	2
23.	Insulation Tester Mains Operated 2500/ 5000V	Nos.	1
24.	Insulation Tester Motorised Operated/ Electronic with selective range of 500/ 1000/ 2500/ 5000 V. Range 0.5 M Ω to 10000 M Ω	Nos.	3
25.	Manometers (+/-) 500 mm mercury column with hand bulb for lab and small manometer for field purpose.	Nos.	2

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26.	Meters for time measurement of breaker opening & closing time	Nos.	1
27.	Micro Ohm meter/ Ducter(mV Volt Drop Test Kit) 0-200 A DC, 0-2000 $\mu\Omega$ with suitable calibrated cable leads for current injection & mv drop	Nos.	1
28.	Muffle furnace – 800 °C with standard temperature gauges	Nos.	2
29.	Multimeters		
30.	A) Digital, 3 1/ 2 digit Motwane/ HIL/ Fluke	Nos.	16
	B) Analog: Motwane make	Nos.	10
	C) Digital, 4 1/ 2 digit Motwane/ HIL/ Fluke	Nos.	10
31.	Oil specific gravity and PPM measuring instrument	Nos.	1
32.	Oil temperature bath suitable to calibrate the instruments range 0 – 200 °C with standard temperature gauges and thermostatic control	Nos.	4
33.	Oscilloscope 100MHz	Nos.	1
34.	Other Protective Devices		As per rqmt
35.	Phantom Load Test Kit		As per rqmt
36.	Phase Sequence Indicator	Nos.	2
37.	Polarity Test Kit	Nos.	1
38.	Portable air compressor with drier and regulator make "Toshniwal/ Khosla" rated for 7 to 10 kg/ cm ²	Nos.	7
39.	PPM Tester for Transformer Oil	Nos.	1
40.	Primary Injection Kit with pair of leads & clamps for testing CTS	Sets	1
41.	Protective Earth rod suitable for 220/ 400 kV System having leakage current meter, 70 sq. mm. cable & clamps (reputed make)	Nos.	2
42.	Relay Testing Kit	Nos.	1
43.	Rheostat	Nos.	3
44.	RTD/ Pt 100 source	Nos.	4
45.	Secondary current injection kit up to 300 A	Nos.	As per rqmt
46.	Secondary injection Kit 7500 A	Nos.	As per rqmt
47.	Secondary Injection kit with integral timer for relay testing with cable leads & Banna plugs selective range 5A & 1A (Range for relay setting))	Set	As per rqmt
48.	Silicon Oil Filter Machine for HVR	Nos.	1
49.	Mineral Oil Filter Machine for HVR	Nos.	1
50.	Single Phase Variac 250 V, 8 A	Nos.	2
51.	Single Phase Variac 250V, 28 A	Nos.	2
52.	Soldering iron "Soldron" make 25 W	Nos.	11
53.	Standard gauges 12" dial size make "Budenberg" or "H Guru" or "Odin"		
54.	A) -1– 0 kg/ cm ² pressure gauge (vacuum gauge)	Nos.	2
	B) 0 – 5 or 6 kg/ cm ² pressure gauge	Nos.	2

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	C) 0 – 10 kg/ cm ² pressure gauge	Nos.	2
	D) 0 – 25 kg/ cm ² pressure gauge	Nos.	2
	E) 0 – 60 kg/ cm ² pressure gauge	Nos.	2
	F) 0 – 100 kg/ cm ² pressure gauge	Nos.	2
	G) 0 – 250 kg/ cm ² pressure gauge	Nos.	2
	H) 0 – 600 kg/ cm ² pressure gauge	Nos.	2
	I) 0.2 to 1 kg pressure gauge	Nos.	2
55.	Standard millamps/ millivolts source of reputed make. Range 0 to 60 mA and 0 to 100 mV	Nos.	6
56.	Stop Watch	Nos.	2
57.	Tachometer (Non-Contact Type) (0-4000 rpm)	Nos.	3
58.	Teletalk 2 wire system/ Group Mobile	Sets	28
59.	Temperature Gun Digital Type	Nos.	1
60.	Three Phase Shifter	Nos.	1
61.	Three Phase Variac 05 A	Nos.	2
62.	Three Phase Variac 15 A	Nos.	2
63.	Transformer oil BDV test kit 0-100kV with 2.5 mm air gap		As per rqmt
64.	Transformer oil purification plant with vacuum pump for evacuation transformer along with accessories & hoses of 750/ 1000/ 6000 LPH		As per rqmt
65.	Transformer turns Ratio test kit	Nos.	1
66.	Two way intercom set with 50 to 100 m cable for checking the cables continuity	Sets	2
67.	Wattmeter AC/ DC 0-125-250 V, 0-5-10 A	Nos.	1
68.	Earth Resistance Tester	Nos.	1
69.	NAS Filtration Machine as mentioned in BOQ	Nos.	As per rqmt

S. No.	Description	UoM	Qty
HANDLING EQUIPMENTS			
1	Chain pulley block/ turfer		As per rqmt
2	Cranes, trucks, Trailer (10-12T), Hydra/ Farana etc. for transportation and erection of equipment		As per rqmt
3	D-shackles		As per rqmt
4	Manila ropes		As per rqmt
5	Nylon Slings		As per rqmt
6	Steel wire ropes		As per rqmt

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Chapter- V: T&Ps and MMEs to be deployed by BHEL on sharing basis

S. No.	Description	UoM	Qty
7	Turn buckles		As per rqmt
MAJOR T&Ps			
8	24V AC Transformer & Hand lamps	Nos.	10
9	Cable Rollers		As per rqmt
10	Chain Pulley Blocks 5/ 10 T	Nos. Each	2
11	Copper tube bender and cutter sizes 6mm, 8mm, 1/ 2", 1/ 4"	Nos. Each	2
12	Crimping tool up to all sizes of Cables under scope of work	Nos. Each	4
13	Die sets for threading up to 2" pipe.	Sets	3
14	Distribution boards with power cable complete as required		As per rqmt
15	Drilling machines 1/ 4", 1/ 2", 3/ 4" & 1"	Nos. Each	4
16	Dynamometers		As per rqmt
17	Electrician tool kit	Nos.	15
18	Electrode drying ovens		As per rqmt
19	Fire extinguishers (Type: as required)	Nos.	5
20	Fire proof tarpaulin		As per rqmt
21	Flood light fittings	Nos.	30
22	Grinding machine	Nos.	15
23	Hydraulic Crimping Tool for conductor/ shield wire		As per rqmt
24	Hydraulic Jacks 250T/ 100T Capacity		As per rqmt
25	Measuring instruments like Micrometres and Callipers	Sets Each	3
26	Mechanical tool kit for fitters	Nos.	15
27	TIG/ MIG Welding Machine with accessories air cool type	Sets	4
28	Painting brush		As per rqmt
29	Personal computer and accessories, Printer	Sets	1
30	Pipe bending machine – 2" size	Nos.	3
31	Safety belts and Safety helmets		As per rqmt
32	Shearing Machine		As per rqmt
33	Spirit level	Nos.	5
34	Tap sets for both BSP and MPT threads up to 1" each	Sets Each	4
35	Torque Wrench Set (Till 225Nm)	Nos. Each	2
36	Tuffer Capacity 15T	Nos.	4
37	Welding Generators	Nos.	12
38	Dewatering Pump	Nos	As per rqmt
39	Welding Transformers	Nos.	12
40	Man-lifter as per requirement	Nos	1

Fire Arc suits are under the contractor's scope as per the requirement.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter- V: T&Ps and MMEs to be deployed by BHEL on sharing basis

The following materials/ consumables are to be arranged by the contractor as part of the contractual scope.

S. No.	Description
1	Welding electrodes for welding AS/ CS/ SS pipe and other welding from BHEL approved vendors only
2	Filler wire for argon welding
3	Argon, oxygen and acetylene gas
4	Provision for temporary scaffoldings.
5	GI "U" clamps with nuts and washers for impulse and GI pipe clamping.
6	Round aluminium tags (30mm dia. x 3mm thick)
7	Teflon tape and insulation tape.
8	Hold tight/ bitumen tape for GI pipe coupling.
9	Required paints and primer from BHEL approved vendors only.
10	Solder wire (60/ 40)
11	Protocol/ calibration report sheets as per BHEL format.
12	Panel/ JB sealing compound material (for cable entry from bottom/ top of panel).
13	PVC cable tie, aluminium strip and hardware for clamping of cables, copper tube, and temperature gauge capillary.
14	Copper lugs up to 4 sq. mm, PVC sleeve of different size, PVC button & tape
15	Ferrules (PVC) and suitable for ferrule printing.
16	Any other consumables as per the requirement.
	NOTE:
1	Instruments shown above are for the regular works only. However, separate sets of tools and instruments are to be arranged and provided to commissioning gang. If contractor fails to arrange the testing instruments as listed above, BHEL site will arrange the instruments at the cost of contractor.
2	The list of instruments/ equipment and their quantities to be brought by the contractor as shown above is only indicative. Any other instruments/ equipment is required for the execution of the work is to be necessarily arranged by the contractor. The testing/ calibration instruments which are used to be duly calibrated in the interval prescribed by BHEL engineer from the BHEL approved agencies. And test certificate to be furnished.
3	The testing/ calibration instruments which are used to be duly calibrated in the interval prescribed by BHEL Engineers from the reputed agencies decided by BHEL and test certificate to be furnished. Contractor to submit calibration report from recognized agency prior to deployment of same at site and periodical calibration of the same to be arranged by contractor as per procedure of BHEL.
4	This above list is only indicative and neither exhaustive nor limiting. Contractor shall deploy all necessary T&P to meet the schedules & as prescribed by BHEL engineer and required for completion of work.
5	In the eventuality of contractor not deploying / abnormal down time of T&P/cranes in his scope during the period specified above, and BHEL arranges for the same [BHEL's own cranes], prevailing BHEL Corporate Crane hire charges (which may vary from time to time) shall be recovered from the contractor's running bills. Corresponding pages of Corporate Crane hire charges are enclosed as part of tender document as file titled "Annexure-15- BHEL T&P Hire Charges". In case BHEL arrange the T&P/Crane through hiring, actual hiring charges with 5% over head shall be recovered from the contractor's running bills.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter- V: T&Ps and MMEs to be deployed by BHEL on sharing basis

S. No.	Description
Other than the aforesaid, one computer, printer and other necessary peripherals will have to be maintained by the contractor in his site office as mentioned in Scope of Work.	
4.1	T&P, MMD TO BE PROVIDED BY SUCCESSFUL BIDDER
i.	Tentative list of T&P to be deployed by successful bidder for successful completion of work is given in the at the end of this tender.
ii.	<p>It may be noted that the list is not exhaustive and is only for general guidance. Successful bidder shall provide all necessary T&P (other than those specified to be provided by BHEL, if any) MMD, handing equipment for timely completion of total work as per contract.</p> <p>In case of project requirement, some activities may have to pre-pone. In such case, successful bidder may have to deploy additional T&P. Accepted rate shall be inclusive of such requirements.</p>
iii.	<p>In the event of any failure on the part of successful bidder progress of work suffers, BHEL, at their discretion may also terminate the contract and take out any or whole amount of contract from the scope of successful bidder. In line with this, in the event of failure of successful bidder to deploy necessary & sufficient T&Ps, BHEL also reserve the right to arrange the same including transportation from any of BHEL site/ other agency & charges, as applicable, in case progress of work is suffered. The decision of BHEL in this regard will be final and binding on the successful bidder.</p>
iv.	<p>Mobilization schedule as mutually agreed at site for major T&Ps, have to be adhered to so as to meet the project requirement. Successful bidder will have to give advance intimation & certification regarding capacity, etc prior to dispatch of heavy equipments. However, depending on project requirement, availability of inputs, the deployment schedule may be revised/ modified based on mutual agreement between BHEL and successful bidder.</p>
v.	All T&P and MMDs, which are required for successful and timely execution of work covered under this tender, shall be arranged & provided by successful bidder at his own cost in working condition.
vi.	<p>After completion of major quantum of work as to be agreed by BHEL, successful bidder may be permitted to take out any of his T&P, MMD progressively, if deemed fit by Construction Manager, BHEL based on review of work progress & balance work program. The same will be jointly agreed and recorded. BHEL's decision in this regard will be final & binding on successful bidder.</p>
4.3	TEST CERTIFICATE FOR T&P
i.	All T&Ps, MMDs, lifting tackles and pulling devices, wire rope, slings to be deployed by successful bidder must bear valid/ latest test certificates for their suitability, and the documents shall be preserved at site.
ii.	In case of expiry of validity of any test certificate during construction, successful bidder shall revalidate the same well in advance, so that construction activities do not suffer on account of non-availability of such test certificates.
iii.	Successful bidder shall submit to BHEL for approval a list of T&Ps along with their fitness certificates. The T&Ps, MMDs, etc shall not be removed from site without written permission of BHEL.
4.4	MMEs / MMRs
	<p>Contractor shall ensure deployment of reliable and calibrated MMEs (Measuring and Monitoring Equipment). The MMEs shall have test /calibration certificates from authorised / Government approved / Accredited agencies traceable to National / International Standards. Retesting / re-calibration shall also be arranged at regular intervals during the period of use as advised by BHEL Engineer within the contract price. The contractor will also have alternate arrangements for such MMEs so that work does not suffer when the particular equipment /instrument is sent for calibration. Also if any MMEs not found fit for use,</p>

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter- V: T&Ps and MMEs to be deployed by BHEL on sharing basis

	BHEL shall have the right to stop the use of such item and instruct the contractor to deploy proper item and recall i.e. repeat the readings taken by that instrument, failing which BHEL may deploy MME and retake the readings at Contractor's cost.
	Contractor shall provide all the Measuring Monitoring Equipment (MMEs) required for completion of the work satisfactorily. These MMEs shall be of brand, quality and accuracy specified by BHEL Engineer and should have necessary calibration and other certificates as per the requirement of BHEL Engineer. Decision of BHEL Engineer regarding acceptance or otherwise of the measuring instruments / gauges / tools for the work under this specification, is final and binding on the contractor. BHEL shall give an indicative list of MMEs required for this work else where in this contract and to be made available by the contractor. The list will be reviewed by BHEL site as per the requirement of approved FQPs and the contractor shall meet any augmentation needed wherever required.
	It is the responsibility of the contractor to prove the accuracy of the testing / measuring / calibrating equipment brought by him based on the periodicity of calibration as called for in the BHEL's quality assurance standards/BHEL Engineer's instructions.
	Re-work necessitated on account of use of invalid MMEs shall be entirely to the contractor's account. He shall be responsible to take all corrective actions, including resource augmentation if any, as specified by BHEL to make-up for the loss of time.
	In the courses of erection, it may become necessary to carry repeated checks of the work with instruments recently calibrated, re-calibrated. BHEL may counter / finally check the measurements with their own MMEs. Contractor shall render all assistance in conduct of such counter /final measurements.
4.5	MEASURING AND MONITORING DEVICE (MMD)
i.	Successful bidder shall provide within accepted rates/ price, all MMDs as necessary for such work.
ii.	Successful bidder shall ensure deployment of reliable & calibrated MMDs. The MMDs shall have valid calibration certificate from authorized/ Govt approved /NABL accredited agencies. Successful bidder shall also keep provision of alternate engagement for such MMDs so that the work does not suffer when a particular MMD is sent for calibration. Re-testing/ re-calibration shall also be arranged by successful bidder at their own cost at regular interval during the period of use as advised by BHEL.
iii.	In the event of failure of successful bidder to bring necessary and sufficient MMDs, BHEL may arrange for the same. The entire cost towards this along-with overhead shall be paid by successful bidder or deducted from successful bidder's bills.
4.6	TOOLS & PLANTS TO BE PROVIDED BY BHEL
i.	For T&P issued by BHEL, successful bidder and BHEL shall maintain joint protocol about the condition of all items taken from BHEL's custody and returned after use. Successful bidder shall not use these equipments for purposes other than the scope of work given in this tender.
ii.	It is the responsibility of successful bidder to keep these equipments always in working condition and ensure their safe return in working condition to BHEL's store subject to normal wear & tear.
iii.	After use of T&P items issued by BHEL the same shall be returned to BHEL in good working condition subject to normal wear & tear failing which recoveries at the book value of the item or the market rate prevailing at the time of returning the items, whichever is higher, shall be made from the payments due to successful bidder. BHEL's decision regarding condition evaluation shall prevail.
iv.	Any damage/ breakdown maintenance of T&Ps arising out of improper handling by successful bidder shall be to the account of successful bidder. BHEL reserve the right to repair the same to its own satisfaction at the cost of successful bidder. During such outage of T&P, BHEL shall not be responsible

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter- V: T&Ps and MMEs to be deployed by BHEL on sharing basis

	to provide any alternative. Successful bidder shall arrange for such alternative arrangement at their own cost.
v.	Successful bidder shall return BHEL, T&Ps issued to them in good working condition as & when desired by BHEL (on completion or reduction of work load). If return of equipment is delayed by successful bidder, hire charges as applicable shall be levied by BHEL from time it was requisitioned till the time of actual return. Hire charges shall also be charged on T&P returned in damaged/ un-serviced condition to BHEL till its satisfactory repair. Equipment returned in damaged un-serviced condition shall be got repaired by BHEL at their discretion and entire cost of repair with BHEL overheads shall be recovered from successful bidder.
vi.	In case of any T&P (issued to successful bidder) remain idle without valid reason, BHEL shall withdraw the T&P immediately for allotment to other agency next in priority and no compensation shall be entertained on this account by BHEL.
vii.	The T&Ps will be issued on sharing basis and distribution of these shall be done at the discretion of Construction Manager, BHEL as per requirement/ priority of the job and availability of these items. In the event of non-availability of crane, BHEL may explore the possibility of providing alternate higher/ nearby capacity crane, found sparable with BHEL site. However, this is not a binding for BHEL. Such cranes of higher capacity (if provided by BHEL) will also be issued on same conditions as applicable to cranes listed in the relevant annexure.
viii.	In the event of any damage or theft occurring to the issued T&Ps, while in use with successful bidder, due to their negligence, the same shall be repaired/ replaced by successful bidder at their own cost within the time stipulated by Construction Manager, BHEL. Successful bidder's failure to do so shall entitle BHEL to get the above done through any agency and cost along with overheads shall be recovered from successful bidder's RA bill.
ix.	The items mentioned in relevant annexure are for general guidance only. Except the referred items, successful bidder has to deploy all other T&Ps required for proper & satisfactory completion of the job.
x.	Increasing/ shortening of crane boom to suit work requirements shall have to be arranged by successful bidder at their cost. In case of non-availability of T&Ps to be provided by BHEL due to any reason, successful bidder shall plan/ amend/ alter their activities to meet erection/ commissioning targets in consultation with BHEL. No additional compensation will be given for this.
xi.	Normal/ schedule maintenance of T&P issued to successful bidder on shared basis shall be carried out by BHEL as per requirement. Successful bidder shall plan/ alter their activities in line with availability of cranes, issued by BHEL on sharing basis.
xii.	Actual use of T&P including marching as per entry in log-book duly certified by BHEL engineer shall be considered for calculation of overtime charges.
xiii.	T&P issued shall be used only for designated scope of work as per direction of BHEL.
xiv.	In the event successful bidder fails to use and/ or maintain BHEL T&P according to BHEL's instructions, BHEL reserve the right to withdraw such T&P without any notice and no claim in this regard shall be entertained and successful bidder shall be responsible for delay in execution on this account.
xv.	It shall be responsibility of successful bidder to take delivery of T&P from stores or place of use of T&P by other agencies at project site, transport the same to site and return the same to BHEL store/ place as intimated by BHEL at project site in good working conditions after use.

TECHNICAL CONDITIONS OF CONTRACT (TCC)
Chapter- V: T&Ps and MMEs to be deployed by BHEL on sharing basis

5.0	T&Ps and MMEs to be deployed by BHEL on sharing basis
5.1	BHEL shall not share Tools & Plants (T&Ps) and Measuring & Monitoring Equipment (MMEs) with the successful bidder, except where specifically mentioned in the tender documents (e.g., EOT crane).

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Chapter – VI: Time Schedule

6.0	Time Schedule & Mobilization						
6.1	<p>Initial Mobilization After issue of LOA (through Fax/courier/email) the contractor shall report to the Construction Manager/Site In-Charge of BHEL at site within Two weeks (14 days) from date of LOA for Kick-off meeting regarding mobilization of manpower, T&Ps and date of start of work and detailed completion program etc.</p> <p>The contractor has to subsequently augment his resources in such a manner that the project milestones are completed on specified schedules and entire work completed within the entire contract period, as specified in the following clause from the date of start of work, in a manner required by BHEL to match with the project schedule.</p>						
6.2	<p>Commencement of Contract Period:</p> <p>BHEL Engineer will certify the actual date of start of work after adequate mobilization of manpower, major equipment and required T&P by the contractor. In case of discrepancy, the decision of BHEL shall be considered to be final and binding to contractor. Based on the availability of civil foundations, drawings and material from BHEL, contractor may have to advance the erection activity after getting clearance from Construction Manager, or the erection activity may get delayed due to site conditions.</p> <p>The contractor shall complete all the works in the scope of this contract within the contract period. Pending points identified by the customer/BHEL during the execution of the contract are to be liquidated during the contract period itself.</p>						
6.3	<p>Schedule of Completion:</p> <p>The contract period for completion of entire work under scope shall be as mentioned hereunder, from the “START OF CONTRACT PERIOD” as specified earlier for completion of the entire work in respective Packages.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; padding: 5px;">Package</th> <th style="text-align: center; padding: 5px;">Contractual Schedule (Month)</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">Package A: Erection, Testing & Commissioning of Electrical Package of Main Plant Area-Unit#1 & Common Systems (Except AHP, CHP, GHP & LHP)</td> <td style="text-align: center; padding: 5px;">20 Months</td> </tr> <tr> <td style="padding: 5px;">Package B: Erection, Testing & Commissioning of Electrical Package of Main Plant Area-Unit#2 including AHP, CHP, GHP & LHP</td> <td style="text-align: center; padding: 5px;">22 Months</td> </tr> </tbody> </table>	Package	Contractual Schedule (Month)	Package A: Erection, Testing & Commissioning of Electrical Package of Main Plant Area-Unit#1 & Common Systems (Except AHP, CHP, GHP & LHP)	20 Months	Package B: Erection, Testing & Commissioning of Electrical Package of Main Plant Area-Unit#2 including AHP, CHP, GHP & LHP	22 Months
Package	Contractual Schedule (Month)						
Package A: Erection, Testing & Commissioning of Electrical Package of Main Plant Area-Unit#1 & Common Systems (Except AHP, CHP, GHP & LHP)	20 Months						
Package B: Erection, Testing & Commissioning of Electrical Package of Main Plant Area-Unit#2 including AHP, CHP, GHP & LHP	22 Months						

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Chapter – VI: Time Schedule

6.4	<p>The contractor has to subsequently augment his resources in such a manner that following major milestones of erection & commission are achieved on specified schedules:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; width: 15%;">S. No.</th><th style="text-align: center; width: 35%;">MAJOR MILESTONE</th><th style="text-align: center; width: 25%;">Tentative Schedule w.r.t date of start of work of Package-A</th><th style="text-align: center; width: 25%;">Tentative Schedule w.r.t date of start of work of Package-B</th></tr> </thead> <tbody> <tr> <td></td><td></td><td style="text-align: center;">Unit-1</td><td style="text-align: center;">Unit-2</td></tr> <tr> <td style="text-align: center;">1</td><td>ND HYDRO TEST</td><td style="text-align: center;">10th Month</td><td style="text-align: center;">12th Month</td></tr> <tr> <td style="text-align: center;">2</td><td>BOILER LIGHT UP</td><td style="text-align: center;">12th Month</td><td style="text-align: center;">14th Month</td></tr> <tr> <td style="text-align: center;">3</td><td>SYNCHRONIZATION</td><td style="text-align: center;">16th Month</td><td style="text-align: center;">18th Month</td></tr> <tr> <td style="text-align: center;">4</td><td>COMPLETION OF FACILITIES</td><td style="text-align: center;">20th Month</td><td style="text-align: center;">22nd Month</td></tr> </tbody> </table> <p>Agency for Package-A & B has to expedite their work in order to meet the milestones as indicated above.</p> <p>NOTE: Above time schedule is only tentative and in order to meet above schedule in general, and any other intermediate targets set, to meet customer/ project schedule, contractor shall arrange & augment all necessary resources from time to time as per the instructions of BHEL Engineer w.r.t. monthly plan and review format (F-14).</p> <p>The above schedule shall be advanced, if there are requirements to advance the project to meet the project requirement. No extra payment whatsoever shall be paid on this account.</p>	S. No.	MAJOR MILESTONE	Tentative Schedule w.r.t date of start of work of Package-A	Tentative Schedule w.r.t date of start of work of Package-B			Unit-1	Unit-2	1	ND HYDRO TEST	10 th Month	12 th Month	2	BOILER LIGHT UP	12 th Month	14 th Month	3	SYNCHRONIZATION	16 th Month	18 th Month	4	COMPLETION OF FACILITIES	20 th Month	22 nd Month
S. No.	MAJOR MILESTONE	Tentative Schedule w.r.t date of start of work of Package-A	Tentative Schedule w.r.t date of start of work of Package-B																						
		Unit-1	Unit-2																						
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2	BOILER LIGHT UP	12 th Month	14 th Month																						
3	SYNCHRONIZATION	16 th Month	18 th Month																						
4	COMPLETION OF FACILITIES	20 th Month	22 nd Month																						
6.5	<p>Intermediate milestones: Two Major Intermediate Milestones are identified as M1 and M2.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; width: 15%;">Milestone Name</th><th style="text-align: center; width: 35%;">Tentative Schedule from start of work of Package- A</th><th style="text-align: center; width: 25%;">Tentative Schedule from start of work of Package- B</th></tr> </thead> <tbody> <tr> <td></td><td style="text-align: center;">Unit-1</td><td style="text-align: center;">Unit-2</td></tr> <tr> <td style="text-align: center;">M1</td><td>BOILER LIGHT UP</td><td style="text-align: center;">12th Month</td><td style="text-align: center;">14th Month</td></tr> <tr> <td style="text-align: center;">M2</td><td>SYNCHRONIZATION</td><td style="text-align: center;">16th Month</td><td style="text-align: center;">18th Month</td></tr> </tbody> </table> <p>Successful bidder shall plan their work in such a manner so as to meet the above construction schedule & project schedule, in consultation with BHEL/ customer. M1 & M2 are the intermediate LD milestones. Successful bidder shall submit detailed L1/L2 schedule separately for the package after getting LOI from BHEL and prior to issuance of detailed work order.</p>	Milestone Name	Tentative Schedule from start of work of Package- A	Tentative Schedule from start of work of Package- B		Unit-1	Unit-2	M1	BOILER LIGHT UP	12 th Month	14 th Month	M2	SYNCHRONIZATION	16 th Month	18 th Month										
Milestone Name	Tentative Schedule from start of work of Package- A	Tentative Schedule from start of work of Package- B																							
	Unit-1	Unit-2																							
M1	BOILER LIGHT UP	12 th Month	14 th Month																						
M2	SYNCHRONIZATION	16 th Month	18 th Month																						
6.6	<p>Provision of Penalty in case of slippage of Intermediate Milestones:</p> <ol style="list-style-type: none"> a. In case of slippage of Two Major Intermediate Milestones, mentioned as M1 & M2 above, delay Analysis shall be carried out on achievement of each of these two Intermediate Milestones in reference to F-14. 																								

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	<ul style="list-style-type: none"> b. In case delay in achieving M1 Milestone is solely attributable to the contractor, 0.5% per week of executable contract value*, limited to maximum 2% of executable contract value, will be withheld. c. In case delay in achieving M2 Milestone is solely attributable to the contractor, 0.5% per week of executable contract value*, limited to maximum 3% of executable contract value, will be withheld. d. Amount already withheld, if any against slippage of M1 milestone, shall be released only if there is no delay attributable to contractor in achievement of M2 Milestone. e. Amount required to be withheld on account of slippage of identified intermediate milestone(s) shall be withheld out of respective milestone payment (if any) and balance amount (if any) shall be withheld @10% of RA Bill amount from subsequent RA bills. f. Final deduction towards LD (if applicable), on account of delay attributable to contractor shall be based on final delay analysis on completion / closure of contract. Withheld amount, if any due to slippage of identified intermediate milestone(s) shall be adjusted against LD or released as the case may be. g. In case of termination of contract due to any reason attributable to contractor before completion of work, the amount already withheld against slippage of intermediate milestones shall not be released and be converted into recovery. h. Contractor shall make all possible efforts to expedite the activities, in case of delay of any intermediate milestone, to maintain overall project completion schedule. i. *Executable Contract Value - Value of work for which inputs/ fronts were made available to contractor and were scheduled for execution till the date of achievement of that milestone.
6.7	Completion of Work and Commencement of Guarantee Period
	The works shall be completed to the entire satisfaction of the Engineer and in accordance with the completion schedule as specified in the Contract, and all unused stores and materials, tools, plant, equipment, temporary buildings, site office, labour hutments and other things shall be removed and the site and work cleared of rubbish and all waste materials and delivered up clean and tidy to the satisfaction of the Engineer at the Contractor's expenses.
	BHEL shall have power to take over from the Contractor from time to time such sections of the work as have been completed to the satisfaction of the Engineer. Such work however shall not be treated as have been completed until the remaining / pending works are executed to the satisfaction of Engineer.
	Commencement of performance guarantee shall be as per clause no. 2.24 (Performance Guarantee for Workmanship) of General Conditions of Contract. The commencement of guarantee period for the quality of the workmanship shall start from the date of Trial operational acceptance of facilities OR Handing Over to the customer, whichever is earlier.
	The contractor shall submit a detailed area/structure wise L3 schedule within 25 days from date of LOA, in consultation with BHEL, based on the tentative schedule provided as above. The detailed L3 schedule shall be approved by BHEL and same shall be implemented. Bidder shall submit L3 schedule in MS Projects and excel to meet the agreed project schedule covering various mile stone activities and their split-up details such as mobilization, procurement of materials & erection activities. This schedule shall also clearly indicate the interface facilities / inputs applicable in each package. Bidders

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	shall submit Resource deployment plan Area wise with detail program in line with above schedule in the form of Bar Chart/ MS project planner along with their offer.
6.8	<p>The under mentioned Records/ Log-books/ Registers applicable to be maintained.</p> <ul style="list-style-type: none"> i) Hindrance Register. ii) Site Order Book. iii) Test Check of measurements. iv) Records of Test reports of Field tests. v) Records of manufacture's test certificates. vi) Records of disposal of scraps generated during and after the work completion
6.9	<p>Control and monitoring of progress of work</p> <p>Refer forms F -14 to F-15 of volume I D (Forms & Procedure). Plan and review will be done as per the formats.</p>
	<p>The progress reports shall indicate the progress achieved against plan, indicating reasons for delays, if any. The report shall also give remedial actions which the contractor intends to make good the slippage or lost time so that further works can proceed as per the original plan the slippages do not accumulate and affect the overall programme.</p>
	<p>It is the responsibility of the contractor to provide all relevant information on a regular basis regarding progress of work, labour availability, equipment deployment, testing, etc.</p>
	<p>Contractor is required to draw mutually agreed monthly work programs in consultation with BHEL well in advance. Contractor shall ensure achievement of agreed program and shall also timely arrange additional resources considered necessary at no extra cost to BHEL.</p>
	<p>Progress review meetings will be held at site during which actual progress during the week vis-a-vis scheduled program shall be discussed for actions to be taken for achieving targets. Contractor shall also present the program for subsequent week. The contractor shall constantly update / revise his work program to meet the overall requirement. All quality problems shall also be discussed during above review meetings. Necessary preventive and corrective action shall be discussed and decided upon in such review meetings and shall be implemented by the contractor in time bound manner so as to eliminate the cause of nonconformities.</p>
	<p>The contractor shall submit quarterly progress reports, manpower reports, materials reports, consumables (gases / electrodes) report, cranes availability report and other reports as per Performa considered necessary by the Engineer. The periodicity of the reports will be decided by BHEL Engineer at site.</p>
	<p>The contractor shall submit quarterly statement report regarding consumption of all consumables for cost analysis purposes.</p>
	<p>The contractor shall submit a report of any damage, shortage, discrepancy etc., every week detailing in this regard. Non-submission of report would be considered as no shortage of materials.</p>
	<p>The manpower reports shall clearly indicate the manpower deployed, category wise specifying also the activities in which they are engaged.</p>

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6.10	<p>The monthly report as a booklet shall be submitted at the end of every month and shall contain the following details: -</p> <ul style="list-style-type: none"> 2.1 Progress photographs in colour. 2.2 Erection progress in terms of the respective work areas against planned 2.3 Site Organization chart of engineers & supervisors as on the last day of the month with further mobilization plan. 2.4 Safety implementation report in the format. 2.5 Pending material and any other inputs required from BHEL for activities planned during the subsequent month.
6.11	<p>Site Data Digitalisation: Daily Activity Log, M-Book and Subcontracting Billing Module: -</p> <ol style="list-style-type: none"> 1. Refer Vendor Portal System with links: for ref. https://pshq.bhel.in/sddvp/ 2. Login ID and Password shall be provided by respective package manager. 3. Contractor by clicking 'Daily Work Photos', shall upload area wise photos on daily basis. 4. Contractor by clicking 'Daily Activity Log', shall update site activities on daily basis. 5. Contractor by clicking 'Measurement Book', shall enter Measurement Book in Format and BOQ. 6. Contractor shall raise their RA Bills along with supporting documents (such as Quality and HR Document – Vetted by Customer Etc.) and checklist through SDD portal only. 7. Contractor shall comply the system requirement. 8. Refer Vendor Manual for further details. <p>Note: The contractor shall be required to provide all facilities including manpower for the aforementioned activities, without any cost implications to the BHEL.</p>
6.12	Agency shall extend all support towards inputs for Project Management to PMC team, IPMS system or any other system/tool for project monitoring and control.
6.13	<p>General Terms:</p> <p>Successful bidder shall submit daily work program based on above construction schedule. Deferment of schedule is not acceptable, unless specifically called for by BHEL. Successful bidder will adhere to schedule and resource planning to be augmented to ensure completion as per schedule. Slippage from adherence to this schedule will attract penalty/ LD as per tender provision.</p> <p>Periodic progress reviews on the entire activities of execution in respect of supply & works in scope of successful bidder will be held once in a month at Nagpur/ site. These meetings will be attended by reasonably higher officials of successful bidder and will be used as a forum for discussing all areas where progress needs to be speeded up. Successful bidder shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings. Review shall be done in applicable BHEL format (F-14 etc) and shall have to be signed jointly by BHEL engineer and site in-charge of vendor. This signed document shall form the basis for future delay analysis of the project.</p> <p>The contractor shall complete all the work in the scope of this contract within the contract period. Subject to availability of materials and other inputs, it is the responsibility of the contractor to carry out work to achieve the monthly progress and keep up the schedules.</p> <p>Contractor shall draw the monthly erection program along with BHEL Engineer indicating the work to be achieved and event to be completed. Once the program is drawn, he shall adhere to the same. Contractor shall plan and erect the materials as it is received at site. The monthly planned percentage shall take into consideration the material available at site before the start of the month and also any</p>

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	material received during the month. Contractor shall mobilize his resources required to achieve the monthly programs.
	Contractor shall specifically note that there is likely to be some delay in supplies of materials/ release of work fronts/ other reasons. Contractor shall have to work round the clock on such critical activities as a part of catch up program to meet the project requirement to the extent possible and shall also provide required resources as part of scope of work.
	In order to meet above schedule in general, and any other intermediate targets set, to meet customer/ project schedule, contractor shall arrange & augment all necessary resources from time to time as per the instructions of BHEL.
	In case the activities in the schedule are to be advanced, the related structural activities in the scope of the contractor are to be advanced to meet the project requirement. No extra payment whatsoever shall be paid on this account.
	The contractor shall submit area-wise L3 schedule within 7 days in consultation with BHEL. The detailed L3 schedule shall be approved by BHEL and same shall be implemented. Bidder shall submit L3 schedule in MS Projects to meet the agreed project schedule covering various mile stone activities and their split-up details such as mobilization, procurement of materials, fabrication & erection activities. This schedule shall also clearly indicate the interface facilities/ inputs applicable in each package.
6.14	DEFINITION OF WORK COMPLETION
	The contractor's scope of work under these specifications will be deemed to have been completed in all respect, only when all the activities are completed satisfactorily and so certified by BHEL site in charge. The decision of BHEL in this regard shall be final and binding on the contractor.
6.15	MATERIAL RE-CONCILIATION & SHORT CLOSURE OF CONTRACT
	The BOQ is for Package-A (Unit#1 & common area) and Package-B (Unit#2 & CHP, AHP, LHP, GHP area) . The contractor shall do unit-wise material re-conciliation periodically. In extreme case if need arises, BHEL may short close the contract unit-wise.
6.16	PERFORMANCE GUARANTEE FOR WORKMANSHIP (Clause no 2.24 of GCC)
	Guarantee Period for entire contract shall commence from the "Work Completion Date" certified by BHEL Engineer.
6.17	SCHEDULE COMPRESSION
	BHEL, owing to its commitment to their customer, may ask contractor to compress the total completion schedule by up to 15%. This will result in advancement of various milestones. For achieving the same, contractor shall plan his activities and mobilize additional resources accordingly to the satisfaction of BHEL engineer within the quoted rates.

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7.0	Terms of Payment	
<p>The progressive payment for erection, testing and commissioning on accepted price of contract value for Electrical Package rates will be released as per the break up given hereinafter:</p>		
S. No.	Activity/ Work Description	%age of Unit Rate
7.1	PRO RATA PAYMENTS (85%)	
7.1.1	Cable tray and accessories	
A)	Fabrication and fixing/ welding/ bolting in position	60%
B)	Earthing of cable trays	10%
C)	Numbering of cable trays	8%
D)	Covering of trays where ever envisaged	7%
	Total =	85%
7.1.2	Cable laying including Earth wires	
A)	Laying of cables/ wires	45%
B)	Glanding & Termination (Except HT Termination) & Testing	15%
C)	Charging of cables	10%
D)	Dressing and clamping of cables	15%
	Total =	85%
7.1.3	Junction box/ Push button station (local)	
A)	Erection including fixing of terminal blocks where ever applicable	75%
B)	Name plate fixing where ever applicable, Labelling (both inside and outside) and Commissioning of connected equipment	10%
	Total =	85%
7.1.4	Miscellaneous Structural steel including frames for Panels/ Racks/ Instruments, supports for cable tray/ pipes/ tubes, Canopies etc.	
A)	Fabrication/Pre assembly/Erection, Alignment, welding/bolting and if applicable chipping/grouting/painting	85%
	Total =	85%
7.1.5	DG sets/ Switch Gears/ MCC/ PCC/ Distribution Boards/ Marshalling Box/ Starter Units/ Dry Transformers/ Electrical Hoists/ Panels/ Cubicles/ Desks/ UPS/ Batteries/ Chargers/ VFD/ LA assy/ NGT/ NGR/ SP/ Miscellaneous Equipment/ Station lighting etc.	
A)	Placement, Alignment and coupling/interconnection where ever applicable, erection of associated accessories etc.	50%
B)	Pre-commissioning checks and tests	10%
C)	Charging, Loop testing and commissioning	15%
D)	Nomenclature/Name-plate/Painting etc	5%
E)	System commissioning	5%
	Total =	85%

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7.1.6	Earthing/ Lightning protection strips, Earthing pits/Rubber mat etc	
A)	Fabrication, erection, alignment, welding/ bolting of earthing/ lightning protection strips; earth pits completion/insulation	60%
B)	Testing/commissioning/Connection to equipment	25%
		Total = 85%
7.1.7	LT/ HT Bus Ducts	
A)	Pre assembly of Bus Ducts and accessories, erection, alignment, bolting/ welding etc. complete with supporting structure	50%
B)	Pre commissioning checks	20%
C)	Testing, Charging and Painting (as applicable)	15%
		Total = 85%
7.1.8	Oil Filled Transformers (Generator, Station, UAT, Station Service etc.)	
A)	Placement on foundation and alignment	25%
B)	Erection of associated auxiliaries/ assemblies, oil filling, etc.	25%
C)	Dry out including oil filtration	15%
D)	Pre-commissioning checks/Testing	10%
E)	Charging and Painting (as applicable)	10%
		Total = 85%
7.1.9	Testing/ Commissioning of Equipment (like motors, actuators, ESP transformer, misc. equipment, etc.) erected by other agencies	
A)	Testing & pre-commissioning checks	65%
B)	System commissioning	20%
		Total = 85%
7.1.9	HT Termination/Straight through Jointing Kits/Trefoil Clamps	
A)	Kit termination/Jointing/Clamping	50%
B)	Testing	20%
C)	Charging/checking	15%
		Total = 85%
7.1.10	NAS Filtration	
A)	Completion of NAS filtration	85%
		Total = 85%
7.1.11	Supply of consumables mentioned in BOQ for Package-B in Vendor Scope (For AHP, CHP, GHP & LHP Area only)	
A)	Supply of consumables mentioned in BOQ for Package-B in Vendor Scope (For AHP, CHP, GHP & LHP Area only)	51%
B)	Erection of consumables mentioned in BOQ for Package-B in Vendor Scope (For AHP, CHP, GHP & LHP Area only)	34%
		Total = 85%

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7.2 STAGE/ MILESTONE PAYMENTS (15%)		
a)	Boiler Light Up	1%
b)	Chemical Cleaning	1%
c)	Steam Blowing	1%
d)	Safety Valve Floating	1%
e)	Oil Flushing (TG)	1%
f)	Barring Gear (TG)	1%
g)	Rolling and Synchronisation (STG)	1%
h)	Coal Firing	1%
i)	Full Load	1%
j)	COD	1%
k)	Trial Operation	1%
l)	Punch List points/ pending points liquidation	1%
m)	Area cleaning, temporary structures cutting/ removal and return of scrap	1%
n)	Submission of 'As Built Drawings'	1%
o)	Material Reconciliation	1%
Total for Stage/ Milestone Payments (15%)		15%

7.3	Progressive Payment/ Final Payment: The payments for works under the scope of this contract for both the packages shall be as per clause no 2.6; 2.22; 2.23 of General Conditions of Contract and Volume-IB, Chapter-X of SCC.
7.3.1	<p>Documents required for RA Bill:</p> <p>GST Complied Invoice of the work done as per approved BBU.</p> <p>WAM -6 for RA Bill.</p> <p>Jointly signed Measurement sheet/ Protocols</p> <p>Power of Attorney before submission of Bill.</p> <p>Validity of Bank Guarantees as applicable under the contract.</p> <p>Monthly HSE Compliance Certificate certified by BHEL- Safety</p> <p>Material reconciliation statement along with RA Bill (Monthly basis).</p> <p>HR/IR compliance documents:</p> <ul style="list-style-type: none"> i. Wages payment sheet as per applicable minimum wages. ii. Proof of PF contribution submission. iii. Proof of ESI/ WC contribution submission

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	<p>iv. Proof of Bonus payment as per Bonus Act if applicable.</p> <p>v. Proof of EL payment if applicable.</p> <p>vi. Any other statutory document if applicable.</p>
7.3.2	<p>Documents required for Final Bill:</p> <p>The final bill is drawn as soon as the entire work is completed. From the final amount due, all amounts already claimed up to the previous running account bill will be deducted. It should be ensured that in the final bill the following additional particulars have been provided:</p> <ul style="list-style-type: none"> • Final Bill in WAM-7 Format. • 'No claim' certificate from the contractor. • Clearance certificates where ever applicable viz. Clearance Certificates from Customer, various Statutory Authorities like Labour department, PF Authorities, Commercial Tax Department etc. • Final Material re-conciliation statement duly approved by BHEL. • Indemnity Bond as per prescribed format. • Deviation statement showing the difference between the actuals and as per the contract. • Final Delay Analysis.
7.3.3	<p>The payment for running bills will be released after submission of running bill complete in all respects with all documents. It is the responsibility of the contractor to make his own arrangements for making timely payments towards labour wages, statutory payments, outstanding dues etc. and other dues in the meanwhile. No interest shall be payable for the delayed payment (if any).</p> <p>Few points of consideration are as below:</p> <ul style="list-style-type: none"> i. The measurements sheets of work done in a month shall be submitted in triplicate duly agreed/signed by BHEL Engineer. The contractor shall extend all necessary assistance for verification of measurements of works without any extra cost. ii. Material reconciliation shall be complied on monthly basis. iii. The RA bill payments are interim payments and bills shall be submitted in prescribed formats. iv. Recoveries on account of electricity, water, statutory deductions etc. shall be made as per terms of contract. v. BHEL will release payment through Electronic Fund Transfer (EFT)/RTGS. vi. Final bill shall be submitted after completion of works and upon material reconciliation along with all prescribed formats. <p>Quoted Rates are inclusive of all labour, contractor's equipment, temporary works, consumables and all matters and things of whatsoever nature, charges for Safety Aspects/Compliance to Safety Rules including operations and maintenance services (if applicable) etc., and other services, as identified in the tender Documents, as necessary for the proper execution of the subject work.</p>

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SECURED RECOVERABLE ADVANCES:

Interest Free Secured Mobilization Advance as per GCC Clause No. 2.13.1 will be payable under exceptional circumstances on certification of BHEL Construction Manager at Site. Interest Free Mobilization Advance shall be disbursed in specifically mentioned stages of major respective resource mobilization as specified hereunder:

1. For Mobilization of 01 no. of 10T-12T Trailer: 1% of Contract value of each package.
2. For Mobilization of 01 no. of Hydra / Farana of required capacity: 1% of Contract value of each package.
3. For Mobilization of required T&Ps: (Chain pulley blocks, Insulation Tester, Cutter & Drill M/c – minimum 2 nos each) at site to start the work: 1% of Contract value of each package.
4. For Mobilization of required manpower at site to start the work: 1% of Contract value of each package.
5. For Installation and Erection of Site Infrastructure by contractor i.e. site office, site stores, computer with printer, etc.: 1% of Contract value of each package.

Note:

1. BHEL Site-PD/CM shall be the deciding authority for assessing the admissibility of advance payment to contractor.
2. In case contractor do not fulfil the agreed conditions of payment of earlier mobilization advance, BHEL Project Director / Construction Manager will have the authority to not allow the subsequent mobilization advance to contractor.

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Chapter – VIII: Taxes & Duties

8.0	Taxes & Duties
8.1	<p>The contractor shall pay all (save the specific exclusions as enumerated in this clause) taxes, fees, license, charges, deposits, duties, tools, royalty, commissions, other charges, etc. which may be levied on the input goods & services consumed and output goods & services delivered in course of his operations in executing the contract. In case BHEL is forced to pay any of such taxes/duties, BHEL shall have the right to recover the same from his bills or otherwise as deemed fit.</p> <p>However, provisions regarding GST on output supply (goods/service) and TDS/TCS as per Income Tax Act shall be as per following clauses.</p>
8.2	GST (Goods and Services Tax)
8.2.1	GST as applicable on output supply (goods/services) are excluded from contractor's scope; therefore, contractor's price/rates shall be exclusive of GST. Reimbursement of GST is subject to compliance of following terms and conditions. BHEL shall have the right to deny payment of GST and to recover any loss to BHEL on account of tax, interest, penalty etc. for non-compliance of any of the following condition.
8.2.2	The admissibility of GST, taxes and duties referred in this chapter or elsewhere in the contract shall be limited to direct transactions between BHEL & its Contractor. BHEL shall not consider GST on any transaction other than the direct transaction between BHEL & its Contractor.
8.2.3	Contractor shall obtain prior written consent of BHEL before billing the amount towards such taxes. Where the GST laws permit more than one option or methodology for discharging the liability of tax/levy/duty, BHEL shall have the right to adopt the appropriate one considering the amount of tax liability on BHEL/Client as well as procedural simplicity with regard to assessment of the liability. The option chosen by BHEL shall be binding on the Contractor for discharging the obligation of BHEL in respect of the tax liability to the Contractor.
8.2.4	Contractor has to submit GST registration certificate of the concerned state. Contractor also needs to ensure that the submitted GST registration certificate should be in active status during the entire contract period.
8.2.5	Contractor/Vendor has to issue Invoice/Debit Note/Credit Note indicating HSN/SAC code, Description, Value, Rate, applicable tax and other particulars in compliance with the provisions of relevant GST Act and Rules made thereunder.
8.2.6	Vendor has to submit GST compliant invoice within the due date of invoice as per GST Law. In case of delay, BHEL reserves the right of denial of GST payment if there occurs any hardship to BHEL in claiming the input thereof. In case of goods, vendor has to provide scan copy of invoice & GR/LR/RR to BHEL before movement of goods starts to enable BHEL to meet its GST related compliances. Special care should be taken in case of month end transactions.

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Chapter – VIII: Taxes & Duties

8.2.7	Vendor has to ensure that invoice in respect of such services which have been provided/completed on or before end of the month should not bear the date later than last working day of the month in which services are performed.
8.2.8	Subject to other provisions of the contract, GST amount claimed in the invoice shall be released on fulfilment of all the following conditions by the Contractor: - <ol style="list-style-type: none">I. Supply of goods and/or services have been received by BHEL.II. Original Tax Invoice has been submitted to BHEL.III. Contractor/ Vendor has submitted all the documents required for processing of bill as per contract/ purchase order/ work order.IV. In cases where e-invoicing provision is applicable, vendor/contractor is required to submit invoice in compliance with e-invoicing provisions of GST Act and Rules made thereunder.V. Contractor has filed all the relevant GST return (e.g. GSTR-1, GSTR-3B, etc.) pertaining to the invoice submitted and submit the proof of such return along with immediate subsequent invoice. In case of final invoice/ bill, contractor has to submit proof of such return within fifteen days from the due date of relevant return.VI. Respective invoice has appeared in BHEL's GSTR - 2A for the month corresponding to the month of invoice and in GSTR-2B of the month in which such invoices has been reported by the contractor along with status of ITC availability as "YES" in GSTR-2B. Alternatively, BG of appropriate value may be furnished which shall be valid at least one month beyond the due date of confirmation of relevant payment of GST on GSTN portal or sufficient security is available to adjust the financial impact in case of any default by the contractor.VII. Contractor has to submit an undertaking confirming the payment of all due GST in respect of invoices pertaining to BHEL.
8.2.9	Any financial loss arises to BHEL on account of failure or delay in submission of any document as per contract/purchase order/work order at the time of submission of Tax invoice to BHEL, shall be deducted from contractor's bill or otherwise as deemed fit.
8.2.10	TDS as applicable under GST law shall be deducted from contractor's bill.
8.2.11	Contractor shall comply with the provisions of e-way bill wherever applicable. Further wherever provisions of GST Act permit, all the e-way bills, road permits etc. required for transportation of goods needs to be arranged by the contractor.
8.2.12	Contractor shall be solely responsible for discharging his GST liability according to the provisions of GST Law and BHEL will not entertain any claim of GST/interest/penalty or any other liability on account of failure of contractor in complying the provisions of GST Law or discharging the GST liability in a manner laid down thereunder.

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Chapter – VIII: Taxes & Duties

8.2.13	In case declaration of any invoice is delayed by the vendor in his GST return or any invoice is subsequently amended/altered/deleted on GSTN portal which results in any adverse financial implication on BHEL, the financial impact thereof including interest/penalty shall be recovered from the Contactor's due payment.
8.2.14	Any denial of input credit to BHEL or arising of any tax liability on BHEL due to non-compliance of GST Law by the Contractor in any manner, will be recovered along with liability on account of interest and penalty (if any) from the payments due to the Contactor.
8.2.15	In the event of any ambiguity in GST law with respect to availability of input credit of GST charged on the invoice raised by the contractor or with respect to any other matter having impact on BHEL, BHEL's decision shall be final and binding on the contractor.
8.2.16	<p><u>Variation in Taxes & Duties:</u></p> <p>Any upward variation in GST shall be considered for reimbursement provided supply of goods and services are made within schedule date stipulated in the contract or approved extended schedule for the reason solely attributable to BHEL. However downward variation shall be subject to adjustment as per actual GST applicability.</p> <p>In case the Government imposes any new levy/tax on the output service/goods after price bid opening, the same shall be reimbursed by BHEL at actual. The reimbursement under this clause is restricted to the direct transaction between BHEL and its contractor only and within the contractual delivery period only.</p> <p>In case any new tax/levy/duty etc. becomes applicable after the date of Bidder's offer but before opening of the price Bid, the Bidder/Contractor must convey its impact on his price duly substantiated by documentary evidence in support of the same before opening of price bid. Claim for any such impact after opening the price bid will not be considered by BHEL for reimbursement of tax or reassessment of offer.</p>
8.3	<p><u>Income Tax:</u></p> <p>TDS/TCS as applicable under Income Tax Act, 1961 or rules made thereunder shall be deducted/collected from contractor's bill.</p>

8.4 BOCW Act & Cess Act

8.4.1 BOCW Cess is not to be borne by contractor. Refer Annexure-I for BOCW Act & Cess Act.

Annexure-I:

Bidder may please note that the sub-contractor/bidder of BHEL engaging building or construction worker in connection with building or other construction work, are required to follow the procedures enumerated below:

1. It shall be the sole responsibility of the contractor as employer to ensure compliance of all the statutory obligations under the Building and other Construction Workers' (Regulation of Employment and Conditions of

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	Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder.
2.	It shall be sole responsibility of the contractor engaging Building Workers in connection with the building or other construction works in the capacity of employer to apply and obtain registration certificate specifying the scope of work under the relevant provisions of the Building and Other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 from the appropriate Authorities.
3.	It shall be responsibility of the contractor to furnish a copy of such Registration Certificate within a period of one month from the date of commencement of Work.
4.	It is responsibility of the contractor to register under the Building and other Construction Workers' Welfare Cess Act, 1996 and deposit the required Cess for the purposes of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 at such rate as the Central Government may, by notification in the Official Gazette, from time to time specify. However, before registering and deposit of Cess under the Building and other Construction Workers' Welfare Cess Act, 1996, the contractor will seek written prior approval from the Construction Manager.
5.	It shall be sole responsibility of the contractor as employer to get registered every Building Worker, who is between the age of 18 to 60 years of age and who has been engaged in any building or other construction work for not less than ninety days during the preceding twelve months as Beneficiary under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996.
6.	It shall be sole responsibility of the contractor as employer to maintain all the registers, records, notices and submit returns under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder.
7.	It shall be sole responsibility of the contractor as employer to provide notice of poisoning or occupation notifiable diseases, to report of accident and dangerous occurrences to the concerned authorities under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the rules made thereunder and to make payment of all statutory payments & compensation under the Employees' Compensation Act, 1923.

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8.	<p>It shall be the responsibility of the sub-contractor as employer to make payment/deposit of applicable cess amount on the extent of work involving building or construction workers engaged by the sub-contractor within a period of one month from the receipt of payment. It shall also be responsibility of the Contractor to furnish BHEL on monthly basis, Receipts/ Challans towards Deposit of the Cess under the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder along with following statistics:</p> <ol style="list-style-type: none">1. Number of Building Workers employed during preceding one month.2. Number of Building workers registered as Beneficiary during preceding one month.3. Disbursement of Wages made to the Building Workers for preceding wage month.4. Remittance of Contribution of Beneficiaries made during the preceding month
9.	<p>BHEL shall reimburse the contractor the Cess amount deposited for the purposes of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 under the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder. However, BHEL shall not reimburse the Fee paid towards the registration of establishment, fees paid towards registration of Beneficiaries and Contribution of Beneficiaries remitted.</p>
10.	<p>It shall be responsibility of the Building Worker engaged by the Contractor and registered as a beneficiary under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 to contribute to the Fund at such rate per mensem as may be specified by the State government by notification in the Official Gazette. Where such beneficiary authorizes the contractor being his employer to deduct his contribution from his monthly wages and to remit the same, the contractor shall remit such contribution to the Building and other construction Workers' Welfare Board in such manner as may be directed by the Board , within the fifteen days from such deduction.</p>
11.	<p>Bidders may please note that though the quoted price is exclusive of BOCW (which will be reimbursed by BHEL as per sub-clause 9 above) , however, If at any point of time during the contract period, non-compliance of the provisions of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder is observed, BHEL reserves the right to deduct the applicable cess (1%) on the contract value and penalty (if any, imposed by Cess Authorities) from the payables on account of non-compliance.</p>
12.	<p>The contractor shall declare to undertake any liability or claim arising out of employment of building workers and shall indemnify BHEL from all consequences / liabilities / penalties in case of non-compliance of the provisions of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder.</p>

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9.0	General Conditions
9.1	BRIEF SCOPE OF WORK
i.	Intent of this tender is to provide services for execution of work according to most modern & proven techniques & codes. Omission of specific reference to any method, equipment or material necessary for proper & efficient services towards installation of the equipment shall not relieve successful bidder of the responsibility of providing such services/ facilities to complete the work or portion of work awarded to him. Accepted rates/ price shall deem to be inclusive of all such contingencies.
ii.	It is not the intent of this tender to specify herein all the details of erection, commissioning, etc. However, the system shall conform in all respects to high standards of quality & workmanship for performing the required duties in a manner acceptable to BHEL/ purchaser who will interpret the meaning of drawings, specifications and shall be entitled to reject any work or material, which in his judgments is not in full accordance herewith.
iii.	Omission of specific reference to any method, equipment or material necessary for proper & efficient working of the plant shall not relieve successful bidder of the responsibility of providing such facilities to complete the work at accepted rates. Any mismatch/ defect found due to mistake in work shall have to be rectified by successful bidder free of cost. Inspection by BHEL/ customer does not relieve successful bidder of responsibility of executing quality erection.
iv.	<p>Following shall be the responsibility of successful bidder and have to be provided within accepted rates/ prices.</p> <ul style="list-style-type: none"> • Provision as required of all types of labour, supervisors, engineers, watch & ward, tools & tackles, calibrated MMD as specified and otherwise required for the work, consumables for erection, testing, commissioning, etc including handling. • Proper out-turn as per BHEL plan and commitment. • Completion of work as per BHEL/ project schedule. • Good quality and accurate workmanship for proper performance of equipment. • Repair and rectification. • Preservation/ re-conservation of all components during storage, erection, commissioning till handing over. • Dismantling, removal of debris, leveling etc of all temporary buildings, structures, pipelines, cables, etc as per instruction of BHEL/ customer on completion of work. If successful bidder fails to do so, BHEL will get the job done through other agency and the cost along with applicable overhead will be recovered from successful bidder. Decision of BHEL in this regard shall be final & binding on successful bidder. However, the scope of dismantling & leveling the area is limited only to successful bidder's site office, yard, other spaces occupied by successful bidder.
v.	BHEL - Power Sector (WR) is ISO 9001-2008 certified company. Quality of work, to customer's satisfaction and as per system requirements are the essence of ISO:9001-2008 certification. The bidder in all respects will organise his work, systems, environment, process control documentation, T&Ps, measuring and monitoring devices (MMDs) etc as per instructions of BHEL engineer.
vi.	Successful bidder shall comply with HSE (Health, Safety & Environment) requirements of BHEL and follow all applicable Operational Control Procedures (OCPs) within quoted rate/ price.
vii.	Successful bidder shall construct closed/ semi closed/ open stores shed for proper storage of items received by them without extra cost.
viii.	Successful bidder should use fire proof tarpaulin only to cover any material either in open or at a covered area.

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ix.	Successful bidder should deploy portable fire extinguishers of required number in his office, stores and work areas.
x.	Earthing of equipment including instruments is also included under his scope.
xi.	Successful bidder shall take the full responsibility of testing, pre-commissioning and commissioning of the equipment being installed by him or installed by others but being commissioned by him under the overall supervision of BHEL. It shall be the responsibility of successful bidder to arrange all the testing/ measuring instruments and complete all testing, pre-commissioning, commissioning activities for the particular equipment as per relevant standards, code of practice, manufacturer's instructions, applicable quality plans for installation, testing, commissioning and BHEL norms. All these will be witnessed by BHEL/ representative of BHEL/ customer and reports signed jointly. Successful bidder shall submit a check list to BHEL prior to taking up testing, commissioning activities which shall be approved by BHEL and the activities shall be carried out in accordance with the check list.
xii.	Successful bidder has to arrange all safety appliances required during acid filling/ charging of battery and other items like sp gravity meter, thermometer, jerry cans, funnels, etc. Resistance box with all interconnecting cables, PVC drums for water loads, etc of suitable rating/ capacity for carrying out capacity/ discharge test of batteries shall be arranged. Also, maintenance of battery parameters, after commissioning till handing over to owner shall be carried out.
xiii.	Rotation of motor terminal boxes and minor modification to suit cable termination, if required shall be carried out at no extra cost.
xiv.	For soot blowers, valves and dampers, operated through associated MCCs, entire commissioning including setting of limit/ torque switch and position feedback unit, electrical control gear of actuators of MOVs & damper, changing of actuator components such as cards, transformer etc. is included in the scope of successful bidder.
xv.	Before starting erection job, successful bidder shall ensure that the area is sufficiently cleaned against ingress of dust & water, and all debris are cleared off from the floor to a designated area as per instruction of BHEL. Successful bidder shall arrange to get the working area and surroundings cleaned daily to ensure a dust free atmosphere for working.
xvi.	The accuracy of all equipment, instruments and their functioning shall be established before they are permitted for use on the job. If the engineer doubts the accuracy of the precision tools any time during erection, successful bidder shall arrange the checking of tools/ equipment/ instruments at his cost.
xvii.	Foundations for all equipment shall be provided by BHEL. Dimensions & locations of foundations, pockets, anchor bolt shall be checked by successful bidder for their correctness as per drawings/ documents. Further, top elevation of foundations shall be checked with respect to bench marks, etc. All minor adjustments of foundation level, dressing and chipping of foundation surfaces up to 50 mm, enlarging the pockets in foundations, etc as may be required for erection of equipment/ plants shall be carried out by successful bidder within the accepted rates/ price.
xviii.	While on the job, care is essential to avoid too much chipping and resultant lowering of level. In case of excess chipping successful bidder has to arrange additional packing plates as per requirements provided it is allowed by BHEL engineer. When required by manufacturers, the embedded sub-sole plates shall be scraped and checked with Prussian blue to get the required contact with frames.
xix.	Successful bidder shall ensure perfect matching of packer plates including scraping and blue matching with foundation by dressing the foundation, as well as perfect matching between packer plates and base plate of equipment to the satisfaction of BHEL engineer.
xx.	All civil works, viz grouting/ excavation/ casting of foundation anchor points for derricks, winches, guy ropes, fastening, etc and foundations required for any other temporary supports/ works, as required for safe &

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	efficient operation of tools & tackles, shall be successful bidder's responsibility. For these civil works all materials excluding normal cement and required facilities will have to be arranged by successful bidder at their own cost.
xxi.	All minor civil works for main equipments including drilling, chipping, enlarging cutouts, foundation pockets, cable cut outs, etc will have to be carried out by successful bidder at no extra cost. Grouting of equipments erected by successful bidder as per procedure is included in the scope. Materials like special cement, sand aggregates, etc including shuttering, curing, etc shall be arranged without any extra cost.
xxii.	All other points shall be as per the terms & conditions and specification along with aforesaid references together with amendments incorporated thereto.
9.2	<p>SITE VISIT</p> <p>Bidder should visit site and acquire full knowledge & information about site conditions. The bidder must visit site, to acquaint themselves with the conditions prevailing at site and in & around the plant premises, together with all statutory, obligatory, mandatory requirements of various authorities before submission of bid.</p>
9.3	<p>DEVIATION/CLARIFICATION</p> <p>Normally no deviation with respect to tender is acceptable to BHEL. However, in case of unavoidable circumstances, the bidder may submit their query for seeking clarifications of BHEL as per modality stipulated in NIT or may submit the same along with offer as per prescribed schedule/ format without any ambiguity. Any assumptions, presumptions, deviations etc. indicated or implied anywhere by the bidder except those indicated in the deviation schedule/ format will not be recognized and will not form a part of consideration / offer. In the absence of such filled-up schedule/ format it will be understood and agreed that the bidder's offer is based on strict conformance to the specification and no negotiation would be allowed in this regard. BHEL reserve the right not to recognize any / all deviations submitted after opening of the bid.</p>
9.4	<p>DEWATERING</p> <p>Successful bidder shall ensure at all times that their work area & approach/ access roads are free from accumulation of water, so that the materials are safe and the erection/ progress schedule are not affected. No separate claim in this regard shall be admitted by BHEL. No separate payments for dewatering of subsoil, surface water or catchments water, if required, at any time during execution of the work including monsoon period shall be considered by BHEL. All dewatering pumps including high capacity pumps and diesel engine driven pumps are to be provided by successful bidder within finally accepted rates.</p>
9.5	<p>GENERAL TECHNICAL REQUIREMENT (CODES AND STANDARDS)</p> <ol style="list-style-type: none"> i. The work must be performed according to the most recent relevant codes, standards, accident prevention regulations and local rules and legal regulations. ii. All materials and equipment supplied and all work carried out as well as calculation sheets, drawings, quality and class of goods, methods of inspection, specific design features of equipment and parts and acceptances of partial plants shall comply in every respect with the applicable standards, codes and regulations to be chosen from the following: iii. It is contractor's responsibility to provide sufficient evidence that any national or other standard the Contractor proposes (other than those mentioned above) will ensure an equivalent or higher standard. iv. Except where otherwise specified, the plant/equipment shall comply with the appropriate agreed internationally accepted Standard Specification as mentioned elsewhere in contract specifications, each incorporating the latest revisions at the time of tendering. Where no internationally accepted standard is applicable, the Successful bidder shall give all particulars and details as necessary; to enable BHEL to identify all of the plant/equipment in the same detail as would be possible had there been a Standard Specification.

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v.	Where the Successful bidder proposes alternative codes or standards he shall include in his tender one copy (in English) of each Standard Specification to which materials offered shall comply. In such case, the adopted alternative standard shall be equivalent or superior to the standards mentioned in the specification.
vi.	In case bidder proposes any IS code, it shall be verified by reputed institutions like IIT that the proposed code is equivalent or superior to the codes mentioned above. Comparison report shall be established and provided to BHEL/Owner for information. Such report shall highlight the main items of the code, including material composition, material properties, design clauses and others as required. Report shall identify deviations of both codes and give justification for this deviation.
vii.	The bidder shall ensure that design will consider material properties as per approved code.
viii.	In the event of any conflict between the codes & standards referred above, and requirements of this specification, the requirements which are more stringent shall govern.
ix.	Wherever specified or required the plant/equipment shall conform to various applicable statutory regulations at Odisha. Wherever required, obtaining approval for plant/ equipment supplied under the specification from statutory authorities shall be the responsibility of the successful bidder.
9.6	<p>GENERAL SERVICES TO BE RENDERED BY BIDDER</p> <p>Services for construction, fabrication, erection, testing, trial run, commissioning/ completion of various equipment & accessories/ items under the contract shall include but not be limited to the following.</p> <ul style="list-style-type: none"> i. Collecting materials from store/open yard from time to time for fabrication/ erection as per construction program and unloading as per flow of consignment. Successful bidder shall be custodian of all materials issued till the plant/ equipment is officially taken over by BHEL/ customer after complete erection, commissioning/ completion. Successful bidder shall maintain adequate security personnel and security measures for proper precaution and safety of material. ii. Trial run, commissioning of individual equipment/ sub-systems to the satisfaction of BHEL/ BHEL's advisor/ owner. iii. Deployment of all skilled & unskilled manpower required for erection supervision, watch & ward, commissioning/ completion and other services to be rendered under this tender. iv. Deployment of all erection tools & tackle, construction machinery, transportation vehicles and all other implements in adequate number and size, appropriate for erection work to be handled under scope of this tender except otherwise specified. v. Supply of all consumables, eg welding electrodes, gases for gas cutting job, etc as well as materials required for temporary supports, scaffolding etc as necessary for such construction work, unless specified otherwise. vi. Providing support services for successful bidder's erection staff eg construction of site offices, temporary stores, residential accommodation and transport to work site for erection personnel, watch and ward for security and safety of the materials under successful bidder's custody etc, as required. vii. Maintaining proper documentation of all site activities undertaken by successful bidder as per proforma, mutually agreed with BHEL, submitting monthly progress reports as also any such document as & when desired by BHEL/ customer, taking approval of all statutory authorities eg, Electrical Inspector, Factory Inspector, Provident Fund authority etc. for respective portions of work under the jurisdiction of such statutes of laws. viii. All the materials issued to the bidder by BHEL shall be reconciled by the bidder and the unused materials have to be returned back to BHEL stores/ yard or any other place as specified by BHEL. A material reconciliation statement showing the details of materials issue/return duly signed by BHEL engineer shall have to be submitted by the bidder. ix. As part of overall project management activity, successful bidder shall be responsible for proper co-ordination of erection activities during various phases of execution of the contract. Successful bidder shall identify a

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	person designated as Site Incharge, with whom BHEL shall interact on matters related to execution of the contract. The Site Incharge shall be the single point contact person on behalf of successful bidder. BHEL shall interact with the Site Incharge only on all matters on co-ordination between BHEL and successful bidder. For timely completion of work successful bidder may have to work in one or more shifts. He will not be eligible for any extra charge on this account.
x.	Successful bidder shall confine all their field operations to those works which can be performed without subjecting the equipment and materials to adverse effects, during inclement weather conditions, like monsoon, storms, etc and during other unfavourable construction conditions. No field activities shall be performed by successful bidder under conditions which might adversely affect quality & efficiency thereof, unless special precautions or measures are taken by successful bidder in proper & satisfactory manner in performance of such works and with concurrence of BHEL. Such unfavourable construction conditions in no way relieve successful bidder of their responsibility to perform work as per schedule.
xi.	Successful bidder shall supply all skilled workmen like mill-wright fitters, welders, gas cutters, electricians, riggers, sarangs, erectors, carpenters, pipe fitters, masons, liggers, tin-smiths, instrument technicians/mechanics etc, as required, in addition to other skilled, semi-skilled and unskilled workmen required for all works of handling, transportation from site store to erection site {from inside or outside plant boundary (Approx 3 km away)}, erection, testing, commissioning/ completion contemplated under this tender. Only fully trained and competent men with previous experience on the job shall be employed. They shall hold valid certificates wherever necessary. BHEL reserve the right to decide on suitability of workers and other personnel who will be employed by successful bidder. BHEL reserves the right to insist on removal of any employee of successful bidder at any time, if found unsuitable and successful bidder shall forthwith remove him.
xii.	Supervisory staff employed by successful bidder shall be technically qualified and experienced in the area of work. They shall ensure proper out turn of work and discipline on the part of labour put on the job by successful bidder and in general see that the works are carried out in a safe & proper manner and in coordination with other labour and staff employed directly by BHEL or other successful bidders of BHEL and BHEL's client.
xiii.	Successful bidder shall also furnish daily labour report showing by classification the number of employees engaged in various categories of work a progress report of work as required by BHEL.
xiv.	The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. Successful bidder and their personnel shall co-operate with other personnel, and other successful bidders, co-ordinating their work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.
xv.	Successful bidder's supervisory staff shall execute the work in the most substantial & workman like manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. Successful bidder shall be responsible to ensure that assembly and workmanship conform to the dimensions and tolerance given in the drawing/ instruction given by BHEL from time to time.
xvi.	It is the responsibility of successful bidder to engage their workman in shifts or on overtime basis for achieving target set by BHEL during erection, commissioning/ completion, testing. Bidder's quoted rate shall include all these contingencies.
xvii.	Any other service, although not specifically called for but required for a contract of the size and nature indicated in the tender.
xviii.	After completion of commissioning activity of equipment/ systems, successful bidder shall prepare test reports/protocols which shall include all relevant information related to various commissioning checks, tests carried out, any deviations/ commissioning noticed wrt intended design requirements, sequence of various

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	commissioning activities as actually adopted vis-à-vis as recommended in the procedures, program schedule achieved and any other such information as required .These test reports/protocols shall be submitted in requisite number of copies to BHEL/ BHEL's advisor/ owner during the commissioning activities.
9.7	PROTECTION
i.	Equipment having anti-friction or sleeve bearings shall be protected by weather tight enclosures. Coated surfaces shall be protected against impact, abrasion, discoloration and other damages. Surfaces which are damaged shall be repainted.
ii.	Electrical equipments, controls and insulations shall be protected against moisture and water damages. All external gasket surfaces and flange faces, couplings, rotating equipment shafts, bearings and like items shall be thoroughly cleaned and coated with rust preventive compound and protected with suitable wood, metal or other substantial type covering to ensure their full protection. All exposed threaded parts shall be greased & protected with metallic or other substantial type protectors
iii.	All piping, tubing and conduit connections on equipment and equipment openings shall be closed with rough usage covers or plugs. Female threaded openings shall be closed with rough usage covers or plugs or forged steel plugs. The closures shall be taped to seal the interior of the equipment. Open ends of piping, tubing and conduit shall be sealed and taped.
iv.	All other consumables including wire brush, emery papers, painting brush, CRC, petrol/diesel for cleaning etc to be supplied by successful bidder within accepted rate.
9.8	GENERAL GUIDELINES FOR FIELD ACTIVITIES
i.	Successful bidder shall execute the works in a professional manner so as to achieve the target schedule without any sacrifice on quality and maintaining highest standards of safety and cleanliness.
ii.	Successful bidder shall co-operate with BHEL/ owner and other successful bidders working in site and arrange to perform their work in a manner so as to minimise interference with other successful bidder's works. BHEL shall be notified promptly of any defect in other successful bidders' works that could affect successful bidder's work. If rescheduling of successful bidder's work is requested by BHEL/ customer in the interest of overall site activities, the same shall be compiled with by successful bidder. In all cases of controversy, the decision of BHEL shall be final & binding on successful bidder without any commercial implication.
iii.	BHEL shall hold weekly meeting of all successful bidders working at site at a time and a place to be designated by the engineer. Successful bidder shall attend such meetings and take notes of discussions during the meeting and the decisions of BHEL and shall strictly adhere to those decisions in performing this work. In addition to weekly meeting, BHEL may call for other meetings either with individual successful bidders or with selected number of successful bidders and in such a case successful bidder, if called will also attend such meetings.
iv.	Time is the essence of the contract and successful bidder shall be responsible for performance of their work in accordance with the specified completion period and construction schedule. If at any time successful bidder fall behind schedule, they shall take necessary action to recover such delays by increasing their workforce and T&Ps to comply with the time/ schedule and shall communicate such action in writing to BHEL, satisfying that their action will compensate for the delay. Successful bidder shall not be allowed any extra compensation for such action.
v.	BHEL shall however not be responsible for provision of additional labour and or materials or supply of any other services to successful bidder except for the co-ordination work between various agencies' as set out earlier.
vi.	The works under execution shall be open to inspection & supervision by BHEL/ customer at all times. Successful bidder shall give reasonable notice to BHEL before covering up or otherwise placing beyond the reach of inspection any work, in order that same may be verified, if so desired by BHEL/ customer.

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vii.	Every effort shall be made to maintain the highest quality of workmanship by stringent supervision and inspection at every stage of execution. Manufacturer's instruction manual and guidelines on sequence of erection and precautions shall be strictly followed. Should any error or ambiguity be discovered in such documents the same shall be brought to the notice of BHEL. Manufacturer's interpretation in such cases shall be binding on successful bidder.
viii.	Successful bidder shall comply with all the rules & regulations of local authorities, all statutory laws including Minimum Wages, Workmen Compensation etc. All registration and statutory inspection fees, if any, in respect of the work executed by successful bidder shall be to their account.
ix.	All the works such as cleaning, checking, levelling, aligning, assembling, temporary erection for alignment, opening, dismantling of certain equipment for checking & cleaning, surface preparation, edge preparation, as per general engineering practice at site, cutting, grinding, straightening, bolting/ welding, etc as may be applicable in such erection and necessary to complete the work satisfactorily, are to be treated as incidental and the same shall be carried out by successful bidder as part of the work.
x.	It is the responsibility of successful bidder to do the alignment etc if necessary, repeatedly to satisfy engineer, with all the necessary tools & tackles, manpower etc. The alignment will be complete only when jointly certified so, by successful bidder's engineer and BHEL. Also successful bidder should ensure that the alignment is not disturbed afterwards.
xi.	Equipment and material, in case wrongly installed, shall be removed and reinstalled to comply with the design requirement at successful bidder expense, to the satisfaction of BHEL/ customer.
xii.	After identification of erection materials by BHEL at BHEL's store/ storage yard, it shall be the responsibility of successful bidder to take delivery of materials from BHEL's store/ storage yard by successful bidder's own manpower and re-stack the leftover materials as per erection sequence at BHEL store at their own cost. The entire activities are to be carried out under supervision of BHEL.
xiii.	In case of successful bidder's failure to meet any of the aforesaid requirements, BHEL will get the same done and cost towards this, along with BHEL's applicable overhead will be recovered from successful bidder's RA bill.
9.9	QUALITY CONTROL & QUALITY ASSURANCE
i.	INSPECTION & FIELD QUALITY ASSURANCE
ii.	Contractor shall carry out all activities conforming to the approved Field Quality Plan (FQP) & technical instructions as revised from time to time. 'Total Quality' shall be the watchword of the work and contractor shall strive to achieve the quality standards, procedures laid down by BHEL. He shall follow all the instructions as per BHEL drawings and quality standards. Contractor shall provide the services of quality assurance engineer as per the relevant clauses.
iii.	Preparation of quality assurance log sheets and protocols with customer / consultants / statutory authority, welding logs, NDE records, testing & calibration records and other quality control and quality assurance documentation as per BHEL engineer's instructions, is within the scope of work / specification. These records shall be submitted to BHEL / customer for approval from time to time.
iv.	The protocols between contractor and customer / BHEL shall be made for correctness of foundations, materials, procedures, at each stage of installation, generally as per the requirement of customer / BHEL. This is necessary to ensure elimination of errors and to avoid accumulation and multiplication of errors.
v.	A daily log book (with proper indexing) should be maintained by every supervisor / engineer of contractor, for respective area of work, on the job for detailing and incorporating alignment/ clearance / centering / levelling readings and inspection details of various equipment, etc. This log book shall be always accessible to BHEL engineers.

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	<p>High pressure welding (as applicable under the scope of this contract) details like serial number of weld joints, welders name, date of welding, details of repair, heat treatment etc. will be documented in welding log as per BHEL Engineer's instructions. Record of radiography (as applicable under the scope of this contract) containing details like serial number of weld joints, date of radiography, repairs, if any, re-shots etc shall also be maintained as per BHEL Engineer's instructions.</p> <p>Record of heat treatments (as applicable under the scope of this contract) performed shall be maintained as prescribed by BHEL.</p>
vi.	The performance of welders (as applicable under the scope of this contract) will be reviewed from time to time as per the BHEL standards. Welders' performance record shall be furnished periodically for scrutiny of BHEL's Engineer. Corrective action as informed by BHEL shall be taken in respect of those welders not conforming to these standards. This may include removal/ discontinuance of concerned welder(s). Contractor shall arrange for the alternate welders immediately.
vii.	Only welders duly authorized by BHEL / customer / consultant after welder qualification test as per ASME Sec-Ix / AWS D1.1 (as applicable) shall be engaged on the work. All the welders shall carry identity cards as per the proforma prescribed by BHEL / Customer / Consultant.
viii.	Any re-laying or re-termination of cables / re-erection of instruments / recalibration of instruments etc. required due to contractor's mistake and found at any stage inspection, shall be carried out by the contractor at no extra cost. Repair / rectification procedure to be adopted to make any job acceptable shall be subject to the approval of BHEL.
ix.	Weekly Quality Review Meeting at site shall be organised by BHEL to discuss quality issues and next weeks' inspection plans. Site in-charge of the contractor along with QAEs of the contractor must be present in the meeting with closure report of the issues raised by BHEL in the previous meetings.
9.10	REQUIREMENT OF ISO 9001
i.	<p>The basic philosophy of the Quality Management System under ISO 9001 is to define the organizational responsibility, work as per documented procedures, verify the output with respect to acceptance norms, identify the non-conforming product / procedure and take corrective action for removal of non-conformance specifying the steps for avoiding recurrence of such non-conformities, & maintain the relevant quality records. The non-conformities are to be identified through the conduct of periodical audit of implementation of quality systems at various locations/stages of work. Suppliers / vendors of various products / services contributing in the work are also considered as part of the quality management system.</p> <p>As such the contractor is expected not only to conform to the quality management system of BHEL but also it is desirable that they themselves are accredited under any quality management system standard.</p>
ii.	BHEL reserves the right to carry out quarterly quality audits and quality surveillance of the systems and procedures of contractor's quality management. Contractor shall provide all necessary assistance to enable BHEL to carry out such audit & surveillance.
iii.	Quality audits / approval of the results of test & inspection will not prejudice the right of BHEL to reject an equipment service not giving desired performance and shall not in no way limit the liabilities and responsibilities of the contractor in earning satisfactory performances of equipment / service as per specification.
9.11	INSPECTION BY TS / FES / QA ENGINEERS OF BHEL UNITS / ENGINEERING CENTRES
i.	Apart from day-to-day inspection by BHEL Engineers stationed at Site and Customer's Engineers, stage inspection of equipment under erection and commissioning at various stages may also be conducted by teams of Engineers from Field Engineering Services of BHEL's Manufacturing Units, Quality Assurance teams from Field Quality Assurance, Unit/Factory Quality Assurance and Commissioning Engineers from

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	Technical Services etc. Contractor shall arrange all labour, tools and tackles etc along with proper access for such stage inspections freeof cost.
ii.	Any modifications suggested by BHEL FES and QA Engineers' team shall be carried out. Claims of contractor, if any, shall be dealt as per applicable clause of the contract, and provided such modifications have not arisen for reasons attributable to the contractor.
9.12	<p>CONFORMANCE TO THE STATUTORY REQUIREMENTS (AS APPLICABLE UNDER THE SCOPE OF THE CONTRACT)</p> <p>The work to be executed under these specifications has to be offered for inspection, at appropriate stages of work completion, to various statutory authorities for compliance with applicable regulations. The work-related statutory inspections, though not limited to, are as under:</p> <p>1) Electrical Inspector 2) Factory Inspector, Labour Commissioner, PF Commissioner and other authorities connected to this project work.</p> <p>The scope includes getting the approvals from the statutory authorities, which includes arranging for inspection visits of statutory authority periodically as per BHEL Engineer's instructions, arranging materials for ground inspection and following up the matter with them. Contractor shall also make all arrangements for offering the Products / Systems for inspection at location, as applicable, to the concerned authority.</p> <p>Bidder to obtain, Statutory clearance w.r.t. Registering, Applying and Submission of Drawing & Testing documents to Electrical Inspector in hard copies for the Electrical Equipments of AHP & CHP System (including Stacker & Reclaimer Transformer) as applicable.</p> <p>Also, Bidder to obtain, Statutory Clearance-Field Inspection and Obtaining Inspector clearance, Inspector Fee, obtaining CEA clearance certificate etc for the Electrical Equipments of AHP & CHP System (including Stacker & Reclaimer Transformer) as applicable.</p>
9.13	<p>HEALTH, SAFETY & ENVIRONMENT</p> <p>i. HSE shall be guided by a separate volume (DOCUMENT NO HSEP:14 Rev-02, Talcher Project, dated 22.11.22), over and above the below mentioned terms and conditions.</p> <p>ii. Round the clock experienced paramedical personnel with first aid facility & ambulance including driver, fuel, etc., at site, shall be arranged by BHEL through other sub-contractors at site. However, expenditure towards above facilities shall be shared by BHEL's sub-contractors working at site (actual cost distribution amongst all successful bidders shall be on pro rata basis proportionate to their contract prices). In case of any dispute, Construction Manager decisions in this regard shall be binding.</p>
9.14	<p>CIVIL WORKS, FOUNDATIONS AND GROUTING</p> <p>i. Foundations for all equipment shall be provided by BHEL. The dimensions & locations of the foundations, pockets, anchor bolt shall be checked by successful bidder for their correctness as per drawings. Further, top elevation of foundations shall be checked with respect to bench marks, etc. All minor adjustments of foundation level, dressing & chipping of foundation surfaces up to 50 mm, enlarging the pockets in foundations, etc as may be required for erection of equipment/ plants shall be carried out by successful bidder within accepted rates/ price.</p> <p>ii. While on the job, care is essential to avoid too much chipping and resultant lowering of level. In case of excess chipping, successful bidder has to arrange additional packing plates as per requirements provided it is allowed by BHEL.</p>

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iii.	Successful bidder shall ensure perfect matching of packer plates including scraping & blue matching with foundation by dressing foundation, as well as perfect matching between packer plates & base plate of equipment to BHEL's satisfaction.
iv.	All civil works, viz grouting/ excavation/ casting of foundation anchor points for derricks, winches, guy ropes, fastening, etc and foundations required for any other temporary supports/ works, as required for safe & efficient operation of tools & tackles, shall be the successful bidder's responsibility. For these civil works all materials excluding cement and required facilities will have to be arranged by successful bidder at their own cost.
v.	All minor civil works for main equipments including drilling, chipping, enlarging cutouts, column foundation pockets, cable cut outs, etc will have to be carried out by successful bidder at no extra cost. Grouting of equipments erected by successful bidder as per procedure is included in scope. Providing & grouting of pocket holes, under base-plates of structural steel/ machinery including roughening of surface, cleaning, ramming, curing, etc, all complete with CONBEXTRA GP-1 or equivalent like Sika is included in scope. Materials like grouting compound, cement, sand, aggregates, etc shall be arranged by successful bidder at no extra cost to BHEL.
9.15	CLEANLINESS
i.	Successful bidder shall be responsible for keeping the entire area allotted to him clean & free from rubbish, debris, etc during the period of contract. Successful bidder shall employ enough number of special personnel to thoroughly clean his work-area at least once in a day. All such rubbish & scrap material shall be stacked or disposed in a place to be identified by BHEL/ customer. Materials and stores shall be so arranged to permit easy cleaning of area. In areas where equipment might drip oil and cause damage to floor surface, a suitable protective cover of a flame resistant, oil proof sheet shall be provided to protect floor from such damage.
ii.	Similarly, labor colony, the offices and the residential areas of successful bidder's employees and workmen shall be kept clean and neat to the entire satisfaction of BHEL/ customer. Proper sanitary arrangements shall be provided by successful bidder, in the work-areas, office and residential areas of successful bidder.
9.16	OTHER FACILITIES TO BE PROVIDED BY SUCCESSFUL BIDDER
i.	Successful bidder shall provide all necessary scaffolding materials, temporary structures, as may be required and necessary safety devices etc.
ii.	Successful bidder's responsibility with regard to operator, fuel, lubricants and daily upkeep of T&Ps provided by BHEL is further detailed in relevant section.
iii.	Successful bidder shall maintain & operate his tools & plants in such a way that major breakdowns are avoided. In the event of major breakdown, successful bidder shall make alternative arrangements expeditiously so that progress of work is not hampered.
iv.	For welding, use of welding generators/ rectifiers only is permitted.
v.	Temporary toilet blocks are to be constructed/ fabricated at different areas as per mutual agreement for maintaining proper sanitation.
vi.	Construction and maintenance of necessary approach & access roads surrounding the work area shall be in the scope of successful bidder within accepted rates.
9.17	RESPONSIBILITIES WITH REGARD TO EMPLOYMENT OF LABOUR, ETC
i.	Successful bidder shall also comply with the requirements of local authorities (Govt. of Odisha) with regard to employment of labours/workers at project site.

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	<p>They shall comply with any other statutory requirement/ local authority requirement such as police verification of antecedents of the workmen, staff, etc. with regard to employment of labours/workers at project site. In case of workmen / supervisors deployed to project from INDIA / any other country, necessary statutory guidelines issued by Indian Govt./ concerned Govt. authorities shall be strictly complied with in addition to local laws.</p> <p>Skilled labour with experience in construction of large utility thermal power projects shall be deployed (preferably 80% of such skilled labours shall be sourced from India).</p>
ii.	BHEL/ customer may insist for witnessing the regular payment to the labour. They may also like to verify relevant records for compliance with statutory requirements. Successful bidder shall enable such facilities to BHEL/ customer.
iii.	It is the responsibility of successful bidder to arrange gate pass for all his employees, T&P, etc for entering the project premises. Necessary co-ordination with customer officials is the responsibility of successful bidder. Successful bidder to follow all procedures laid down by customer for making gate pass. To work beyond normal working hours, successful bidder shall arrange necessary work permits for working beyond normal working hours.
iv.	If at any time during the execution of work, it is noticed that the work is suffering on account of non-availability/ shortfall of resources from successful bidder's side, BHEL will make suitable alternate arrangements. The expenditure incurred along with applicable overheads shall be recovered from the successful bidder.
v.	It is the responsibility of successful bidder to engage his workmen in shifts and or on overtime basis to achieve targets, to suit BHEL's commitments to customer or to adjust date of completion of events or due to other reasons. Decision of BHEL in this regard will be final & binding on successful bidder.
vi.	Successful bidder shall deploy only qualified & experienced engineers/ supervisors. They shall have professional approach in executing the work.
vii.	Successful bidder's supervisory staff shall execute the work in the most professional manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. They shall be responsible to ensure that workmanship conform to dimensions & tolerances given in drawings/ instructions given by BHEL engineer from time to time.
viii.	The supervisory staff employed by successful bidder shall ensure proper outturn of work and discipline on the part of labour put on the job. Also in general they should see that the works are carried out in a safe and proper manner and in coordination with other labour and staff employed directly by BHEL or other successful bidders of BHEL or BHEL's client.
ix.	If at any time, it is found that successful bidder is not in a position to deploy required engineers/ supervisors/ workmen due to any reason, BHEL shall have the option to make alternate arrangements. The expenditure incurred along with applicable overheads shall be recovered from the successful bidder.
x.	The successful bidder shall deploy all the skilled/semiskilled/ unskilled labour including highly skilled workmen etc. These workmen should have previous experience on similar job. They shall hold valid certificates wherever necessary. BHEL reserves the right to insist on removal of any employee of the successful bidder at any time if he is found to be unsuitable and the successful bidder shall forthwith remove him. Successful bidder should furnish a tentative deployment plan of his manpower as required in GCC. Also the actual deployment will be so as to satisfy the project schedule of erection and commissioning.
9.18	LABOR CODES IMPLEMENTATION w. e. f. 21.11.2025:
	Labor codes implementation w. e. f. 21.11.2025: Bidder to ensure workers' right to minimum wages, the Central Government has amalgamated.

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	<p>A. 4 laws in the Wage Code, B. 9 laws in the Social Security Code, C. 13 laws in the The Occupational Safety, Health and Working Conditions Code, 2020 D. 3 laws in the Industrial Relations Code</p> <p>The Central Government hereby appoints the 21st day of November, 2025 as the date on which the following provisions of the said Codes, shall come into force.</p> <ol style="list-style-type: none"> 1. Social Security Code 2020 2. Occupational Safety, Health and Working Conditions Code, 2020 3. Code on Wages, 2019 4. Industrial Relations Code, 2020
9.19	<p>AS BUILT DRAWING</p> <p>Successful bidder shall submit as-built drawing to BHEL/ customer after completion of work for acceptance/ approval. Successful bidder will be given 1 copy of working drawing based on which as-built drawing is to be prepared. However, the contractor has to make those 'as-built drawing' from the modified drawing which is already followed in between the project work. The contractor has to submit required no. of as-built drawing as per the instruction of BHEL engineer after completion of jobs.</p>
9.20	<p>PROJECT MANAGEMENT/ CONSTRUCTION MANAGEMENT</p> <p>To meet the need of construction management at site, successful bidder shall provide the following services within accepted rates.</p>
9.20 a	<p>PLANNING & MONITORING</p> <ol style="list-style-type: none"> i. On the basis of accepted/ approved master schedule, on every month, the successful bidder shall submit to Construction Manager, BHEL schedule-wise plan vs actual status of erection, testing, commissioning, along with action plan to make-up delay, if any. ii. The project schedule might undergo revision/ modification periodically, for which the successful bidder may have to prepare/ modify schedule periodically in consultation with BHEL, so as to match with revised project milestones. iii. The successful bidder shall ensure monitoring of these activities at least on fortnight basis or at other frequency as mutually agreed with BHEL. iv. Successful bidder shall submit daily work program based on above schedule. Deferment of above schedule is not acceptable. Successful bidder will adhere to schedule & augment resources to ensure completion as per schedule. v. Progress reviews on entire activities will be held periodically as per direction of BHEL, at site/ Nagpur. These meetings will be used as a forum for discussing all areas where progress needs to be expedited. The successful bidder shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings.
9.20 b	<p>INFRASTRUCTURE</p> <ol style="list-style-type: none"> i. Successful bidder shall install 2 nos all in one PCs (multimedia PC work station Core-i3, 2.1 GHz or above, 500 GB HDD, 4 GB RAM, 100/ 1000 MBPS LAN card) of HP/ Compaq/ Lenevo or equivalent make with window 8 or 7 O/S and required software like MS Office 2010 Professional, AutoCAD 2009 or higher, PageMaker (7.0, etc), ADOBE PDF CREATOR and ONE NO. SCANNER (HP Scan Jet Pro 2500 or equivalent), one no laser jet printer compatible for A4 size printing (ink/ cartridge for which to be supplied as & when required) with power backup at places, as per instruction of BHEL for exclusive use of BHEL. These computers/ printers/scanners shall remain successful bidder's property and they will be allowed to take out the same after completion of contract period including extension. Successful bidder shall provide data/

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	<p>information, etc in prescribed formats for periodical updating of progress reports, material management reports, updating of network pertaining to successful bidder's scope of work, etc</p> <p>Successful bidder shall provide 2 nos. computer operator and 2 number service staff (1 No. computer operator and 1 No. service staff for CHP, AHP, LHP, GHP area) for miscellaneous service for BHEL's use at site/ Nagpur for reconciliation, progress review & day-to-day planning purpose, documentation, etc. These facilities are to be provided within 15 days from date of start date till completion of scheduled contract period, including extension, if the reason for extension is attributable to successful bidder. In case successful bidder fails to provide 2 nos. computer/ 2 nos. printer (1 No. computer and 1 No. printer for CHP, AHP, LHP, GHP area) or personnel as per requirement, for a continuous period of fifteen days or more, suitable penalty (as decided by Erection In Charge) may be levied from contractor's RA Bill.</p>
ii.	Successful bidder's site office must have facilities of communications like, E-mail, and telephone with STD facility within a month from LOI.
9.20 c	PROGRESS REPORTING <ul style="list-style-type: none">i. The bidder shall submit daily, weekly and monthly progress reports for work force, materials reports, consumables (gases/electrodes) report and other reports as per pro-forma considered necessary by the BHEL. In case of any failure on successful bidder's part to comply with this, BHEL may at its discretion, consider to withhold part payment against their RA bills.ii. The progress report shall indicate the progress achieved against planned with reasons indicating delays, if any, and shall give the remedial actions which successful bidder intends to take to make good the slippage or lost time, so that further works again proceed as per the original program and the slippages do not accumulate and effect the overall program.iii. The daily work force reports shall clearly indicate the work force deployed, category-wise specifying also the activities in which they are engaged.iv. Weekly progress review meetings will be held at site during which actual progress during the week vis-à-vis scheduled program shall be discussed or actions to be taken for achieving targets. For discussions, successful bidder shall present program of subsequent week. Successful bidder shall constantly update/revise their work program to meet the overall requirement.v. Periodic progress reviews on the entire activities of execution in respect of supply and works in scope of bidder will be held once in a month at Calcutta/site. These meetings will be attended by reasonably higher officials of successful bidder and will be used as a forum for discussing all areas where progress needs to be speeded up. Successful bidder shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings.vi. Successful bidder has to provide electronic/ computerized storing and re-production/ printing/ plotting of various data, log sheets, protocols, measurements etc. These may be stored in CD (as per requirement) and handed over to BHEL as per requirement.
9.20 d	SITE ORGANIZATION <ul style="list-style-type: none">i. Successful bidder shall maintain a site organization of adequate strength in respect of manpower, construction machinery and other implements at all time for smooth execution of the contract headed by Site Incharge for site operations with sufficient level of authority to take site decisions. Successful bidder will submit organization chart (showing the name of Site Incharge) with individual bio-data indicating various levels of experts to be posted for supervision in the fields of supervision and execution, quality, material management, planning, safety, etc. The organization shall be reinforced from time to time, as required to make up slippage (if any) from the schedule without any commercial implication to BHEL. The organization chart is to be submitted within 10 days from the date of LOI.

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ii.	Following (minimum) engineering manpower with power plant construction background to be deployed at site by successful bidder for proper execution. This requirement is in addition to the normal manpower required for installation, erection, and commissioning activities under the scope of the contract.	
a.	Qualified safety officers with assistants Including minimum 3nos Safety Officer/engineer for CHP, AHP, LHP & GHP area. (exclusive for safety supervision for project jobs).	As per relevant HSE clause/manual.
b.	For planning function of entire scope of work.	1 no with sufficient experience.
c.	For quality inspection function of entire scope.	1 no engineer. 1 no supervisor.
d.	Material handling area for follow-up with BHEL for timely putting up material requirement, identification of material for receipt from BHEL store/ storage yard, etc for various systems, ie transformer, busduct, cable tray, cable, switchgear, panel, etc.	1 no engineer. 2 nos supervisor.
e.	For Transformer, Busduct function. (including 1 no engineer & 1 no supervisor for CHP, AHP, LHP & GHP area)	2 nos engineer. 2 nos supervisor.
f.	For Cable tray, cabling function. (including 1 no engineer & 1 no supervisor for CHP, AHP, LHP & GHP area)	2 no engineer. 5 nos supervisors.
g.	For Switchgear, panel, balance function. (including 1 no engineer & 1 no supervisor for CHP, AHP, LHP & GHP area)	2 no engineer. 3 nos supervisors.
h.	For AHP for Trouble shooting and Operation & Maintenance including Coordination, Inspection of each area, attending the faults, demonstration of trouble shooting procedures, operation and functioning of all electrics, C&I and DCS/PLC systems during continuous plant operation towards handing over.	1 commissioning engineer, 1 highly skilled, 1 skilled technician with tools and tackles
i.	For CHP for Trouble shooting and Operation & Maintenance including Coordination, Inspection of each area, attending the faults, demonstration of trouble shooting procedures, operation and functioning of all electrics, C&I and DCS/PLC systems during continuous plant operation towards handing over.	1 commissioning engineer, 1 highly skilled, 1 skilled technician with tools and tackles
j.	For LHP & GHP for Trouble shooting and Operation & Maintenance including Coordination, Inspection of each area, attending the faults, demonstration of trouble shooting procedures, operation and functioning of all electrics, C&I and DCS/PLC systems during continuous plant operation towards handing over.	1 commissioning engineer, 1 highly skilled, 1 skilled technician with tools and tackles
iii.	Deputation of above man-power shall be jointly decided at site in line with construction schedule and front availability.	
iv.	Engineer/ supervisor for other functions like store & purchase, material management, planning, finance, administration, etc are to be provided as per site requirement and not considered above.	
v.	In the event of non-deputation of engineer/ supervisor by the bidder as per above agreed schedule, BHEL shall reserve the right to deduct from RA bills as per prevailing rates applicable along with overheads for Skilled, Semi-skilled & Un-skilled for arranging alternative arrangements.	

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vi.	BHEL reserves the right to reject or approve the list of personnel proposed by successful bidder. The persons whose bio-data have been approved by BHEL will have to be posted at site and deviation in this regard will not be permitted unless specific & reasonable justification is made.
vii.	In addition to above, a well experienced qualified engineer to be designated, as 'Project Co-ordinator, shall be deployed by successful bidder. Such engineer shall have adequate exposure on the job and shall remain fully involved in all planning activities, guidance etc to successful bidder's own team during the complete execution period of contract.
viii.	Successful bidder should also submit to BHEL for approval a list of T&Ps along with their fitness certificates. The tools & tackles shall not be removed from site without written permission of BHEL.
ix.	Successful bidder should also submit network programs for the erection of various items. These networks shall show BHEL/ customer hold points (CHP), which have to be cleared by BHEL/ customer, or their authorized representatives before further erection can take place. These programs for the erection would clearly identify responsibilities of successful bidder and BHEL/ customer. It is the responsibility of successful bidder to get the networks approved by BHEL within four weeks of the date of finalization of award of work/ placement of LOI.
9.21	CONSTRUCTION MANAGEMENT
i.	Based on the approved program, successful bidder shall submit a program of construction/ erection/ commissioning for the implementation. These programs would be amplified showing start of erection and subsequent activities and shall form the basis for site execution and detail monitoring. The three-monthly rolling program with the first month's program being tentative based on the site condition would be prepared based on these programs. Successful bidder shall also be involved along with BHEL/ customer to tie up detailed resources mobilization plan over the period of the contract matching with the performance targets.
ii.	The program would be jointly finalized by Site Incharge of successful bidder with BHEL/ customer as well as the site-planning representative. The erection program will also identify sequential events matching financial turnover.
iii.	Successful bidder is liable to furnish all documentary evidences towards payment of Works Contract Tax as and when required by BHEL.
iv.	CONSTRUCTION OF TEMPORARY OFFICE, STORES, ETC Successful bidder shall arrange at their own cost cleaning & grading of area allotted, construction of their temporary office, stores, godown, fabrication yards, etc and also watch & ward.
9.22	EOT CRANE
i.	EOT crane shall be made available to successful bidder in TG hall free of charges for erection purpose as per availability on shared basis. As the operator will be from other agency, successful bidder will do necessary co-ordination.
ii.	Availability of EOT crane may be affected from time to time due to routine preventive maintenance or break down maintenance. Successful bidder have to make alternative arrangement or plan/ amend/ alter their actions to suit the above condition and successful bidder will not be entitled to any compensation due to this non-availability of the crane to maintain the schedule.
iii.	Services of EOT crane will be provided to other agencies working in power house building or adjacent area as required. Decision of BHEL engineer for allocation of EOT crane will be final. Successful bidder has to make adjustments accordingly.
iv.	It is not obligatory on the part of BHEL to provide any T&P or other materials other than those specifically agreed to do so by BHEL in the tender. However, depending upon availability & job requirement, BHEL/ customer may make available any T&P or other material to successful bidder on chargeable basis. Hiring

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	charge will be based on standard followed by BHEL/ customer, as applicable. Hire charge will be recovered from successful bidder's RA bills/ security deposit or any other dues in one installment.
9.23	<p>REPORTING DAMAGES AND CARRYING OUT REPAIRS</p> <p>i. Checking all components/ equipment at siding/ site and reporting to transport and/ or insurance authorities of any damages/ losses will be in the scope of successful bidder. Necessary assistance for verification/ survey and lodging claims with underwriters and follow up to logical conclusion will also be part of this tender.</p> <p>ii. Successful bidder shall render all help to BHEL in inspection including handling, opening packages, re-packing, re-stacking, assessing and preparing estimates for repairs of components damaged during transit, storage, erection, commissioning and preparing estimates for fabrication of materials lost/ damaged during transit, storage and erection. Successful bidder shall help BHEL to furnish all the data required by railways, insurance company or their surveyors.</p> <p>iii. Successful bidder shall report to BHEL in writing any lost/ damages to equipment/ components during drawl of the materials from stores, in transit to site and unloading at a place of work and during erection & commissioning. The above report shall be as prescribed by BHEL site. Any consequential loss arising out of noncompliance of this stipulation will be borne by successful bidder.</p> <p>iv. Successful bidder shall carry out fabrication of any material lost/ damages as per Instructions from BHEL.</p> <p>v. BHEL, however, reserve the right to award or not to award to successful bidder any of the rectification/ rework/ repairs of damages and also fabrication of components.</p> <p>vi. All the repairs/ rectification/ rework of damages and fabrication of materials lost, if any, shall be carried out by a separately identifiable gang for certification of man-hours. Daily log sheets should be maintained for each work separately and be signed by successful bidder's representative & BHEL. Signing of log sheets does not necessarily mean acceptance of these as extra works for payment purpose.</p> <p>vii. All rectification, repairs, reworks and fabrication of components lost, which are minor and incidental to erection work (consuming up to 50 man-hours on each occasion) shall be treated as part of work without any extra cost.</p> <p>viii. In case the repairs/ rectification/ rework and fabrication of materials lost, the work has been done by more than one agency including successful bidder, payment towards extra charges will be on pro-rata basis and decision of BHEL in this regard is final & binding on the successful bidder.</p>
9.24	ISSUE & HANDLING, USAGE, RECONCILIATION, RECOVERY, ETC OF BHEL'S FREE ISSUED EQUIPMENT/ MATERIALS
9.24 a	<p>ISSUE & HANDLING</p> <p>BHEL will issue various equipment/ materials/ items free of cost to successful bidder as per the scope of this tender</p> <p>Successful bidder shall maintain proper store account for all the BHEL issued materials and shall give requisite copies of monthly computerized reconciliation statement of such account to the BHEL.</p> <p>Successful bidder shall solely be responsible for the safety & quality of material after it is handed over and issued to successful bidder by BHEL.</p> <p>BHEL issued materials shall not under any circumstances taken out of the project site unless otherwise permitted by BHEL.</p> <p>Necessary lifting tackles, cranes, tools & plants including tractors, Crane, Farana, trailers, trucks, pulley blocks, jacks, winches, wire ropes etc, of suitable capacities and other equipments incidental to carry out this work shall have to be arranged by successful bidder within the accepted rates/ price. BHEL reserve the right to inspect lifting tackles and equipment before allowing their use. Such approval however shall not</p>

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	relieve successful bidder to ensure safe handling of equipment taking precaution to avoid any accident and damage to other equipment and personnel.
	Successful bidder shall satisfy himself of the quality and quantity of the materials at the time of taking delivery from BHEL/ customer store/ storage yard. No claims whatsoever will be entertained by BHEL because of quality or quantity after the materials are taken by successful bidder from BHEL/ customer.
	Successful bidder shall submit to BHEL, a statement indicating estimated quantity of equipment/ materials required atleast 1 month in advance.
	Successful bidder shall ensure that no lamination materials are taken over by them from BHEL. Wastage, if any due to above, shall not be compensated by BHEL.
	Successful bidder has to note that all fasteners like MS/ HT/ HSFG bolts/ nuts, lock nuts, washers, etc shall be supplied by successful bidder as per applicable item of price schedule of tender.
	Successful bidder to note that steel required for their enabling job like store/ site office, etc shall be arranged at their own cost.
9.24 b	RETURN
a)	All surplus equipment/ materials issued by BHEL shall be returned by successful bidder to BHEL/ customer store/ storage yard.
b)	Surplus, unused and un-tampered materials shall be sorted and returned separately at a place directed by BHEL within project area; Return of such materials will not be entitled to any handling and incidental charges.
c)	All wastage/ scrap (including wastage, unusable scrap) shall be returned to stores/ designated area and a receipt obtained from BHEL for material accounting purposes. Return of such material will not be entitled to any additional cost due handling and transportation and incidental charge.
d)	Scrap for structural steel shall be returned separately.
	USE AND WASTAGE
	Unless specified otherwise in the tender, following guidelines shall be applicable.
a)	Theoretical consumption of various equipment/ materials shall be based on tender provision/ approved drawing/ guidelines/ mutual agreement with BHEL. No extra shall be payable for any deviation for two different procedures adopted for issue and calculation of the theoretical consumption.
b)	Allowable wastage of the theoretical consumption shall be considered based on tender provision/ approved drawing/ guidelines/ mutual agreement with BHEL. Invisible wastage (loss of materials due to gas cutting, straightening of edges, etc) shall be limited to above specified guidelines and shall be considered for reconciliation purpose. But this invisible wastage shall be considered to be included in allowable wastage.
c)	All wastage shall be returned to BHEL.
9.24 c	RECONCILIATION
a)	Successful bidder shall submit a reconciliation statement of equipment/ materials issued to him, once in two months. The same may be submitted alongwith RA bill.
b)	Successful bidder shall properly account for the material issued to him as specified herein to the satisfaction of BHEL certifying that the balance materials are available with successful bidder's custody at site.
c)	If it is noticed by BHEL that the wastage is high and calls recovery at the penal rate, then BHEL will proceed for recovery for the excess wastage as per penal recovery rates as specified from RA bill.
	RECOVERY
	If wastage exceeds the specified limit, recovery of excess wastage shall be made from monthly RA bill at the penal rate stipulated tender provision/ approved drawing/ guidelines/ mutual agreement with BHEL.
9.25	EXTENSION OF COMPLETION PERIOD

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i.	Successful bidder shall submit detail work program (L-2 schedule) for approval of BHEL, as detailed in construction schedule. The approved schedule will be taken into account as basis for consideration of contract extension as per following detail.
ii.	If the completion of work as detailed in the scope of work gets delayed beyond the contract/ completion period, successful bidder shall request for an extension of the contract and BHEL at its discretion may extend the contract.
iii.	Based on the reviews jointly signed, the works balance at the end of original contract period less the backlog attributable to successful bidder shall be quantified, and the number of months of 'Time extension' required for completion of the same shall be jointly worked out. Within this period of 'Time extension', successful bidder is bound to complete the portion of backlog attributable to successful bidder. Any further 'Time extension' or 'Time extensions' at the end of the previous extension shall be worked out similarly.
iv.	However, if any 'Time extension' is granted to successful bidder to facilitate continuation of work and completion of contract, due to backlog attributable to successful bidder alone, then it shall be without prejudice to the rights of BHEL to impose penalty/ LD for the delays attributable to successful bidder, in addition to any other actions BHEL may wish to take.
v.	A joint programme shall be drawn for the balance amount of work to be completed during the period of 'Time Extension', along with matching resources to be deployed by successful bidder as per specified format. Review of the programme and record of shortfall shall be done.
vi.	During the period of 'Time extension', successful bidder shall maintain their resources as per mutually agreed program.
vii.	At the end of total work completion as certified by BHEL, and upon analysis of the total delay, the portion of time extensions attributable to (i) Successful bidder, (ii) Force majeure conditions, and (iii) BHEL, shall be worked out and shall be considered to be exhausted in the same order. The total period of time extensions shall be the sum of (i), (ii) and (iii) above and shall be equal to period between the scheduled date of completion and the actual date of completion of contract. LD shall be imposed/ levied for the portion of time extensions attributable to successful bidder and recoverable from the dues payable to successful bidder.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

CHAPTER X – Specific Inclusions & Exclusions

10.0	SPECIFIC INCLUSIONS & EXCLUSIONS
10.1	INCLUSIONS
10.1.1	Consumables/ items to be provided by BHEL free of charge (except mentioned in Chapter-12 of TCC pertaining to Package-B For AHP, CHP, GHP & LHP Area)
a)	Metallic Cable glands.
b)	Steel for fabrication.
c)	Lugs beyond 4 sq. mm size.
d)	HT Termination/Jointing Kits/ Straight through jointing Kits.
e)	Trefoil Clamps with hardware except mentioned in BOQ which is to be supplied by subcontractor.
10.1.2	All Consumables/ items to be arranged by Bidder at his/ her own cost, broad items are mentioned below (except mentioned in Clause 10.1.1 a) to e) of TCC)
a)	Lugs up to 4 sq. mm size.
b)	Paint, primer and consumables.
c)	LT cable Straight through jointing Kits.
d)	Cable ferruling printing machine along with ferrule rolls.
e)	Identification tags PVC/ Metals with tying/ fixing material, sleeve and clamps with hardware. PVC ties, Ferrule, Buttons and tap for cables at both end & field instruments.
f)	Cable Markers.
g)	Trefoil Clamps with hardware as mentioned in BOQ.
10.2	EXCLUSIONS
a)	Erection of dampers, valves, electrical actuators, pneumatic actuators.
b)	Erection of ESP rectifier transformer, electrical heaters, rapping motors, mechanical interlock and ALI's.(except ALI Commissioning)
c)	Erection of HT/ LT motors and Hoists. (except those specified herein)
d)	Erection, testing and commissioning of elevators.
e)	Generator Erection
<p>Note: The aforesaid exclusions should not be construed as exhaustive. They are meant for general guideline. BHEL reserves the right to include or exclude any item which is required for completing the job as per rates indicated in rate schedule. Contractor should carry out all such jobs as per the instructions of BHEL Engineer.</p>	

TECHNICAL CONDITIONS OF CONTRACT (TCC)
CHAPTER XI – Annexures

11.0 Drawings Details (Enclosed with the NIT as Annexure):		
S No	Annexure No	Drawing Description
1	Annexure-1	EKD OF IPB (MAIN, DELTA AND TAP-OFF RUN) 4540-001-207-PVE-C-100
2	Annexure-2	EKD OF SEGREGATED PHASE BUSDUCT 4540-001-207-PVE-C-101
3	Annexure-3	TECHNICAL DATA SHEET OF IPBD 4540-001-207-PVE-Y-006
4	Annexure-4	TECHNICAL DATA SHEET OF SPBD 4540-001-207-PVE-Y-103
5	Annexure-5	DG SETS - LAYOUT DRAWINGS & SECTIONAL DETAILS IS-4-LA-765-800-A004
6	Annexure-6	ESLD PE-DG-497-565-E001
7	Annexure-7	HT Interlock (Rotary Switches) 36510000066
8	Annexure-8	Data Sheet of GT 4540-001-201-PVE-Y-166
9	Annexure-9	OGA of GT CC-ENGG-4540-001-201-PVE-B-153
10	Annexure-10	OGA for Turbine-Generator Auxiliary Control Cabinets 4540-001-110-PVE-B-0135
11	Annexure-11	OGA of DAVR 4540-001-110-PVE-B-001
12	Annexure-12	Data sheet of Station Transformer 4540-001-201-PVE-Y-201
13	Annexure-13	HSE PLAN FOR TALCHER HSEP: 14: Revision: REV02: Date: 22.11.2022
14	Annexure-14	Cable Erection Philosophy 4540-001-199-PVE-W-001_1
15	Annexure-15	BHEL T&P Hire Charges BHEL: PW:FM:FAX:T&P Hire: 2023-25

Note: - The above drawings are reference purpose only. These drawings may change and vendor will have to execute the work as per final approved drawings and instruction of BHEL engineer.

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CHAPTER XII – Scope of Supply for Package-B

12.0	Scope of Supply of consumables mentioned in BOQ for Package-B in Vendor Scope (For AHP, CHP, GHP & LHP Area only)
12.1	<p>The supply scope includes all consumables required for the erection works. The major electrical supply items required for the CHP/AHP Electrical E&C works in scope of Bidder are listed in the BOQ line item. Any material supplied by bidder (whether billable or non-billable) must be of approved make wherever defined in contract and shall meet the technical specifications provided. Item make approval shall be obtained from BHEL, wherever not available.</p> <p>Before procuring any such material vendor shall mandatorily take approval from BHEL for quantity and make.</p> <p>Bidder shall supply all types of erection accessories, tools and plants which are required for final installation of equipment by the Bidder to the satisfaction of BHEL/Customer. Bidder shall go through FQP, technical spec of every item mentioned in BOQ and get clarified regarding installation services and the accessories required. Same shall be considered in his price.</p> <p>Note: Watch & ward of the above-mentioned supply items shall be in the scope of vendor. BHEL shall not be responsible for any loss/damage/theft of any item supplied by the vendor.</p>
12.2	<p>Earthing Materials: Bentonite, Salt, Charcoal, Cl cover etc. as mentioned in BOQ shall be supplied by Bidder in required quantity to meet the earth resistance limitation while testing the earth pit and earth grid.</p>
12.3	<p>Steel Materials: It includes all types of steel materials like insert plates, angles, channels, plates, beams, pipes, conduits, hardware's, nuts, bolts, plain and ring washers, sheets, gland plates of motors, panels, which is required for project execution.</p>
12.4	<p>Conduits and pipes: BHEL has supplied cable trays for all cabling purposes. The requirement of conduits and pipes are miscellaneous as per site requirement. The conduits of various sizes shall be supplied.</p>
12.5	<p>PVC Pipes: Various sizes as per requirement shall be supplied.</p>
12.6	<p>Electrical Components: Copper Bus bars, Aluminum Bus bars, Control Junction boxes are included in the scope of bidder. In case of requirement of these items in project due to any damage, same shall be procured by bidder.</p>
12.6	<p>Cabling Accessories: It includes cable tags, clamps as per Customer NIT Specification requirement. Cable Tags shall be supplied as per Site requirement. Cable clamping materials: SS material shall be supplied as per site requirement.</p>
12.7	<p>Cable glands: Cable shall be terminated using double compression type cable glands. Cable glands shall conform to BS:6121 and be of robust construction capable of clamping cable and cable armour firmly without injury to insulation. Cable glands shall be made of heavy-duty brass, machine finished and nickel chrome plated. Thickness of plating shall not be less than 10 microns. All washers and hardware shall also be made of brass with nickel chrome plating. Rubber</p>

TECHNICAL CONDITIONS OF CONTRACT (TCC)

CHAPTER XII – Scope of Supply for Package-B

	components shall be of neoprene and of tested quality. Supply of all cable glands is in the scope of bidder which shall be part of cable termination price as per BBU
12.8	<p>HT & LT Cable Kits: HT & LT Jointing Kits – Shall be of approved make. Bidder shall provide heat shrinkable Jointing kit for Armoured & Unarmoured cables as per standard practice and technical specification.</p>
12.9	<p>Cable Lugs: Cable lugs for power cables shall be tinned copper solder less crimping type for aluminium compacted conductor cables. Cable lugs and ferrules for control cables shall be tinned copper conforming to Standard specifications. The cable lugs for control cables shall be provided with insulating sleeve and shall suit the type of terminals provided on the equipment's. The ferrules shall be indelible interlocking type and shall fit tightly on cores. The required lugs for the termination of all cables in scope of bidder shall be supplied at the BBU rates. The quantity of lugs is tentative and may change during detail engineering. Bidder to consider the same while pricing. Wastage of lugs while crimping and handling, shall not be billed. The total lugs requirement as per Cable Schedule only shall be entertained for billing. Bidder to consider the wastage cost in pricing. Supply of all cable lugs is in the scope of bidder which shall be part of cable termination price as per BBU</p>
12.10	<p>Any other materials which are not listed above but are part of bidder scope of supply, shall be supplied as per technical specification.</p> <p>Note: Successful bidder should get written clearance from BHEL site in charge before supply of these items. BHEL reserves the right to issue partial procurement clearances based on site progress especially for cable glands, lugs, erection steel, fire retardant paints, fire sealing material etc.</p> <p>Bidder to note that supply clearance to fire retardant paint and fire sealing material shall be issued at fag end of the project after completion of erection activity.</p>

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Chapter-XIII: BOQ Cum Rate Schedule

13.0	BOQ Cum RATE SCHEDULE
13.1	Any other entry elsewhere in the offer of the bidder shall be treated as Null and Void

Schedule of Items -Talcher U#1 & Common Systems: Package-A				
S. No	DESCRIPTION	UOM	Total Quantity	Item Weightage
E1A	CABLE TRAYS AND ACCESSORIES			
E1A.01	Ladder type Cable Tray 150mm	Meter	13576	0.0075319721
E1A.02	Ladder type Cable Tray 300mm	Meter	16355	0.0109141219
E1A.03	Ladder type Cable Tray 600mm	Meter	44408	0.0356644933
E1A.04	Perforated type Cable Tray 50mm	Meter	2100	0.0008050089
E1A.05	Perforated type Cable Tray 100mm	Meter	2100	0.0009428422
E1A.06	Perforated type Cable Tray 150mm	Meter	4924	0.0031555523
E1A.07	Perforated type Cable Tray 300mm	Meter	4235	0.0033253043
E1A.08	Perforated type Cable Tray 600mm	Meter	7641	0.0083235969
E1B	FLEXIBLE CABLE TRAY SUPPORT AND ACCESSORIES			
E1B.01	Single Channel (in standard length of 6 meter per piece)	Meter	24045	0.0143669742
E1B.02	Double Channel (in standard length of 6 meter per piece)	Meter	19240	0.0154854322
E1C	CANTILEVER ARM (EACH COMPLETE WITH, 2 NOS.-M12 HEX. BOLT & WASHER, 2 NOS.-M12 SPRING NUTS, 2 NOS.-M6 PAN HEAD SCREWS & WASHER, 2 NOS.-M6 SPRING NUTS)			
E1C.03	For 700/750mm wide trays	No	1369	0.0007925950
E1C.01	For 600/620mm wide trays	No	17668	0.0148295576
E1C.02	For 300/320mm wide trays	No	9116	0.0049917328
E1C.04	For 150/170mm wide trays	No	8337	0.0040350891
E1D	CLAMPS & FITTINGS (COMPLETE WITH REQUIRED HARDWARE I.E. SPRING NUTS / WASHERS, TRESTLE BRACKET, ETC. AND ACCESSORIES AS REQUIRED FOR COMPLETE INSTALLATION)			
E1D.01	Base plate for single channel.	No	2664	0.0006121655
E1D.02	Base plate for double channel.	No	5675	0.0014388152
E1D.03	Flat plate TEE fitting - PF1	No	1750	0.0002714072
E1D.04	Flat plate straight fitting - PF2	No	13202	0.0020474956
E1D.05	Beam Clamps	No	2343	0.0003006603
E1D.06	90degree angle fitting (LA1)	No	19742	0.0028505533

TECHNICAL CONDITIONS OF CONTRACT (TCC)

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E1D.07	90degree angle fitting (HL1)	No	8740	0.0012620032
E1D.08	90degree angle fitting - PF1	No	75	0.0000108295
E1D.09	Clamp CC1	No	18138	0.0015520104
E1D.10	Clamp CC2	No	1637	0.0001488274
E1D.11	Tray fixing Clamp -TC1	No	39582	0.0033869046
E1E	FABRICATION OF IRREGULAR BEND TO BE DONE FROM THE EXISTING CABLE TRAY AS PER SITE REQUIREMENT (cable tray material will be issued by BHEL free of cost) (CONSUMABLES etc. TO BE PROVIDED BY VENDOR) (Applicable for BEND TYPE 'E', 'F' & 'G')			
E1E.1	IRREGULAR BEND FOR LADDER 150 MM TRAYS	No	100	0.0001224463
E1E.2	IRREGULAR BEND FOR LADDER 300 MM TRAYS	No	100	0.0001462352
E1E.3	IRREGULAR BEND FOR LADDER 600 MM TRAYS	No	100	0.0001868983
E2A	LT XLPE/ PVC ARMOURED/ UNARMOURED ALUMINIUM/ COPPER CONDUCTOR POWER/ FRLS CABLE			
E2A.01	1Cx35sqmm Al Cable	Meter	90300	0.0101671243
E2A.02	1Cx70 sqmm Al Cable	Meter	500	0.0000601178
E2A.03	1Cx95 sqmm Al Cable	Meter	500	0.0000601178
E2A.04	1Cx120sqmm Al Cable	Meter	7700	0.0012351819
E2A.05	1Cx300sqmm Al Cable	Meter	26950	0.0047547715
E2A.06	1Cx400sqmm Al Cable	Meter	500	0.0000820148
E2A.07	1Cx630sqmm Al Cable	Meter	56700	0.0139502276
E2A.08	2Cx6 sqmm Al Cable	Meter	500	0.0000380503
E2A.09	2Cx10 sqmm Al Cable	Meter	24500	0.0018644655
E2A.09	2Cx25sqmm Al Cable	Meter	21000	0.0017617758
E2A.10	2Cx95 sqmm Al Cable	Meter	28700	0.0030339687
E2A.11	2Cx240sqmm Al Cable	Meter	35500	0.0065403079
E2A.12	3Cx10sqmm Al Cable	Meter	50400	0.0043920075
E2A.13	3Cx16sqmm Al Cable	Meter	14600	0.0011857116
E2A.14	3Cx25 sqmm Al Cable	Meter	51500	0.0059492339
E2A.15	3Cx70 sqmm Al Cable	Meter	22400	0.0037141091
E2A.16	3Cx95 sqmm Al Cable	Meter	11200	0.0018570545
E2A.17	3Cx150 sqmm Al Cable	Meter	18200	0.0047885418
E2A.18	3Cx185sqmm Al Cable	Meter	15200	0.0050829471
E2A.19	3.5Cx25 sqmm Al Cable	Meter	13300	0.0018833004
E2A.20	3.5Cx50 sqmm Al Cable	Meter	32200	0.0057687540

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E2A.21	3.5Cx95 sqmm Al Cable	Meter	26400	0.0047765603
E2A.22	3.5Cx185 sqmm Al Cable	Meter	5600	0.0018726647
E2A.23	3.5Cx240 sqmm Al Cable	Meter	500	0.0002718256
E2A.24	2Cx1.5 sqmm Cu Control Cable	Meter	21700	0.0015489981
E2A.25	2Cx2.5 sqmm Cu Power Cable	Meter	163400	0.0115121017
E2A.26	3Cx1.5 sqmm Cu Control Cable	Meter	837000	0.0606391241
E2A.27	3Cx2.5 sqmm Cu Power Cable	Meter	408200	0.0314841140
E2A.28	4Cx1.5 sqmm Cu Screened Cable	Meter	60200	0.0051069995
E2A.29	4Cx10 sqmm Cu Control Cable	Meter	19600	0.0018164849
E2A.30	5Cx1.5 sqmm Cu Control Cable	Meter	18200	0.0013580972
E2A.31	5Cx2.5 sqmm Cu Control Cable	Meter	17500	0.0013058627
E2A.32	7Cx1.5 sqmm Cu Control Cable	Meter	700	0.0000567840
E2A.33	10Cx1.5sqmm Cu Control Cable	Meter	49700	0.0044822178
E2A.34	12Cx1.5 sqmm Cu Control Cable	Meter	50800	0.0052345598
E2A.35	14Cx1.5sqmm Cu Control Cable	Meter	500	0.0000515213
E2A.36	16Cx1.5sqmm Cu Control Cable	Meter	7000	0.0007246614
E2A.37	19Cx1.5sqmm Cu Control Cable	Meter	11200	0.0011594582
E2A.38	Optical Fibre Cable includes fixing of fibre optic components and termination kits LIU, face , splicing, plates,cabinets,SC coupler,grounding & minor civil works etc	Meter	2000	0.0001910129
E2B	HT ALUMINIUM CONDUCTOR, ARMoured/ UNARMoured XLPE POWER CABLE			
E2B.01	19/33kV, 1Cx300sqmm Power Cable	Meter	1200	0.0003432217
E2B.02	11/11kV, 1Cx630sqmm Power Cable	Meter	31650	0.0136055118
E2B.03	11/11kV, 1Cx300sqmm Power Cable	Meter	12000	0.0057104474
E2B.04	11/11kV, 3Cx150 sqmm Power Cable	Meter	23100	0.0162408694
E2B.05	3.3/3.3kV, 1Cx185sqmm Power Cable	Meter	4500	0.0017580059
E2B.06	3.3/3.3kV, 3Cx150sqmm Power Cable	Meter	14000	0.0071488950
E2C	Laying of underground cables including excavation, back filling, supply of all civil material to complete the job			
E2C.1	11kV 3CX240 Sq. MM	Mtr	1000	0.0023828116
E2D	TERMINATION & JOINTING KITS/TREFOIL CLAMPS (COMPLETE WITH FIXING HARDWARES) 19/33kV,11/11kV, 6.6/6.6kV, 3.3/3.3kV,1.1kV GRADE ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMoured/ UNARMoured CABLES AS PER CABLE OD./ FILTRATION			

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E2D.1	HT END TERMINATION JOINTING KITS, XLPE INSULATED, UNARMOURED/ ARMOURED, ALUMINIUM/Cu CABLE WITH LUGS			
E2D.1.2	33kV, 1Cx300sqmm Power Cable	No	29	0.0003563083
E2D.1.1	11kV, 3Cx150 sqmm Power Cable	No	88	0.0024992490
E2D.1.3	11kV, 1Cx630sqmm Power Cable	No	84	0.0016889130
E2D.1.4	11kV, 1Cx 300sqmm Power Cable	No	113	0.0028159104
E2D.1.5	3.3kV, 1Cx185sqmm Power Cable	No	101	0.0024079649
E2D.1.6	3.3kV, 3Cx150sqmm Power Cable	No	113	0.0025125828
E2D.2	HT STRAIGHT THROUGH JOINTING KITS, XLPE INSULATED, UNARMOURED/ ARMOURED, ALUMINIUM/Cu CABLE WITH LUGS			
E2D.2.1	11kV, 3Cx150/240 sqmm Power Cable	No	21	0.0004542147
E2D.2.2	11kV, 1Cx240/300sqmm Power Cable	No	10	0.0002483166
E2D.2.3	11kV, 1Cx630sqmm Power Cable	No	6	0.0001244830
E2D.3	TREFOIL CLAMPS (COMPLETE WITH FIXING HARDWARES) 19/33kV, 11/11kV, 6.6/6.6kV, 3.3/3.3kV, 1.1kV GRADE ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMOURED/ UNARMOURED CABLES AS PER CABLE OD			
E2D.3.1	Trefoil Clamp Cable OD (30.1 – 35mm)	No	10968	0.0078866227
E2D.3.2	Trefoil Clamp Cable OD (40.1 – 45mm)	No	23567	0.0169465743
E2D.3.3	Trefoil Clamp Cable OD (50.1 – 55mm)	No	8120	0.0058389599
E3	JUNCTION BOXES AND PUSH BUTTON			
E3.01	Junction Box 12/ 24/ 26/ 48/ 96 ways/VAR P1,P3 &C2.	No	138	0.0005592029
E3.02	Local Control box for panel type hopper heater.	No	96	0.0016047009
E3.03	Local push button station Type A/ B/ C/ D	No	1645	0.0058279841
E3.04	MCCB DB	No	140	0.0047370489
E4	STRUCTURAL STEEL			
E4.01	Structural Steel fabrication & Installation (MS angle, Channel, Plate etc)/ Cable tray structural steel fabrication & installation.	MT	31	0.0031768097
E5	SWITCHGEARS/ MCC/ PCC			
E5A	HT SWITCHGEAR (33/11/3.3 KV)			
E5A.01	11kV Unit Switchgear Board #1BA. Each board shall have 19 panels. Approx. overall dimension of each panel is approx 820x2600x2927 mm.	No	1	0.0012410059
E5A.02	11kV Unit Switchgear Board #1BB. Each board shall have 19 panels. Approx. overall dimension of each panel is approx 820x2600x2927 mm.	No	1	0.0012251733

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E5A.03	11kV Station Switchgear Board #0BA. Each Board shall have 16 panels (Approx dimension of each panel is approx 820x2600x2927mm) and 2 panels (Approx dimension of each panel is approx 1220x2600x2927mm) .	No	1	0.0011915200
E5A.04	11kV Station Switchgear Board #0BB. Each Board shall have 15 panels (Approx dimension of each panel is approx 820x2600x2927mm) and 2 panels (Approx dimension of each panel is approx 1220x2600x2927mm) .	No	1	0.0011915200
E5A.05	11kV Misc Switchgear Board #0BG. Each board shall have 19 panels. Approx. overall dimension of each panel is approx 820/1220x2600x2927 mm.	No	1	0.0010640810
E5A.06	3.3kV Unit Switchgear Board #1CA. Each board shall have 29 panels. Approx. overall dimension of each panel is approx 820/1220x2600x2927 mm.	No	1	0.0012703553
E5A.07	3.3kV FGD Switchgear Board #1CB. Each board shall have 21 panels. Approx. overall dimension of each panel is approx 820/1220x2600x2927 mm.	No	1	0.0010939509
E5A.08	3.3kV Stn. Aux Switchgear Board #0CC. Each board shall have 21 panels. Approx. overall dimension of each panel is approx 820/1220x2600x2927 mm.	No	1	0.0010939509
E5A.09	33kV Misc Switchgear Board #0AA. Each board shall have 21 panels. Approx. overall dimension of each panel is approx 820/1220x2600x2927 mm.	No	1	0.0010939509
E5A.10	3.3/11/33 kV Earthing Truck. Approx. Overall dimension is 19800x900x900 mm. (25 Panels)	No	25	0.0232669760
E5B	LT SWITCHGEAR (415/220V)			
E5B.1	415V LT Station Services PMCC #0DA (4000A), no of verticals-21, Approx overall dimensions 2400(H) x 20400(W) x 1000/1500(D) MM	No	1	0.0005699141
E5B.2	415V LT Boiler Service PMCC #1DA (4000A), No of verticals-28. Approx overall dimension 2400(H) x 27600(W) x 1000/1500(D) MM	No	1	0.0011427607
E5B.3	415V LT Turbine Service PMCC #1DB (4000A). Approx overall dimensions 2400(H) x 21600(W) x 1000/1500(D) MM	No	1	0.0009970318
E5B.4	U#1 FGD PMCC #1DK & 1DL, 2 BOARDS EACH WITH 2 I/C AND NO B/C .Approx overall	No	2	0.0010360458

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	dimension 2400(H) x 31200(W) x 1000/1500(D) MM			
E5B.5	DMP/SW/CLW PMCC #0DJ & 0DL, 2 BOARDS EACH WITH 2 I/C AND NO B/C. Approx overall dimension 2400(H) x 34400(W) x 1000/1500(D) MM	No	2	0.0010360458
E5B.6	415V LT Raw Water PMCC #0DK (3000A). Approx overall dimensions 2400(H) x 15200(W) x 1000/1500(D) MM	No	1	0.0006631976
E5B.7	FW PH/ AUX. BOILER PMCC #0DD (3000A). Approx overall dimension 2400(H) x 14200(W) x 1000/1500(D) MM	No	1	0.0006631976
E5B.8	ADMIN BLDG PMCC. 2500A. #0DE. Approx Dimension is. 2400(H) x 17000(W) x 1000/1500(D) MM	No	1	0.0006797301
E5B.9	ETP MCC. 400A. #0DF. Approx Dimension is. 2400(H) x 15000(W) x 1000(D) MM	No	1	0.0006631976
E5B.10	WORKSHOP PMCC. 2500A. #0DH. Approx Dimension is. 2400(H) x 13000(W) x 1000/1500(D) MM	No	1	0.0006631976
E5B.11	CSSP PMCC. 2500A. #0DP. Approx Dimension is. 2400(H) x 29400(W) x 1000/1500(D) MM	No	1	0.0006631976
E5B.12	ESP PMCC. 2500A. #1DC, 1DD, 1DE, 1DF, 1DH, 1DJ. Approx Dimension is. 2400(H) x 17000(W) x 1000/1500(D) MM	No	6	0.0040783808
E5B.13	U#1 ESP STANDBY PMCC. 2500A. #1DS-1, 1DS- 2. Approx Dimension is. 2400(H) x 4000(W) x 1000/1500(D) MM	No	2	0.0010785171
E5B.14	AIR WASHER MCC-1. 630A. #1SA. Approx Dimension is. 2400(H) x 10400(W) x 1000(D) MM	No	1	0.0005699141
E5B.15	FUEL OIL MCC. 630A. #0WB. Approx Dimension is. 2400(H) x 11400(W) x 1000(D) MM	No	1	0.0005699141
E5B.16	CHLORINATION PLANT MCC. 630A. #0WE. Approx Dimension is. 2400(H) x 19400(W) x 1000(D) MM	No	1	0.0005886810
E5B.17	415 LT MISC. SERVICE MCC-1. 250A. #0QA. Approx Dimension is. 2400(H) x 16000(W) x 1000(D) MM	No	1	0.0008992503
E5B.18	CPU MCC. 400A. #0WA. Approx Dimension is. 2400(H) x 17000(W) x 1000(D) MM	No	1	0.0004638556

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E5B.19	FQA/ O&M LAB PMCC. 2500A. #0WF. Approx Dimension is. 2400(H) x 9000(W) x 1000/1500(D) MM	No	1	0.0005198558
E5B.20	ESP & ID FAN AREA MCC-1. 400A. #1HC. Approx Dimension is. 2400(H) x 7000(W) x 1000(D) MM	No	1	0.0005198558
E5B.21	VENTILATION MCC-1. 1000A. #1TA. Approx Dimension is. 2400(H) x 12400(W) x 1000(D) MM	No	1	0.0005516881
E5B.22	SERVICE BLDG. MCC. 1000A. #0SB. Approx Dimension is. 2400(H) x 15400(W) x 1000(D) MM	No	1	0.0004638556
E5B.23	PRE-TREATMENT PLANT MCC. 1600A. #0WC. Approx Dimension is. 2400(H) x 29400(W) x 1000(D) MM	No	1	0.0008896709
E5B.24	AIR CONDITIONING MCC. 800A. #0TA. Approx Dimension is. 2400(H) x 11400(W) x 1000(D) MM	No	1	0.0008896709
E5B.25	415V LT CW MCC-1. 250A. #. Approx Dimension is. 2400(H) x 5000(W) x 1000(D) MM	No	1	0.0004638556
E5B.26	415V U-1 BA & COMP PMCC-2A, 1000A, No. Of verticals - 16, Panel Size 2400(H) x 15600(W) x 1000/1500(D) MM, Approx. Weight (14.2 Tons)	No	1	0.0007328888
E5B.27	415V LT SOOT BLOWER MCC-1. 63A. #. Approx Dimension is. 2400(H) x 4500(W) x 1000(D) MM	No	1	0.0008553798
E5B.28	BOILER V&D ACDB-1. 250A. #1HA. Approx Dimension is. 2400(H) x 15250(W) x 800(D) MM	No	1	0.0007330822
E5B.29	415V LT TURBINE VALVE ACDB-1. 250A. #1KA. Approx Dimension is. 2400(H) x 22850(W) x 800(D) MM	No	1	0.0006627501
E5B.30	415V LT BOILER ACDB-1. 400A. #1HB. Approx Dimension is. 2400(H) x 5750(W) x 800(D) MM	No	1	0.0004638556
E5B.31	415V LT UNIT SERVICE ACDB-1. 630A. #1QA. Approx Dimension is. 2400(H) x 10500(W) x 800(D) MM	No	1	0.0007005518
E5B.32	CANTEEN MCC. 400A. #0SC . Approx Dimension is. 2400(H) x 6000(W) x 1000(D) MM	No	1	0.0002864337
E5B.33	415V LT OIL FILTERATION ACDB-1 (OUTDOOR PANEL). 400A. #. Approx Dimension is. 2400(H) x 1950(W) x 800(D) MM	No	1	0.0003299635
E5B.34	FGD EMERGENCY MCC. 1250A. #0DG. Approx Dimension is. 2400(H) x 11200(W) x 1000/1500(D) MM	No	1	0.0010643192

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E5B.35	415V LT UNIT EMERGENCY MCC-1. 3000A. #1DG. Approx Dimension is. 2400(H) x 26200(W) x 1000/1500(D) MM	No	1	0.0017693038
E5B.36	220V MAIN DCDB-1. 1000A. #1FA. Approx Dimension is. 2400(H) x 12400(W) x 800(D) MM	No	1	0.0010349161
E5B.37	DM/ETP/PTP DCDB. 50A. #0FA. Approx Dimension is. 2400(H) x 4800(W) x 800(D) MM	No	1	0.0004638556
E5B.38	RAW WATER DCDB. 50A. #0FB. Approx Dimension is. 2400(H) x 4800(W) x 800(D) MM	No	1	0.0004638556
E5C	STARTER PANEL/BOXES/POWER DISTRIBUTION BOX/MARSHALLING BOXES			
E5C.01	Electronic Control Panel (including ARECA Controller-96 nos), Electronic Control Panel, overall dimensions approx. 600W x 550D x 2000H mm, approx. weight of each panel 0.15 MT. ARECA-III Controller approx. dimension 280 x 210 x 210 mm, rotary switches (108 Nos.), etc along with cables and connectors, shall be supplied loose for mounting in the panel at site.	No	96	0.0046385958
E5C.02	PMU Panel (To be erected alongwith GRP, Commissioning in BHEL-Bhopal Scope)	No	1	0.0000483187
E5C.03	IOS Data Logger PC, Embedded IOS with enclosure box, Computer Furniture, Printer etc.	Set	1	0.0000570462
E5C.04	ALCS Control Panel	No	6	0.0002275074
E5C.05	MULTIMEDIA CLEANING DEVICE PANEL	No	1	0.0000483187
E5C.06	HIGH PRESSURE PUMP STARTER PANEL	No	1	0.0000483187
E5C.07	Ground Brush Monitoring System	Set	1	0.0000482517
E5C.08	Rotor Flux Monitoring System including Sensors & Monitoring unit as per drawing.	Set	1	0.0000731396
E5C.09	Erection , Testing and Commissioning of Online Moisture Removal System for Generator Transformer	No	1	0.0000616350
E5C.10	3D Acoustic level transmitter/scanner for first field ESP along with probe head assembly, electronic unit, JB, etc.	No	12	0.0005790312
E5C.11	DC motor starter panels, etc (DC JOP, DC EOP, Seal oil panel, DC Scanner fan), including resistance boxes.	No	6	0.0004388411
E5C.12	Dynamic Braking Resistance box (DBR) as per drg no. 4540-001-102-PVE-Y-009	Set	7	0.0004835373
E5C.13	HMI Console for DC Panel	Set	1	0.0007278559
E5C.14	Local Motor Starter Panels (flame proof/Non-flame proof)	No	256	0.0018528069

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E5C.15	Making foundation (including supply of civil material), erection, Testing , commissioing of 500kVA, 11kV/415V Package Sub-Station (as per drawing/instruction of BHEL engineer)	No	2	0.0027801782
E5D	DRY TYPE TRANSFORMER			
E5D.1	2500/2000 kVA, 11/0.433kV Dry Type Transformer with off load tap switch, including all loose accessories of transformer etc.	No	6	0.0033805750
E5E	PANELS			
E5E.01	Generator, Generator Transformer, Unit Transformer, Control, protection & Metering panels (5 Panels). Approx dimension of each panel 2315x800x800mm	Set	1	0.0012235439
E5E.02	Station Transformer Control, protection & Metering panels (2 Panels). Approx dimension of each panel 2315x800x800mm	Set	1	0.0002944287
E5E.03	BTS Panel. Approx. overall dimension of each panel 3200x2800x2927mm. Each set contains 2 panels.	Set	3	0.0011163816
E5F	220Volt DC BATTERY & BATTERY CHARGER SYSTEM			
E5F.01	220Volt DC Battery Charging System which includes DC battery (Each having 2 strings of 169 nos. 670AH battery. 8 Nos. of Battery health Monitoring System) and DC Battery Charger (550A) for Main Plant .	Set	2	0.0027963639
E5F.02	220Volt DC Battery Charging System which includes DC battery (each having 169 nos. 90AH battery including health monitoring system) and DC Battery Charger (50A) for RWPH Plant .	Set	2	0.0021618528
E5F.03	220Volt DC Battery Charging System which includes DC battery (each having 169 nos. 90AH battery.) and DC Battery Charger (50A) for Water System Plant .	Set	2	0.0021618528
E5G	DIGITAL AUTOMATIC VOLTAGE REGULATOR FOR BRUSHLESS EXCITATION SYSTEM			
E.5G.1	Transportation from store / storage yard to erection site, Erection, Assembly, Testing & Commissioning of Digital Excitation Equipments / System, System consist of DAVR panels.	Set	1	0.0005769589
E5H	VARIABLE FREQUENCY DRIVE SYSTEM FOR CEP/RC Pump/APH/other systems			

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E5H.1	Transportation from stores/ storage yards to erection site, erection, assembly, testing & commissioning of Variable Frequency Drive System consisting of IGBT based VFD Panel and transformer for CEP-A, B, C, RCP & APH 1. VFD FOR DYNAMIC CLASSIFIER - 7 Nos 2. VFD for Oxidation Blower - 2 Nos 3. 3.3 KV, 1200 KW VFD for CEP Motor - 3 Nos 4. 3.3 KV, 1200 KW VFD for RCP Motor - 1 No 5. 415V, 37 KW VFD for APH Motor - 2 Nos	Set	15	0.0757599290
E5I	MISCELLANEOUS EQUIPMENT			
E5I.01	Ash Level Indicator comprising of level probe with extension lagging pipe, Electronic Unit, Interconnecting PTFE Cabling, Conduit, etc.	Set	192	0.0010585194
E5I.02	Opacity Monitor consisting of Transmitter & Receiver, Electronic Unit, Air Blower unit, Weather Proof housings, Junction boxes, flexible hoses, mounting flanges with pipe for Transmitter, Receiver & Air blower, interconnected cables etc. for mounting on ESP outlet duct.	Set	6	0.0003552426
E6	ABOVE GROUNG/BELOW GROUND EARTHING & LIGHTNING PROTECTION MATERIALS			
E6.01	14 SWG GI wire	Meter	310100	0.0130411944
E6.02	8 SWG/3.15 Dia GI wire	Meter	43800	0.0016273539
E6.03	65x8mm GS flat	Meter	31500	0.0212105566
E6.04	50x6mm GS flat	Meter	27800	0.0134845010
E6.05	25x6/30X5 mm GS flat	Meter	30567	0.0092592464
E6.06	25x3mm GS flat	Meter	3500	0.0010271784
E6.07	Ground Electrode with 40mm Dia rod (One end Sharpened) 3000mm long located along the periphery of Earthing Grid (Without Treated Pit Other than Earth Test Pit)	No	NA	
E6.08	GS Rod 20mm dia Vertical Air Termination	No	84	0.0008187554
E6.09	Test Links with 150x150x3mm GS flat	No	259	0.0005662597
E6.10	Flexible braided Copper conductor of 600mm with tinned Cu, clamp connected by U-bolt for fence gate earthing.	No	35	0.0000055701
E6.11	50NB gal MS pipe(PERF) (for neutral earthing along with salt, sand, charcol & chamber with cover)	No	133	0.0021916018
E6.12	Earth Insulating rubber mat (LT & HT)	No	900	0.0004139173

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E6.13	Treated Earthpit with supply & E&C of earthing electrode including brick chamber with cover, accessories etc. complete in all respect (Treated Earth Pit and its test links - 0.4 m ³ bentonite (1 cubic meter of Bentonite weighs 593 kilograms) in each pit. Earth electrode to be cut by contractor from full length. Including the supply of Bentonite and salt as required. Measurement of earth pit resistance and recording with customer signature)	No	10	0.0011420320
E6.14	Testing, commissioning and charging of Treated Earth Pits / Earth grid in each equipment area - 10 fine readings in each area as per Technical Specification One grid means all the earth pits of a building in totality including both earthing and lightning along with submisison of report (MCC, JNT, PH, Con Gallery, Cable rack etc) (1 Unit =1 Building)	Pits / grids	110	0.0111871380
E7	BUS DUCTS			
E7A	LT BUS DUCTS (NSPBD)			
E7A.01	415V, 1000A/ 1600A/ 2500A/ 3000A/ 4000A, LT Bus Duct (NSPBD) (For MCC/Emergency MCC/ PMCC/ FGD PMCC/ ESP/DG Boards only). Loose items like silicagel Breather pipe, GI Channel Supports and associated accessories.	Meter	993	0.0168653225
E7B	LT BUS DUCTS (SANDWICH BD)			
E7B.01	415V, 3000A, LT Bus Duct (Sandwich BD) (For MCC/Emergency MCC/ PMCC/ FGD PMCC/ ESP/DG Boards only). Loose items like silicagel Breather pipe, GI Channel Structural Supports, Wall Frame assembly, Adopter Box & End Flange (Swgr & DG), Al & Cu Flex, 90 Deg Edge & Flat Bellow, Rubber Bellow (Swgr & DG), Phase cross over and associated accessories.	Meter	265	0.0033794229
E7C	HT BUS DUCTS (SPBD)			
E7C.01	11kV, 3750A, SPBD from ST-1 to 11kV STN SWBD. (Including enclosures, Conductors, Chennel boxes, erection of Support structure, duct earthing, support insulator, space heater etc. which shall be supplied by manufacturing unit)	Meter	167	0.0043923340
E7C.02	3.3kV, 2500A, SPBD from UAT-1 to 3.3kV unit switchboard. (Including enclosures, Conductors, Chennel boxes, erection of Support structure, duct	Meter	97	0.0014036016

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	earthing, support insulator, space heater etc. which shall be supplied by manufacturing unit)			
E7C.03	11kV, 2500A, SPBD from UT-1 to 11kV unit switchboard. (Including enclosures, Conductors, Chennel boxes, erection of Support structure, duct earthing, support insulator, space heater etc. which shall be supplied by manufacturing unit)	Meter	142	0.0027413494
E7C.04	11kV, 2500A, SPBD from TIE-15 & TIE-16 to 11kV SWBD. (Including enclosures, Conductors, Chennel boxes, erection of Support structure, duct earthing, support insulator, space heater etc. which shall be supplied by manufacturing unit)	Meter	23	0.0004440214
E7C.05	11kV, 3750A, SPBD from TIE-13 & TIE-14 (Unit-1 & 2 common)to 11kV SWBD. (Including enclosures, Conductors, Chennel boxes, erection of Support structure, duct earthing, support insulator, space heater etc. which shall be supplied by manufacturing unit)	Meter	446	0.0117304250
E7C.06	3.3kV, 2500/3150A, CHP/AHP SPBD from CHP/AHP to 3.3kV SWBD. (Including enclosures, Conductors, Chennel boxes, erection of Support structure, duct earthing, support insulator, space heater etc. which shall be supplied by manufacturing unit)	Meter	38	0.0005527136
E7C.07	3.3kV, 630/1600A, SAT & FGD SPBD from SAT/FGD to 3.3kV SWBD.(Including enclosures, Conductors, Chennel boxes, erection of Support structure, duct earthing, support insulator, space heater etc. which shall be supplied by manufacturing unit)	Meter	80	0.0011636075
E7C.08	11kV, 630A, Miscellaneous TRF SPBD from Misc TRF 1 & 2 to switchboards. (Including enclosures, Conductors, Chennel boxes, erection of Support structure, duct earthing, support insulator, space heater etc. which shall be supplied by manufacturing unit)	Meter	25	0.0004826319
E7C.09	Shifting of 3.3/11kV SPBD (Without inside conductor to site), if 11kV SPBD enclosures are supplied to site in loose condition in future)	No (pieces)	30	0.0003395176
E7C.10	Shifting of 3.3/ 11 KV loose conductors from BHEL store (works include loading, shifting & unloading), if 11kV SPBD conductors are supplied to site in loose condition in future)	No (pieces)	30	0.0000712710

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E7C.11	Assembly of 3.3/ 11kV SPBD conductors in its SPBD for readiness, if 11kV SPBD enclosures & conductors are supplied to site in loose condition in future)	No (pieces)	30	0.0001157337
E7C.12	Space heater fixing, including wiring in SPBD Ducts	No	20	0.0001595425
E7D	NEUTRAL GROUNDING RESISTOR			
E7D.01	Neutral Grounding Resistor including NGR support structure 3.3/11kV	No	14	0.0196341831
E7E	HT BUS DUCTS (IPBD)			
E7E.01	Isolated Phase Bus Duct main run (21/24kV: 24000A- approx length 270 mtrs (200 kg/Mtr)), Isolated Phase Bus Duct Delta Run (21/24kV: 14000A- approx length 150 mtrs (150 kg/Mtr)), Isolated Phase Bus tap off run (21/24kV: 2800A- approx length 140 mtrs (120kg/Mtr)) (Including SPVT Cubicle (1 set), NG Cubicle (1 set), Air pressurisation equipment (3 MT) (load consist of compressor and receiver -1 set, Drier and pressuring panel- 1 set, Control panel- 1 set) , Support structure for IPBD - 50 To ns etc) (Including support structure, conductor, shunt & enclosure weting (Al.), CT, NG Cubicle (2 MT) along with NG Transformer & Resistance, Earthing of duct, support insulator, etc.) as per technical specification, enclosed drawing and technical data sheet -4540-001-207-PVE-Y-006	Set	1	0.0182864416
E8	OIL FILLED TRANSFORMERS (GT, UT, UAT & ST)			
E8.01	Single Phase 265MVA, 420/21kV, OFAF cooled YNd11 (after 3-ph bank formation), Generator Transformer (GT) including all accessories, piping, cabling etc.	Set	4	0.0344527302
E8.02	130/65/65 MVA, 3-phase, 400/11.5/11.5kV Station Transformer (ST), OLTC, ONAF/ ONAN including all accessories, piping, cabling etc.	Set	1	0.0061099516
E8.03	40 MVA, 21/11.5kV Unit Transformer (UT) including all accessories, piping, cabling etc.	Set	2	0.0070104761
E8.04	25MVA, 34.5/11kV Common Service Aux. Transformer including all accessories, piping, cabling etc.	Set	2	0.0038977241
E8.05	12.5 MVA, 11/3.45kV Unit Aux Transformer including all accessories, piping, cabling etc.	Set	2	0.0038977241

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E8.06	7.5MVA, 11/3.45kV FGD Aux Transformer including all accessories, piping, cabling etc.	Set	2	0.0032556012
E8.07	7.5MVA, 33/11.5kV Misc Service Transformer including all accessories, piping, cabling etc.	Set	2	0.0032556003
E8.08	1600/ 2000/ 2500 kVA, 11/0.433kV Auxiliary Transformer (3 phase, 4 wire, ONAN) including all loose accessories of transformer etc.	No	29	0.0334745555
E8.09	2500 kVA, 11/ 3.45kV Station Auxiliary Transformer (3 phase, 4 wire, ONAN) including all loose accessories of transformer etc.	No	2	0.0023085900
E9	ONLY TESTING & COMMISSIONING			
E9.01	Heating elements for Hopper Heater of ESP.	Module	1728	0.0038187756
E9.02	Heating elements for Support Insulator Heater, Shaft Insulator Heaters of ESP.	No	480	0.0010822961
E9.03	HighVoltage Rectifier Transformers (95kV peak, 1000 mA) including oil filtration.	No	96	0.0041106227
E9.04	Testing & Commissioning of Collecting, Emitting, GD Screen Motor	No	204	0.0015246381
E9.05	Testing and commissioning of 3.3kV & 11kV HT motors including dryout.	No	55	0.0036931614
E9.06	Testing and commissioning of 415V LT motors including dry out.	No	2100	0.0695491658
E9.07	Testing, commissioning and charging of SFU / MCB / MCCB outgoing feeders	No	3360	0.0253573552
E9.08	Generator System Testing	No	1	0.0008200156
E9.09	Testing & Commissioning of Wall, Long Retractable, Air Heater Soot Blower (Not Motors)	No	200	0.0004392808
E9.10	Testing & Commissioning of Furnace Temperature Probe	No	2	0.0000133952
E9.11	Thermostats including Calibration	No	108	0.0002385058
E9.12	Electrically (LT) Operated Valves, Dampers and Gates with Actuators, Limit Switches, etc. (Regulating & ON/OFF Type).	No	450	0.0033645419
E9.13	Electrical Operated Hoist at various area like ESP, Mill, IDF, PAF, FDF, Vacum Pumps, BFP, CW & ACW etc area	No	33	0.0005988867
E9.14	Testing and Commissioning of H2 Drier Panels.	No	1	0.0000228706
E9.15	1750kVA, 3-phase, 415V Diesel Generator set. approx Weight 42 MT (drawing enclosed)	Set	2	0.0000624287
E9.16	1010 kVA, 3-phase, 415V FGD Diesel Generator set. Approx Weight 18 MT (drawing enclosed)	Set	1	0.0000357962

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E10	NAS Filtration and Particle counting for 400kV or above Oil filled transformers inclusive of transportation	Ltrs	358310	0.0041107680
				1.00000000000

Schedule of Items -Talcher U#2 & AHP, CHP, LHP & GHP : Package B

S. No	DESCRIPTION	UOM	Total Quantity	Item Weightage
E1A	CABLE TRAYS AND ACCESSORIES			
E1A.01	Ladder type Cable Tray 150mm	Meter	15729	0.0103047501
E1A.02	Ladder type Cable Tray 300mm	Meter	16545	0.0130378057
E1A.03	Ladder type Cable Tray 450mm	Meter	375	0.0004494815
E1A.04	Ladder type Cable Tray 600mm	Meter	49532	0.0469742861
E1A.06	Perforated type Cable Tray 100mm	Meter	11525	0.0061102664
E1A.07	Perforated type Cable Tray 150mm	Meter	9432	0.0071380846
E1A.08	Perforated type Cable Tray 300mm	Meter	3690	0.0034213997
E1A.09	Perforated type Cable Tray 450mm	Meter	375	0.0004948210
E1A.10	Perforated type Cable Tray 600mm	Meter	9239	0.0118846196
E1B	FLEXIBLE CABLE TRAY SUPPORT AND ACCESSORIES			0.00000000000
E1B.01	Single Channel (in standard length of 6 meter per piece)	Meter	35805	0.0252629282
E1B.02	Double Channel (in standard length of 6 meter per piece)	Meter	11260	0.0107017828
E1C	CANTILEVER ARM (EACH COMPLETE WITH, 2 NOS.-M12 HEX. BOLT & WASHER, 2 NOS.-M12 SPRING NUTS, 2 NOS.-M6 PAN HEAD SCREWS & WASHER, 2 NOS.-M6 SPRING NUTS)			
E1C.01	For 700/750mm wide trays	No	587	0.0004011197
E1C.02	For 600/620mm wide trays	No	8472	0.0083970402
E1C.03	For 300/320mm wide trays	No	4730	0.0030583385
E1C.04	For 150/170mm wide trays	No	4859	0.0027769692
E1D	CLAMPS & FITTINGS (COMPLETE WITH REQUIRED HARDWARE I.E. SPRING NUTS / WASHERS, TRESTLE BRACKET, ETC. AND ACCESSORIES AS REQUIRED FOR COMPLETE INSTALLATION)			
E1D.01	Base plate for single channel.	No	1656	0.0004493600
E1D.02	Base plate for double channel.	No	4275	0.0012798962
E1D.03	Flat plate TEE fitting - PF1	No	750	0.0001373548
E1D.04	Flat plate straight fitting - PF2	No	5658	0.0010362050

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E1D.05	Beam Clamps	No	2033	0.0003080538
E1D.06	90degree angle fitting (LA1)	No	10004	0.0017056914
E1D.07	90degree angle fitting (HL1)	No	4860	0.0008286760
E1D.08	90degree angle fitting - PF1	No	75	0.0000127882
E1D.09	Clamp CC1	No	11202	0.0011318797
E1D.10	Clamp CC2	No	873	0.0000937234
E1D.11	Tray fixing Clamp -TC1	No	48678	0.0049185539
E1E	FABRICATION OF IRREGULAR BEND TO BE DONE FROM THE EXISTING CABLE TRAY AS PER SITE REQUIREMENT (cable tray material will be issued by BHEL free of cost) (CONSUMABLES etc. TO BE PROVIDED BY VENDOR) (Applicable for BEND TYPE 'E', 'F' & G)			
E1E.1	IRREGULAR BEND FOR LADDER 150 MM TRAYS	No	225	0.0003253325
E1E.2	IRREGULAR BEND FOR LADDER 300 MM TRAYS	No	475	0.0008202479
E1E.3	IRREGULAR BEND FOR LADDER 600 MM TRAYS	No	150	0.0003310520
E1E.5	50/75/100mm Perforated Tray modification to bend and erection 2.5m Length	No	600	0.0013571611
E1E.6	150mm Perforated Tray modification to bend and erection 2.5m Length	No	20	0.0000659753
E1E.7	300mm Perforated Tray modification to bend and erection 2.5m Length	No	50	0.0001916421
E1E.8	450mm Perforated Tray modification to bend and erection 2.5m Length	No	150	0.0006432674
E1E.9	600mm Perforated Tray modification to bend and erection 2.5m Length	No	20	0.0000948754
E2A	LT XLPE/ PVC ARMoured/ UNARMoured ALUMINIUM/ COPPER CONDUCTOR POWER/ FRLS CABLE			
E2A.01	1Cx35sqmm Al Cable	Meter	45700	0.0060761161
E2A.02	1Cx70 sqmm Al Cable	Meter	500	0.0000709909
E2A.03	1Cx95 sqmm Al Cable	Meter	500	0.0000709909
E2A.04	1Cx120sqmm Al Cable	Meter	9300	0.0017616622
E2A.05	1Cx300sqmm Al Cable	Meter	12550	0.0026146532
E2A.06	1Cx400sqmm Al Cable	Meter	500	0.0000968482
E2A.07	1Cx630sqmm Al Cable	Meter	44300	0.0128706784
E2A.08	2Cx10 sqmm Al Cable	Meter	14500	0.0013030340
E2A.09	2Cx16sqmm Al Cable	Meter	4000	0.0004435637
E2A.10	2Cx25sqmm Al Cable	Meter	16000	0.0015850786

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E2A.11	2Cx35sqmm Al Cable	Meter	4000	0.0004562932
E2A.12	2Cx50sqmm Al Cable	Meter	1000	0.0001372357
E2A.13	2Cx70sqmm Al Cable	Meter	12000	0.0014979935
E2A.14	2Cx95sqmm Al Cable	Meter	13800	0.0017226925
E2A.15	2Cx240sqmm Al Cable	Meter	37000	0.0080495397
E2A.16	3Cx10sqmm Al Cable	Meter	31600	0.0032517646
E2A.17	3Cx16sqmm Al Cable	Meter	15400	0.0014768841
E2A.18	3Cx25 sqmm Al Cable	Meter	46500	0.0063431685
E2A.19	3Cx50sqmm Al Cable	Meter	28600	0.0050066618
E2A.20	3Cx70sqmm Al Cable	Meter	10000	0.0019579704
E2A.21	3Cx95 sqmm Al Cable	Meter	15800	0.0030935932
E2A.22	3Cx120 sqmm Al Cable	Meter	8000	0.0024855435
E2A.23	3Cx150 sqmm Al Cable	Meter	17800	0.0055303342
E2A.24	3Cx185 sqmm Al Cable	Meter	41300	0.0163087822
E2A.25	3.5Cx25 sqmm Al Cable	Meter	27700	0.0046317724
E2A.26	3.5Cx50 sqmm Al Cable	Meter	23800	0.0050350361
E2A.27	3.5Cx70 sqmm Al Cable	Meter	3000	0.0006346684
E2A.28	3.5Cx95sqmm Al Cable	Meter	16100	0.0034398277
E2A.29	3.5Cx150 sqmm Al Cable	Meter	2000	0.0004439981
E2A.30	3.5Cx185 sqmm Al Cable	Meter	5000	0.0019744288
E2A.31	3.5Cx240sqmm Al Cable	Meter	4400	0.0028247017
E2A.32	2Cx1.5sqmm Cu Control Cable	Meter	9300	0.0007839233
E2A.33	2Cx2.5sqmm Cu Power Cable	Meter	115600	0.0096174487
E2A.34	3Cx1.5sqmm Cu Control Cable	Meter	93300	0.0079819423
E2A.35	3Cx2.5sqmm Cu Power Cable	Meter	221800	0.0202013083
E2A.36	4Cx2.5 sqmm Cu Screened Cable	Meter	53800	0.0053895323
E2A.37	4Cx10 sqmm Cu Control Cable	Meter	13400	0.0014664930
E2A.38	4Cx16sqmm Cu Control Cable	Meter	7000	0.0007660784
E2A.39	5Cx1.5 sqmm Cu Control Cable	Meter	7800	0.0006873114
E2A.40	5Cx2.5 sqmm Cu Control Cable	Meter	7500	0.0006608763
E2A.41	7Cx1.5sqmm Cu Control Cable	Meter	300	0.0000287375
E2A.42	10Cx1.5sqmm Cu Control Cable	Meter	47300	0.0050372927
E2A.43	12Cx1.5sqmm Cu Control Cable	Meter	35200	0.0042831038
E2A.44	16Cx1.5sqmm Cu Control Cable	Meter	3000	0.0003667396
E2A.45	19Cx1.5sqmm Cu Control Cable	Meter	4800	0.0005867834
E2A.46	Optical Fibre Cable includes fixing of fibre optic components and termination kits LIU, face, splicing, plates, cabinets, SC coupler, grounding & minor civil works etc	Meter	2000	0.0002255601
E2B	HT ALUMINIUM CONDUCTOR, ARMoured/ UNARMoured XLPE POWER CABLE			

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E2B.01	11/11kV, 1Cx630sqmm Power Cable	Meter	3200	0.0016243912
E2B.02	11/11kV, 1Cx300sqmm Power Cable	Meter	9250	0.0051979261
E2B.03	11/11kV, 3Cx150 sqmm Power Cable	Meter	13050	0.0108344604
E2B.04	3.3/3.3kV, 1Cx185sqmm Power Cable	Meter	4000	0.0018453013
E2B.05	3.3/3.3kV, 3Cx150sqmm Power Cable	Meter	27750	0.0167329823
E2C	TERMINATION & JOINTING KITS/TREFOIL CLAMPS (COMPLETE WITH FIXING HARDWARES) 19/33kV, 11/11kV, 6.6/6.6kV, 3.3/3.3kV, 1.1kV GRADE ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMOURED/ UNARMOURED CABLES AS PER CABLE OD./ FILTRATION			
E2C.1	HT END TERMINATION JOINTING KITS, XLPE INSULATED, UNARMOURED/ ARMOURED, ALUMINIUM/Cu CABLE WITH LUGS			
E2C.1.1	33kV, 1Cx300sqmm Power Cable	No	13	0.0001803220
E2C.1.2	11kV, 3Cx150 sqmm Power Cable	No	205	0.0068528365
E2C.1.3	11kV, 1Cx630sqmm Power Cable	No	48	0.0011396427
E2C.1.4	11kV, 1Cx300sqmm Power Cable	No	61	0.0017769609
E2C.1.5	3.3kV, 1Cx185sqmm Power Cable	No	43	0.0012186327
E2C.1.6	3.3kV, 3Cx150sqmm Power Cable	No	49	0.0012715782
E2C.2	HT STRAIGHT THROUGH JOINTING KITS, XLPE INSULATED, UNARMOURED/ ARMOURED, ALUMINIUM/Cu CABLE WITH LUGS			
E2C.2.1	11kV, 3Cx150 sqmm Power Cable	No	12	0.0003139699
E2C.2.2	11kV, 1Cx300sqmm Power Cable	No	10	0.0003346112
E2C.2.2	11kV, 1Cx630sqmm Power Cable	No	2	0.0000629989
E2C.3	TREFOIL CLAMPS (COMPLETE WITH FIXING HARDWARES) 19/33kV, 11/11kV, 6.6/6.6kV, 3.3/3.3kV, 1.1kV GRADE ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMOURED/ UNARMOURED CABLES AS PER CABLE OD			
E2C.3.1	Trefoil Clamp Cable OD (30.1 – 35mm)	No	4700	0.0039912944
E2C.3.2	Trefoil Clamp Cable OD (40.1 – 45mm)	No	10500	0.0089160476
E2C.3.3	Trefoil Clamp Cable OD (50.1 – 55mm)	No	8980	0.0076252709
E3	JUNCTION BOXES AND PUSH BUTTON			
E3.01	Junction Box 12/ 24/ 26/ 48/ 96 ways/VAR P1,P3 &C2.	No	138	0.0006603420
E3.02	Local Control box for panel type hopper heater.	No	96	0.0018949318
E3.03	Local push button station Type A/ B/ C/ D	No	825	0.0034514842

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E3.04	MCCB DB	No	40	0.0015982301
E4	STRUCTURAL STEEL			
E4.01	Structural Steel fabrication & Installation (MS angle, Channel, Plate etc)/ Cable tray structural steel fabrication & installation.	MT	65	0.0079195730
E5	SWITCHGEARS/ MCC/ PCC			
E5A	HT SWITCHGEAR (11/3.3 KV)			
E5A.01	11kV Unit Switchgear Board #2BA. Each board shall have 18 panels. Approx. overall dimension of each panel is approx 820x2600x2927/2405 mm.	No	1	0.0014654578
E5A.02	11kV Unit Switchgear Board #2BB. Each board shall have 18 panels. Approx. overall dimension of each panel is approx 820x2600x2927/2405 mm.	No	1	0.0014467617
E5A.03	11kV Station Switchgear Board #0BC. Each Board shall have 15 panels (Approx dimension of each panel is approx 820x2600x2927mm) and 2 panels (Approx dimension of each panel is approx 1220x2600x2927/2405 mm.	No	1	0.0014070218
E5A.04	11kV Station Switchgear Board #0BD. Each Board shall have 14 panels (Approx dimension of each panel is approx 820x2600x2927mm) and 2 panels (Approx dimension of each panel is approx 1220x2600x2927/2405 mm.	No	1	0.0014070218
E5A.05	11kV CHP Switchgear Board #0BE. Each board shall have 23 panels. Approx. overall dimension of each panel is approx 820x2600x2927 mm.	No	1	0.0014043970
E5A.06	11kV AHP Switchgear Board #0BF. Each board shall have 22 panels. Approx. overall dimension of each panel is approx 820x2600x2927 mm.	No	1	0.0013433363
E5A.07	3.3kV Unit Switchgear Board #2CA. Each board shall have 28 panels. Approx. overall dimension of each panel is approx 820x2600x2927 mm.	No	1	0.0014043970
E5A.08	3.3kV FGD Switchgear Board #2CB. Each board shall have 20 panels. Approx. overall dimension of each panel is approx 820x2600x2927 mm.	No	1	0.0013433363
E5A.09	3.3kV AHP Switchgear Board #0CA. Each board shall have 49 panels. Approx. overall dimension of each panel is approx 820x2600x2927/2405 mm.	No	1	0.0020208889

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E5A.10	3.3kV CHP Switchgear Board #0CB. Each board shall have 30 panels. Approx. overall dimension of each panel is approx 820x2600x2927/2405 mm.	No	1	0.0018786474
E5A.11	3.3/11/33 kV Earthing Truck. Approx. overall dimension of each truck is 19800x900x900 mm.	No	8	0.0087920349
E5B	LT SWITCHGEAR (415/220V)			
E5B.01	415V LT U#2 Station Services PMCC #0DB (4000A), No of verticals-19, Approx overall dimensions 2400(H) x 18400(W) x 1000/1500(D) MM (Weight-23.4 T)	No	1	0.0006729904
E5B.02	415V LT Boiler PMCC-2 #2DA (4000A), No of verticals-27. Approx overall dimension 2400(H) x 26800(W) x 1000/1500(D) MM (Weight-17.6 T)	No	1	0.0013494437
E5B.03	415V LT Turbine PMCC-2 #2DB (4000A). Approx overall dimensions, No of Vertical-23, 2400(H) x 22600(W) x 1000/1500(D) MM, Weight-20.8 T	No	1	0.0011773579
E5B.04	415V LT U#2 FGD PMCC, 2 BOARDS EACH WITH 2 I/C AND NO B/C. 2500A. #2DK & 2DL. No of Verticals-28, Approx Dimension is. 2400(H) x 27200(W) x 1000/1500(D) MM, Weight-24.6 T.	No	2	0.0012234281
E5B.05	415V LT ESP PMCC. 2500A. #2DC, 2DD, 2DE, 2DF, 2DH, 2DJ. No. of Verticals-16 Nos, Approx Dimension is. 2400(H) x 17000(W) x 1000/1500(D) MM, Wt-13.2 T.	No	6	0.0048160085
E5B.06	415V LT ESP STANDBY PMCC. 2500A. #1DS-2, 2DS-2 . Approx Dimension is. 2400(H) x 4000(W) x 1000/1500(D) MM	No	2	0.0012735808
E5B.07	415V LT MISC. SERVICE MCC-2. 250A. #0QB. No of Vertical-15, Approx Dimension is. 2400(H) x 16000(W) x 1000(D) MM, Wt=12 T	No	1	0.0010618914
E5B.08	415V LT ESP & ID FAN AREA MCC-2. 400A. #2HC. No of Verticals-7, Approx Dimension is. 2400(H) x 8000(W) x 1000(D) MM, Wt-6.2 T.	No	1	0.0006138784
E5B.09	415V LT VENTILATION MCC-2. 1000A. #2TA. No of Verticals-11, Approx Dimension is. 2400(H) x 11400(W) x 1000(D) MM, Wt - 9.4 T.	No	1	0.0006514680
E5B.10	415V LT CW MCC-2. 250A. #. Approx Dimension is. 2400(H) x 5000(W) x 1000(D) MM, No. of Vertical-4, Wt-3.2 T.	No	1	0.0005477498
E5B.11	415V LT U-2 BA & COMP PMCC-2B. 1000A. #. Approx Dimension is. 2400(H) x 15600(W) x	No	1	0.0008654412

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	1000/1500(D) MM, No of Verticals-16 Wt- 14.2 T.			
E5B.12	415V LT SOOT BLOWER MCC-2. 63A. #. Approx Dimension is. 2400(H) x 4500(W) x 1000(D) MM, No. of Verticals-44, Wt-35.2 T.	No	1	0.0010100863
E5B.13	415V LT BOILER V&D ACDB-2. 250A. #2HA. Approx Dimension is. 2400(H) x 15250(W) x 800(D) MM, No. of Verticals-15, Wt-9.75 T.	No	1	0.0008656695
E5B.14	415V LT TURBINE VALVE ACDB-2. 250A. #2KA. Approx Dimension is. 2400(H) x 22850(W) x 800(D) MM, No of Verticals-23, Wt - 15 T.	No	1	0.0007826170
E5B.15	415V LT BOILER ACDB-2. 400A. #2HB. Approx Dimension is. 2400(H) x 5750(W) x 800(D) MM, No of Verticals-5, Wt-3.25 T.	No	1	0.0005477498
E5B.16	415V LT UNIT SERVICE ACDB-2. 630A. #2QA. Approx Dimension is. 2400(H) x 9100(W) x 800(D) MM, No of Verticals-9, Wt- 5.85 T.	No	1	0.0008272556
E5B.17	415V LT OIL FILTERATION ACDB-2 (OUTDOOR PANEL). 400A. #. Approx Dimension is. 2400(H) x 1950(W) x 800(D) MM, No. of Verticals-1, Wt- 0.65 T.	No	1	0.0003896416
E5B.18	415V LT Unit Emergency MCC #2DG (3000A). Approx overall dimension 25000x1700x2450mm, No of Verticals-26, Weight- 16.9 T.	No	1	0.0020893052
E5B.19	415V LT BA ACDB-2 (OUTDOOR PANEL). 400A. #. Approx Dimension is. 2400(H) x 1950(W) x 800(D) MM, No. of Verticals-1, Wt- 0.65 T.	No	1	0.0003896416
E5B.20	220V MAIN DCDB-2. 1000A. #2FA. Approx Dimension is. 2400(H) x 12400(W) x 800(D) MM, No. of Verticals-12, Wt - 7.8 T.	No	1	0.0012220941
E5B.21	415V LT AIR WASHER MCC-2. 630A. #2SA . Approx Dimension is. 2400(H) x 7400(W) x 1000(D) MM, No. of Verticals-7, Wt - 6.2 T.	No	1	0.0005477498
E5B.22	415V BUNKER PMCC, 2500A, No. Of verticals - 14, Panel Size2400(H) x 15000(W) x 1000/1500(D) MM, Approx. Weight (11.8 Tons)	No	1	0.0007831455
E5B.23	415V LHP/GHP PMCC, 3000A, No. Of verticals-20, Panel Size2400(H) x 20200(W) x 1000/1500(D) MM, Approx. Weight (17 Tons)	No	1	0.0010618914

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E5B.24	415V TRACK HOPPER / STACKER RECLAIMER PMCC, 2 BOARDS EACH WITH 2 I/C AND NO B/C 3000A, No. Of verticals - 25, Panel Size 2400(H) x 25200(W) x 1000/1500(D) MM, Approx. Weight (21.2 Tons)	No	2	0.0010826596
E5B.25	415V CHP CRUSHER HOUSE PMCC, 3000A, No. Of verticals 21, Panel Size 2400(H) x 21200(W) x 1000/1500(D) MM, Approx. Weight (17.8 Tons)	No	1	0.0010826596
E5B.26	415V CLASSIFIER PMCC, 2500A, No. Of verticals 18, Panel Size 2400(H) x 19000(W) x 1000/1500(D) MM, Approx. Weight (15 Tons)	No	1	0.0008506611
E5B.27	415V ASH SILO PMCC, 2500A, No. Of verticals - 27, Panel Size 2400(H) x 28000(W) x 1000/1500(D) MM, Approx. Weight (22.2 Tons)	No	1	0.0013146581
E5B.28	415V ASH WATER/ASH SLURRY PMCC 3000A, No. Of verticals - 21, Panel Size 2400(H) x 21600(W) x 1000/1500(D) MM, Approx. Weight (17.8 Tons)	No	1	0.0012373253
E5B.29	415V BA ACDB-1 (OUTDOOR PANEL) 400A, No. Of verticals - 1, Panel Size 2400(H) x 1950(W) x 800(D) MM, Approx. Weight (0.65 Tons)	No	1	0.0003896416
E5B.30	415V CHP MAIN DCDB 100A, BOARD NO #0FC, No. Of verticals - 4, Panel Size 2400(H) x 4800(W) x 800(D) MM, Approx. Weight (2.6 Tons)	No	1	0.0005477498
E5B.31	415V AHP DCDB 100A, BOARD NO #0FD, No. Of verticals - 4, Panel Size 2400(H) x 4800(W) x 800(D) MM, Approx. Weight (2.6 Tons)	No	1	0.0005477498
E5B.32	LIMESTONE/ GYPSUM PMCC, 2 BOARDS EACH WITH 2 I/C AND NO B/C. 2500A. #0DC & 0DN. Approx Dimension is. 2400(H) x 47400(W) x 1000/1500(D) MM	No	2	0.0012234281
E5C	STARTER PANEL/BOXES/POWER DISTRIBUTION BOX/MARSHALLING BOXES			
E5C.01	Electronic Control Panel (including ARECA Controller-96 nos), Electronic Control Panel, overall dimensions approx. 600W x 550D x 2000H mm, approx. weight of each panel 0.15 MT. ARECA-III Controller approx. dimension 280 x 210 x 210 mm, rotary switches (108 Nos.), etc along with cables and connectors, shall be supplied loose for mounting in the panel at site.	No	96	0.0054775457

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E5C.02	IOS Data Logger PC, Embedded IOS with enclosure box, Computer Furniture, Printer etc.	Set	1	0.0000673637
E5C.03	HMI Console for DC Panel	No	1	0.0008594980
E5C.04	ALCS Control Panel	No	6	0.0002686550
E5C.05	MULTIMEDIA CLEANING DEVICE PANEL	No	1	0.0000570578
E5C.06	HIGH PRESSURE PUMP STARTER PANEL	No	1	0.0000570578
E5C.07	Ground Brush Monitoring System	Set	1	0.0000569786
E5C.08	Rotor Flux Monitoring System including Sensors & Monitoring unit as per drawing.	Set	1	0.0000863679
E5C.09	Erection , Testing and Commissioning of Online Moisture Removal System for Generator Transformer	No	1	0.0000727824
E5C.10	3D Acoustic level transmitter/scanner for first field ESP along with probe head assembly, electronic unit, JB, etc.	No	12	0.0006837565
E5C.11	DC motor starter panels, etc (DC JOP, DC EOP, Seal oil panel, DC Scanner fan), including resistance boxes.	No	6	0.0005182112
E5C.12	Dynamic Braking Resistance box (DBR) as per drg no. 4540-001-102-PVE-Y-009	Set	7	0.0005709912
E5C.13	Local Motor Starter Panels (flame proof/Non-flame proof)	No	110	0.0009376761
E5D	DRY TYPE TRANSFORMER			
E5D.1	2500/2000 kVA, 11/0.433kV Dry Type Transformer with off load tap switch, including all loose accessories of transformer etc.	No	6	0.0039919956
E5E	PANELS			
E5E.01	Generator, Generator Transformer, Unit Transformer, Control, protection & Metering panels (5 Panels). Approx dimension of each panel 2315x800x800mm	Set	1	0.0014448376
E5E.02	Station Transformer Control, protection & Metering panels (2 Panels). Approx dimension of each panel 2315x800x800mm	Set	1	0.0003476799
E5E.03	BTS Panel. Approx. overall dimension of each panel 3200x2800x2927mm. Each set contains 2 panels.	Set	3	0.0013182936
E5E.04	Erection of Local Panels / JB / Welding Sockets (up to 100 kG)	No	8	0.0002062462
E5F	220Volt DC BATTERY & BATTERY CHARGER SYSTEM			
E5F.01	220Volt DC Battery Charging System which includes DC battery (Each having 2 strings of 169 nos. 670AH battery. 8 Nos. of Battery	Set	2	0.0033021224

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	health Monitoring System) and DC Battery Charger (550A) for Main Plant .			
E5F.02	Complete installation & commissioning of 220V DC NiCad Battery Banks (170*2 cells) , Fuse box, battery stands and Cabling from battery to charger panels, BHMS if any and DCDB including battery health management system etc. Cabling implies laying,dressing of cables and supply & erection of cable glands, lugs, tags, ferrules, clamps, conduits etc. included in this line item along with charging and discharging of Batteries as per OEM standard along with Erection of 220V DC Battery Charger with Fuse Box Size: 1600 mm (L) x 800 mm(D)x 2100 mm(H) (AHP,CHP, LHP & GHP)	Set	4	0.0051057035
E5G	DIGITAL AUTOMATIC VOLTAGE REGULATOR FOR BRUSHLESS EXCITATION SYSTEM			
E.5G.1	Transportation from store / storage yard to erection site, Erection, Assembly, Testing & Commissioning of Digital Excitation Equipments / System, System consist of DAVR panels.	Set	1	0.0006813094
E5H	VARIABLE FREQUENCY DRIVE SYSTEM FOR CEP/RC Pump/APH/other systems			
E5H.1	Transportation from stores/ storage yards to erection site, erection, assembly, testing & commissioning of Variable Frequency Drive System consisting of IGBT based VFD Panel and transformer for CEP-A, B, C , RCP & APH 1. VFD FOR DYNAMIC CLASSIFIER - 7 Nos 2. VFD for Oxidation Blower - 2 Nos 3. 3.3 KV, 1200 KW VFD for CEP Motor - 3 Nos 4. 3.3 KV, 1200 KW VFD for RCP Motor - 1 No 5. 415V, 37 KW VFD for APH Motor - 2 Nos	Set	15	0.0894620898
E5I	MISCELLANEOUS EQUIPMENT			
E5I.01	Ash Level Indicator comprising of level probe with extension lagging pipe, Electronic Unit, Interconnecting PTFE Cabling, Conduit, etc.	Set	192	0.0012499663
E5I.02	Opacity Monitor consisting of Transmitter & Receiver, Electronic Unit, Air Blower unit, Weather Proof housings, Junction boxes, flexible hoses, mounting flanges with pipe for Transmitter, Receiver & Air blower,	Set	6	0.0004194928

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	interconnected cables etc. for mounting on ESP outlet duct.			
E6	ABOVE GROUNG/BELOW GROUND EARTHING & LIGHTNING PROTECTION MATERIALS			
E6.01	14 SWG GI wire	Meter	132900	0.0065999412
E6.02	8 SWG/3.15 Dia GI wire	Meter	31200	0.0013688692
E6.03	65x8mm GS flat	Meter	27500	0.0218662186
E6.04	50x6mm GS flat	Meter	35700	0.0204483270
E6.05	25x6/30X5 mm GS flat	Meter	26067	0.0093242382
E6.06	25x3mm GS flat	Meter	7000	0.0024259137
E6.07	Ground Electrode with 40mm Dia rod (One end Sharpened) 3000mm long located along the periphery of Earthing Grid (Without Treated Pit Other than Earth Test Pit)	NO	150	0.0018409677
E6.08	GS Rod 20mm dia Vertical Air Termination	No	236	0.0027163541
E6.09	Test Links with 150x150x3mm GS flat	No	311	0.0008029265
E6.10	Flexible braided Copper conductor of 600mm with tinned Cu, clamp connected by U-bolt for fence gate earthing.	No	15	0.0000028189
E6.11	50NB gal MS pipe(PERF) (for neutral earthing along with salt, sand, charcol & chamber with cover)	No	57	0.0011091348
E6.12	Earth Insulating rubber mat (LT & HT)	No	555	0.0003014141
E6.13	Treated Earthpit with supply & E&C of earthing electrode including brick chamber with cover, accessories etc. complete in all respect (Treated Earth Pit and its test links - 0.4 m3 bentonite (1 cubic meter of Bentonite weighs 593 kilograms) in each pit. Earth electrode to be cut by contractor from full length. Including the supply of Bentonite and salt as required. Measurement of earth pit resistance and recording with customer signature)	No	160	0.0215773309
E6.14	Testing, commissioning and charging of Treated Earth Pits / Earth grid in each equipment area - 10 fine readings in each area as per Technical Specification One grid means all the earth pits of a building in totality including both earthing and lightning along with submisison of report (MCC, JNT,	Pits / grids	114	0.0136908572

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	PH, Con Gallery, Cable rack etc) (1 Unit =1 Building)			
E7	BUS DUCTS			
E7A	LT BUS DUCTS (NSPBD)			
E7A.01	415V, 1000A/ 1600A/ 2500A/ 3000A/ 4000A, LT Bus Duct (NSPBD) (For MCC/Emergency MCC/ PMCC/ FGD PMCC/ ESP/DG Boards/ CHP/AHP/LHP/GHP). Loose items like silicagel Breather pipe, GI Channel Supports and associated accessories.	Meter	543	0.0108904220
E7B	LT BUS DUCTS (SANDWICH BD)			
E7B.01	415V, 3000A, LT Bus Duct (Sandwich BD) (For MCC/Emergency MCC/ PMCC/ FGD PMCC/ ESP/DG Boards only). Loose items like silicagel Breather pipe, GI Channel Supports, assembly, adopter box, Flex, Bellow, Phase cross over and associated accessories.	Meter	150	0.0022588501
E7C	HT BUS DUCTS (SPBD)			
E7C.01	111kV, 3750A, SPBD from ST-1 to 11kV STN SWBD-0BA. (Including enclosures, Conductors, Chennel boxes, erection of Support structure, duct earthing, support insulator, space heater etc. which shall be supplied by manufacturing unit)	Meter	196	0.0060917846
E7C.02	3.3kV, 2500A, SPBD from UAT-2 to 3.3kV unit switchboard. (Including enclosures, Conductors, Chennel boxes, erection of Support structure, duct earthing, support insulator, space heater etc. which shall be supplied by manufacturing unit)	Meter	94	0.0016165827
E7C.03	11kV, 2500A, SPBD from UT-2 to 11kV Unit switchboard. (Including enclosures, Conductors, Chennel boxes, erection of Support structure, duct earthing, support insulator, space heater etc. which shall be supplied by manufacturing unit)	Meter	147	0.0033552457
E7C.04	11kV, 2500A, SPBD from TIE-17 & TIE-18 to 11kV SWBD. (Including enclosures, Conductors, Chennel boxes, erection of Support structure, duct	Meter	23	0.0005243284

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	earthing, support insulator, space heater etc. which shall be supplied by manufacturing unit)			
E7C.05	Shifting of 3.3/11kV SPBD (Without inside conductor to site), if 11kV SPBD enclosures are supplied to site in loose condition in future)	No (pieces)	30	0.0004009237
E7C.06	Shifting of 3.3/ 11 KV loose conductors from BHEL store (works include loading, shifting & unloading), if 11kV SPBD conductors are supplied to site in loose condition in future)	No (pieces)	30	0.0000841613
E7C.07	Assembly of 3.3/ 11kV SPBD conductors in its SPBD for readiness, if 11kV SPBD enclosures & conductors are supplied to site in loose condition in future)	No (pieces)	30	0.0001366656
E7C.08	Space heater fixing, including wiring in SPBD Ducts	No	20	0.0001883978
E7D	NEUTRAL GROUNDING RESISTOR			
E7D.01	Neutral Grounding Resistor including NGR support structure 3.3/11kV	No	8	0.0132487305
E7E	HT BUS DUCTS (IPBD)			
E7E.01	Isolated Phase Bus Duct main run (21/24kV: 24000A- approx length 270 mtrs (200 kg/Mtr)), Isolated Phase Bus Duct Delta Run (21/24kV: 14000A- approx length 150 mtrs (150 kg/Mtr)), Isolated Phase Bus tap off run (21/24kV: 2800A- approx length 140 mtrs (120kg/Mtr)) (Including SPVT Cubicle (1 set), NG Cubicle (1 set), Air pressurisation equipment (3 MT) (load consist of compressor and receiver -1 set, Drier and pressuring panel- 1 set, Control panel- 1 set) , Support structure for IPBD - 50 To ns etc) (Including support structure, conductor, shunt & enclosure weting (Al.), CT, NG Cubicle (2 MT) along with NG Transformer & Resistance, Earthing of duct, support insulator, etc.) as per technical specification, enclosed drawing and technical data sheet -4540-001-207-PVE-Y-006	Set	1	0.0215937805
E8	OIL FILLED TRANSFORMERS (GT, UT, UAT & ST)			
E8.01	Single Phase 265MVA, 420/21kV, OFAF cooled YNd11 (after 3-ph bank formation), Generator Transformer (GT) including all accessories, piping, cabling etc.	Set	3	0.0305129633

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E8.02	130/65/65 MVA, 3-phase, 400/11.5/11.5kV Station Transformer (ST), OLTC, ONAF/ ONAN including all accessories, piping, cabling etc.	Set	1	0.0072150152
E8.03	40 MVA, 21/11.5kV Unit Transformer (UT) including all accessories, piping, cabling etc.	Set	2	0.0082784111
E8.04	12.5 MVA, 11/3.45kV Unit Aux Transformer including all accessories, piping, cabling etc.	Set	2	0.0046026778
E8.05	7.5 MVA, 11/3.45kV FGD Aux Transformer including all accessories, piping, cabling etc.	Set	2	0.0038444187
E8.06	1600/ 2000/ 2500 kVA, 11/0.433kV Auxiliary Transformer (3 phase, 4 wire, ONAN) including all loose accessories of transformer etc.	No	25	0.0340766042
E8.07	16/12.5MVA, 11/3.45kV CHP/AHP Aux Transformer including all accessories, piping, cabling etc.	No	4	0.0092053555
E9	ONLY TESTING & COMMISSIONING			
E9.01	Heating elements for Hopper Heater of ESP.	Mod	1728	0.0045094504
E9.02	Heating elements for Support Insulator Heater, Shaft Insulator Heaters of ESP.	No	480	0.0012780433
E9.03	HighVoltage Rectifier Transformers (95kV peak, 1000 mA) including oil filtration.	No	96	0.0048540818
E9.04	Testing & Commissioning of Collecting, Emitting, GD Screen Motor	No	204	0.0018003886
E9.05	Testing and commissioning of 3.3kV & 11kV HT motors including dryout.	No	87	0.0068984946
E9.06	Testing and commissioning of 415V LT motors including dry out.	No	1213	0.0474387144
E9.07	Testing, commissioning and charging of SFU / MCB / MCCB outgoing feeders	No	1440	0.0128329543
E9.08	Generator System Testing	No	1	0.0009683260
E9.09	Testing & Commissioning of Wall, Long Retractable, Air Heater Soot Blower (Not Motors)	No	200	0.0005187304
E9.10	Testing & Commissioning of Furnace Temperature Probe	No	2	0.0000158179
E9.11	Thermostats including Calibration	No	108	0.0002816426
E9.12	Electrically (LT) Operated Valves, Dampers and Gates with Actuators, Limit Switches, etc. (Regulating & ON/OFF Type).	No	450	0.0039730627
E9.13	Electrical Operated Hoist at various area like ESP, Mill, IDF, PAF, FDF, Vacum Pumps, BFP, CW & ACW etc area	No	16	0.0003428863
E9.14	Testing and Commissioning of H2 Drier Panels.	No	1	0.0000270071

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E9.15	1750kVA, 3-phase, 415V Diesel Generator (DG) set. approx Weight 42 MT (drawing enclosed)	Set	1	0.0000368599
E10	NAS Filtration and Particle counting for 400kV or above Oil filled transformers inclusive of transportation	Ltrs	288380	0.0039068672
E11	Supply of Consumables for AHP, CHP, LHP & GHP related E&C works			
E11.1	Supply of Outdoor HT End Termination kit -3C above 120Sq.mm upto 300Sq.mm	No	10	0.0009102455
E11.2	Supply of Indoor HT End Termination kit -3C above 120Sq.mm upto 300Sq.mm	No	157	0.0142908538
E11.3	Supply of out door HT Straight through Jointing kit -3C above 120Sq.mm upto 300Sq.mm	No	8	0.0009526363
E11.4	Supply of out door HT End Termination kit - 1CX300Sq.mm upto 630Sq.mm	No	12	0.0010922946
E11.5	Supply of In door HT End Termination kit - 1CX300Sq.mm upto 630Sq.mm	No	12	0.0010922946
E11.6	LT Power cable straight through jointing kit for 3C/3.5C/4C upto 35 Sq.mm including supply of Staright through joiting Kit and other consumables	No	20	0.0001537631
E11.7	LT Power cable straight through jointing kit for 3C/3.5C/4C Above 35 Sq.mm upto 95 Sq.mm including supply of Staright through joiting Kit and other consumables	No	30	0.0002391425
E11.8	LT Power cable straight through jointing kit for 3C/3.5C/4C Above 95 Sq.mm upto 185 Sq.mm including supply of Staright through joiting Kit and other consumables	No	30	0.0003277580
E11.9	LT Power cable straight through jointing kit for 3C/3.5C/4C Above 185 Sq.mm upto 400 Sq.mm including supply of Staright through joiting Kit and other consumables	No	65	0.0009310743
E11.10	Supply of Cable Clamping materials (25mm x 3mm x 2mm aluminium flat)	Meter	30000	0.0138723749
E11.11	Supply of Concrete / Insulator Compound blocks (approx 200mm x 200mm x 75 mm) for resting Lightning conductor at roof top.	No	1000	0.0003660625
E11.12	Supply of Hardwares (Nuts, bolts with spring & plain washers) Fitting of Lightning Conductor (25 x 4 - 9000 meters) for Horizontal down conductors	KGs	100	0.0001108025

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E11.13	supply of erection steel of various sizes as per site requirement	MT	4	0.0027746419
E11.14	Supply of 32 mm dia Flexible conduit along with Couplers	Meter	500	0.0004816937
E11.15	Supply of 32 mm dia GI conduit along with Couplers	Meter	500	0.0013247281
E11.16	Supply of Spacers , Saddles & bolts for 32mm dia GI conduit	sets	100	0.0000022485
E11.17	Supply of 100 mm dia GI Pipe	Meter	500	0.0021677062
E11.18	Supply of Terminal Blocks (for cable terminations in bidder scope) for 0.5/2.5 sqmm cable	No	1000	0.0001124271
E11.19	Supply of Shorting Links for TB shorting.	No	500	0.0000722906
E11.20	Supply of Copper Bus bars	KGs	100	0.0008568179
E11.21	Supply of CJB - 80 terminal Control Junction Box	No	5	0.0003151359
E11.22	Supply of CJB - 50 terminal Control Junction Box	No	5	0.0003151359
E11.23	Supply of PJB - With Bus bar to facilitate 240Sqm Cable 4 Runs	No	5	0.0000661125
E11.24	Supply of ISI Marked HDPVC pipes - 32mm dia	Meter	2500	0.0044075624
E11.25	Supply of Cotton waste, cleaning cloth etc	KGs	50	0.0000139128
E11.26	Supply of Heavy duty PVC pipes - 90mm dia	Meter	200	0.0004231192
E11.27	Supply of Hume pipe type NP2 - 300 mm dia	Meter	100	0.0003878621
E11.28	Cable clamps/ties of SS-316 material, 12mm wide, polyester coated ladder lock type with self-locking arrangement & sufficient strength in individual pieces of suitable length to meet the site requirements.	No	150000	0.0080404257
E11.29	Identification / Marking of equipments Painting(Yellow base and Black Coloured letter) - Considering 16 letters x (8-15) mm height each.	Sets	2000	0.0022185143
E11.30	Lamination , framing & Mounting of CHP / AHP Flow Diagrams in Control Room- A0 size.	No	20	0.0003327814
E11.31	Anchor bolts including Supply & Fixing-Supply and Erection	No	1000	0.0004046478
E11.32	LT Power cable Gland Upto cable OD upto 22mm	No	1350	0.0003039281
E11.33	LT Power cable Gland cable OD Above 22mm Upto 28mm	No	650	0.0001724671
E11.34	LT Power cable Gland cable OD Above 28mm Upto 35mm	No	500	0.0002974958

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E11.35	LT Power cable Gland cable OD Above 35mm Upto 45mm	No	360	0.0003212954
E11.36	LT Power cable Gland cable OD Above 45mm Upto 50mm	No	120	0.0001374913
E11.37	LT Power cable Gland cable OD Above 50mm Upto 62mm	No	180	0.0003118881
E11.38	Long barrel lug for 2.5Sqmm LT power Cable	No	2750	0.0000899188
E11.39	Long barrel lug for 10Sqmm LT power Cable	No	900	0.0000294280
E11.40	Long barrel lug for 16Sqmm LT power Cable	No	850	0.0000277931
E11.41	Long barrel lug for 25Sqmm LT power Cable	No	1750	0.0000572210
E11.42	Long barrel lug for 35Sqmm LT power Cable	No	700	0.0000228884
E11.43	Long barrel lug for 50Sqmm LT power Cable	No	1350	0.0000441419
E11.44	Long barrel lug for 70Sqmm LT power Cable	No	850	0.0000277931
E11.45	Long barrel lug for 95Sqmm LT power Cable	No	550	0.0000179838
E11.46	Long barrel lug for 120Sqmm LT power Cable	No	400	0.0000130791
E11.47	Long barrel lug for 150Sqmm LT power Cable	No	400	0.0000130791
E11.48	Long barrel lug for 185Sqmm LT power Cable	No	150	0.0000049047
E11.49	Long barrel lug for 240Sqmm LT power Cable	No	800	0.0000495290
E11.50	Long barrel lug for 300Sqmm LT power Cable	No	50	0.0000030956
E11.51	Long barrel lug for 630Sqmm LT power Cable	No	250	0.0000231162
E11.52	Long barrel lug for 150Sqmm HT Power Cable	No	550	0.0000179838
				1.000000000000