VOLUME - IA

Technical Conditions of Contract (TCC) for "Erection, Testing & Commissioning of Composite Work-Mechanical, Piping, Electrical, C&I work and Material Management Works"

FOR

Demonstration of Methanol Firing in One GT at NTPC Kayamkulam, Kerala

BHARAT HEAVY ELECTRICALS LIMITED

	Technical Conditions Of Contract (TCC) **PROJECT ENGINEERING & SYSTEMS DIVISION** **HYDERABAD**	Ref No: HY/PE&SD/Projects/TCC/2024-25/Electro-Mech/NTPC-Kayamkulam/01 Rev. No. 00

TECHNICAL CONDITIONS OF CONTRACT (TCC)

FOR

"Erection, Testing & Commissioning of Composite Work-Mechanical, Piping, Electrical, C&I work and Material Management Works"
FOR
Demonstration of Methanol Firing in One GT at NTPC Kayamkulam, Kerala

Revisions:	Prepared By:	Checked By:	Approved By:	Date
Refer to record of revisions				18.09.2024
	Priyabrata Padhiary	Satyajit Das	Arif Naiyer	

Chapter I- Project Information

1.0 Project Details			
1	Customer	:	NTPC, Kayamkulam, Kerala
2	Project Information	:	Demonstration of Methanol Firing in One GT at NTPC Kayamkulam
3	Location	:	Kayamkulam, Kerala
4	Address Detail	:	Choolatheruvu, Haripad in Alappuzha district, Kerala, India
5	Nearest Railway Station	:	Cheppad halt RS, Harippad RS
6	Road Approach	:	38KM towards South from District Head quarters
7	Nearest Air Port	:	Trivandrum International airport (Approx. 110.0 Km), Kochi International Airport (Approx. 99.0 Km)
11	Ambient Air Temperature (Average)	:	a) Maximum : 30^0 C b) Minimum : 25^0 C
12	Average Relative Humidity	:	73%
13	Climatic Condition	:	Tropical Climate

Bidder is advised to visit the project site and appraise himself about the local conditions and infrastructure available in the area for fulfilling their commitments under the contract. BHEL will not admit any claims whatsoever on account of Contractor's non-familiarization of local conditions.

Chapter II- Scope of Work

1. **Scope:** BHEL has received an order from NTPC for the work of "Demonstration of Methanol Firing in One unit of GT of Rajiv Gandhi Combined Cycle Power Plant, Kayamkulam (2 X 115 MW + 1 X 120 MW) at NTPC Kayamkulam", Kerala.

   Contractor's Scope of works shall be carried out by the Contractor according to the relevant Construction Specifications provided by BHEL and NTPC (or PMC of NTPC) as part of the Contract Specification. Scope under this document shall comprise but not limited to the following: (All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified)

2. **Erection, Testing and Commissioning of Piping system:**

Note-All piping including all sizes both below NB 50 and above NB 50 are Non IBR.

2.1 All Piping of size NB50 and above, shall be supplied by BHEL as per the following philosophy:

a) Pipes will be supplied loose in single random length of 3 to 7 meters.

b) All Stubs (Pressure tap-offs, Temp tap-offs, Vent & Drain tap-offs and all pipe to pipe tees & stubs) will be supplied loose.

c) All Fittings will be supplied loose duly edge prepared as per requirement.

d) All Flanges, Gaskets & Stud Nuts will be supplied loose.

e) All Valves will be supplied loose.

f) Cutting of Pipes, Spool preparation, Edge preparations, Welding of Branches & Stubs and the final field welding of Pipe Spools & Fittings and all other erection activities as required by respective P&ID's, Piping Isometric and Piping Layout drawings shall be carried out at site and the same are in Erection Agency's scope.

g) Surface Preparation, Supply & Application of Primer and paint as per Customer Specification is in the scope of the Erection Agency.

h) Welding Electrodes shall not be supplied by BHEL and the same shall be arranged by Erection Agency.

2.2 All Piping of size below NB50, shall be supplied by BHEL as per the following philosophy:

a) Pipes will be supplied loose in single random length of 3 to 7 metres.

b) All Stubs (Pressure tap-offs, Temp tap-offs, Vent & Drain tap-offs and all pipe to pipe tees & stubs) will be supplied loose.

c) All Fittings, Flanges, Gaskets & Stud Nuts will be supplied loose.

d) All Valves will be supplied loose.

e) Cutting of Pipes, Spool preparation, Edge preparations, Welding of Branches & Stubs and the final field welding of Pipe Spools & Fittings and all other erection activities as required by respective P&ID's, Piping Isometric and Piping Layout drawings shall be carried out at site and the same are in Erection Agency's scope.

f) Surface Preparation, Supply & Application of Primer as per Customer Specification is in the scope of the Erection Agency.

g) Welding Electrodes shall not be supplied by BHEL and the same shall be arranged by Erection Agency without any extra cost.

3. The supplied piping items shall be with rust preventive coating outside. Surface preparation, painting (Supply & Application) and identification mark-up shall be carried out by the Erection agency as per the applicable customer specification of all piping and support.

4. Pipe shoe fabrication and welding of the pipe shoe to the Main Pipe including welding of shoe pad is in scope of Erection Agency.

5. Fabrication and Installation of Auxiliary Structure for Pipe Supports is in the scope of Erection Agency.

6. Surface preparation of Structural Steel supplied for Pipe & Cable Tray Supports is in the scope of Erection Agency. Supply & Application of Primer and Final painting for the structural steel is also in the scope of Erection Agency.

7. In general, Embeded steel plates / Concrete pedestals with a steel plate are provided on the Grade/ Floor/ Wall/ Slab / Ceiling for Pipe Supports. However, if such provision is not made because of any reason, where a pipe support is envisaged, then a steel plate shall be provided with the help of Anchor fasteners by Erection Agency. Procurement of Anchor Fasteners (if required) and Installation of Steel Plate with the help of Anchor fasteners shall be in the scope of Erection Agency.

8. The Material required for temporary supports are to be arranged by Erection Agency.

9. Access platforms (scaffolding at all height) wherever required as per Piping Layout/ as per final site conditions, are in the scope of Erection Agency.

10. Valves are supplied by BHEL PE&SD Vendors.
11. The final piping hook-up at all the Terminal Points is in the Scope of Erection agency.

12. NB40 & below piping shall be site routed by Erection Agency. Indicative routing of these lines shall be provided by PE&SD, wherever possible. Erection Agency to take prior approval from PE&SD for routing of the site routed lines.

13. All items supplied shall be properly stored until erection. Erection agency to ensure that items supplied are not damaged due to poor storage conditions.

14. Temporary gasket and other consumable required during erection and pre-commissioning activities shall be supplied by erection agency.

15. Supply and installation of Hose pipe of length not more than 30 M and Size=NB 40, Coupling size for connection to tanker shall be taken as per site suitability, shall be in contractor's scope, within the quoted rate of item no. D (1) of SOQ (Pre-commissioning & Commissioning…..).

16. Contractor's scope of work for Piping System and other mechanical works shall be as following:

i) Receipt of material from BHEL store, transportation to site,
ii) Inspection, obtaining statutory approvals/ certificates as applicable,
iii) Preparation, erection, leveling, centering, alignment, grouting as applicable, Pre-assembly, Erection, Alignment, Welding, NDT, fixing of hangers & supports,
iv) As required and per technical specification- Chemical cleaning / pickling, oil flushing, water flushing, hydro testing & steam blowing including temporary piping and pumps required for testing,
v) Surface finish, supply & application of primer & finish paints of all the pipes including pipe fittings and support structures as per requirement / as given in the drawings including labeling & flow direction on the piping & hangers and supports,
vi) Pre-commissioning, commissioning, trial operation & handing over to customer and supply & application of final painting, etc. for all the piping systems
vii) Any modification to be carried out at site (to be duly approved by PE&SD) shall be done by the contractor.

i) Fabrication and Installation of Auxiliary Structure for Pipe Supports is in the scope of Contractor. Necessary Structural Steel and Plates shall be supplied loose by BHEL.
ii) Surface preparation of Structural Steel supplied for Pipe & Cable Tray Supports is in the scope of contractor. Supply & Application of Primer and Final painting for the structural steel is also in the scope of contractor.

iii) The material required for temporary supports are to be arranged by contractor.

iv) Access platforms wherever required as per piping Layout/ as per final site conditions, are in the scope of Contractor.

v) NB40 & below piping shall be site routed by Contractor. Indicative routing of these lines shall be provided by BHEL. Contractor to take prior approval from BHEL for routing of these lines.

vi) Erection and Commissioning of Piping Systems/mechanical works shall be carried out by the Contractor according to the relevant Construction Specifications provided by BHEL and NTPC (or PMC of NTPC) as part of the Contract Specification.

17. **Material Handling Services**

17.1 Material Handling services: The scope of work in general are receipt of project material, unloading, storing, preservation, issuing of material with proper documentation at NTPC, Kayamkulam on as and when required basis along with the supply of all consumables (slippers, wooden planks, supports, Tarpaulins) tools & tackles (Hydra/Crane, Slings etc.) and all type of manpower (Hydra operator, supervisor. Store keeper, Rigger, helper etc) required for Material handling.

a. It is not the intent to specify herein all details of material handling items. Any material handling work related to this project not covered, but necessary to complete the project will be deemed to have been included in the scope of the work.

b. The contractor shall take full responsibility for satisfactory handling of Material & reconciliation under overall guidance of BHEL and shall locate any cause of malfunction and rectify the same for proper operation.

c. The work shall be executed under the usual conditions without affecting project work and in conjunction with other operations and contracting agencies at site. The contractor and his personnel shall cooperate with the personnel of other agencies, co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

d. The contractor shall note that whenever required items/materials shall be unloaded at erection site / assembly yard by the prescribed route without disturbing and causing damage to other works in the most professional manner. All items, Hardware, etc., shall be stored in appropriate manner as per instructions of BHEL engineer.

e. Contractor shall deploy adequate Manpower for Material Management to meet scope of works and Minimum manpower & T&P's shall be available at site on continuous basis to meet the daily site requirements.

17.2 Guidelines for handling and storage of electronic cubicles / subassemblies / loose items.

a) 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.

b) 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.

c) 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 are exposed to rain, water/liquid splashing, dust or other harmful materials like chlorine gas, sulphur dioxide etc.

d) After opening the case, all supports provided for transport are to be removed with due care.

e) 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.

17.3 Storage

a) The equipment should be preferably 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.

b) The wooden pallet provided for packing itself can be retained for raised platform to protect equipment from ground damps, sinking into around and to circulate air under the stored equipment. This will also help in lifting packing with fork-lifter.

c) Periodic inspection if silica gel placed inside the equipment is necessary. It has to be replaced or regenerated when de - colorization takes place.

d) 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.

e) 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.

f) All the equipments, 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.

g) The packing material shall be retained if the cubicle is to be repacked after inspection.

h) All subassemblies should be kept in a separate place where it is easily accessible.

i) Subassemblies should have a protective cover in case it is stored without wooden packing/case to prevent accumulation of dust. Silica gel packets should also be kept along with it.

j) Subassemblies should not be stacked one above the other.

k) 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 categorised and stored separately.

18. **Electrical and C&I Works:**

The scope of work under this specification covers the receipt of materials from BHEL/ Customer stores/ storage yard, handling at stores/ storage yard, transportation to site of work, preassembly, erection, calibration, testing, pre-commissioning tests and checks, commissioning, trial run of various auxiliaries and equipment, achieving various milestones till handing over of the following electrical systems and associated items to BHEL's Customer:

18.1	**General Notes for Erection and Commissioning works for electricals items/equipment.**
1	Erection agency shall carry out the Illumination, Earthing & Lighting protection and cabling works in line with customer/consultant's Technical specifications and "Illumination, Earthing & Cabling layout for Methenol storage tank area, DRG no: PY-LC-0-M231-2012-01 R00 & KEY SLD, DRG no: PY-DL-1-M160-8801-01 R01.
2	Erection Agency shall arrange all the tools and facilities required for calibration, erection and testing required for Erection & Commissioning activities.
3	Obtaining statutory approvals from PESO, Electrical Inspector or any other Governing Agencies shall be in Erection Agency scope.
4	Marked-up documents/drawings have to be prepared and provided by Erection Agency to PE&SD-Engg after E&C to enable submission of contractual 'As-Built" documentation.
5	**Notes for Earthing and lightning Material:** i) Below ground Electrical earthing is not in BHEL's scope. BHEL scope is limited to earthing of BHEL supplied equipment from earth risers. ii) Zinc rich paint for welded joints of earthing strip shall be supplied by site contractor.

6	**Notes for cable trays:** i) All the Pre-fabricated Perforated type Cable Trays are made out GI Sheets. Minor modification work by cutting, welding wherever required shall also be part of work. ii) Supporting steel shall be painted as per contract before laying of cables. iii) Cable Trays shall be numbered as per layout drawing before laying of cables. iv) The cable trays shall be supported in general at a span of 1.5mtrs horizontally and at a distance of 1mtr vertically. v) Cable Tray covers shall be provided for the top most cable trays and vertical trays. vi) All Sharp edges and Burr on the trays shall be removed. vii) The holes in the Cable Trays shall be provided by the Cable Tray vendor, however in case of requirement of any additional holes to be drilled for Cable Trays for the purpose of Cable Tray Erection, same shall be done by the Erection Agency. viii) Cable trays shall be bolted to structural angle supports including making holes in structural angle support. Erection Agency shall ensure that all welded portion of cable trays shall be painted with anti-corrosive paint (one coat of approved Anti corrosive primer with 2 coat of cold galvanization paint). Supply of anti-corrosive Primer and cold galvanization paint for site painting of cable trays shall be in the Site contractor's scope.

7	**Notes regarding Erection of Cables and Accessories within quoted rate of the contractor:** i) The work shall include all clamping, fitting, fixing, soldering, tapping, compound filling, cable jointing, crimping, shorting and grounding as required for the complete job. Cables shall be checked for insulation resistance before and after jointing. All erection consumables shall be in Erection Agency's scope. Termination & Connection shall be carried out in such a manner as to avoid strain on the terminals. Cables shall be marked with cable numbers as per applicable drawing. ii) Cable Glands and Lugs are being supplied along with corresponding equipment like Illumination package, Wall mounted DB, etc. However, one lot of Glands and Lugs are being supplied to take care of shortages/mismatches at site. iii) Cables shall also be laid in existing cable cellar, cable duct bank, trays etc. as per site requirement. iv) All cables shall be provided with minimum 2mm thick Al strips as cable identification tags indicating cable designation in accordance with the cable schedule. The cable identification tags shall be provided at their entrance, at the ends, every 30mtrs and when the cable changes its direction/ elevation. The tags shall be of Stainless steel with the number punched on it and securely attached to the cable by not less than two turns of 16 SWG GI wire. v) For buried cable, the marker shall project at least 150mm above ground and shall be spaced at an interval of 30mtrs and at every change of direction. vi) Cables to be strapped to tray at interval not greater than 5000mm and at bends by means of self-locking nylon cable ties. vii) supply and installation of Cable marker for buried cable, self locking nylon cable ties shall be in site contractor's scope. viii) All G.I. pipes shall be laid as per layout drawings and site requirements. Before fabrication of various profiles of pipe by hydraulically operated bending machine (which is to be arranged by the site contractor), all the burrs from the pipes shall be removed. GI Pipes with bends shall be buried in oil/concrete in such way that that the bends shall be totally concealed. Laying of GI pipes shall be undertaken well before paving is completed and necessary co -ordination with paving agency shall be the responsibility of Electrical Contractor. The open ends of pipes shall be suitably plugged with G.I. plugs.

8	**Notes on Illumination package:** i) Fixtures, Accessories of lighting panel/JB like cable glands, Undrilled gland plate etc. will be supplied to site in loose parts as per standard packing and practices of OEM. Assembly and erection of the fixtures shall be carried out by Erection Agency. ii) Erection of all illumination items (including cutting/ threading /welding /Bending etc. of conduit/ pipe/ ISMC/ ISA/ MS Flats etc.) shall be carried out at site by Erection Agency as per the installation requirements. iii) All the required erection consumables (like rawl plugs, screws, check nuts, nuts & bolts, locking wire, insulation tape, sealing compound/plugs, washers etc.) which are not covered in above list but required for successful completion of the work shall be in the scope of Erection Agency. iv) Pipes & accessories of poles will be supplied in loose condition. Assembling and Erection of these poles shall be carried out by Erection Agency. v) All the necessary civil works for lighting pole including foundations etc. as well as structural works required for installation of these poles shall be in Erection Agency's scope within quoted rate of contractor. vi) Site team to ensure the completion of foundations for lighting poles before commencement of paving work in related areas.
9	**Notes on Structural steel for support:** i) Structural Steels for support" materials are supplied to make supports for cable trays (Overhead tray arrangement on pipe racks, Pipe sleeper & other arrangements as applicable for the project. These are also required for making of frames for junction boxes, lighting panels, lighting fixtures, base frames of Wall mounted DBs, stand for UPS etc. as per the project requirements. Drilling of holes/ cutting/ welding/ bending in structural steel for bolting/mounting of equipment shall be done by Erection Agency. ii) Erection Agency shall ensure that all steel structure used for electrical installation shall be painted with Red Oxide Zinc Chromate Primer and Intermediate & Final finish painting as per contract specification. Supply of Red Oxide Zinc Chromate Primer and paint for site painting of all Structural Steels (required support of Electrical equipment) shall be in the Erection contractor's scope. Erection Agency shall ensure that after welding and drilling (if any) of the steels bracket, above mentioned paint of approved shade shall be applied. Site shall carry out the structural steel works in line with customer/consultant's technical specifications.

18.2	The tentative consumables required for Electrical Equipment/Items shall be in Erection Agency's scope, apart from below mentioned, other consumable as required and as mentioned in the tender specification shall also be included in total quoted price of the erection agency.	UOM	QTY
1	One-meter-long earthing discharge rods	Nos.	1
2	Safety items like danger boards, Do not switch on, man on work, display charts, first aid boxes near LT panels etc.	Lot	1

18.3	**General Notes for Erection and Commissioning works For C&I items/equipment.**
a.	Erection Agency shall provide all the required services for installation, erection and commissioning of all the Equipment/ Packages / Systems in BOP Area for successful/satisfactory operation of the Plant including Receipt, Unloading, Storage & Handling of material, Erection & Installation, Commissioning, Calibration & Testing, and Final Painting etc.
b.	Erection Agency shall arrange all the tools and facilities required for calibration, erection and testing required for Erection & Commissioning activities.
c.	Obtaining statutory approvals from IBR, PESO, TAC, Electrical Inspector or any other Governing Agencies shall be in Erection agency's scope.
d.	Erection Agency shall ensure that Storage and Handling of the BOP equipment/Packages is carried out as per the recommendations of OEMs.
e.	Only general erection guidelines have been indicated in this document. Erection Agency shall follow the Erection & Procedures and requirements specified in the Customer's Technical Specifications / Contract Documents while executing the project. The responsibility for adhering to Customer's Technical Specifications/Contractual requirements shall be with Erection Agency.
f.	Instrument impulse lines are piping based with welded end connections. The pipe & pipe fitting shall be as per piping specification.
g.	Painting of impulse line, instrument / JB supports etc shall be in erection agency scope. Painting procedure as per main piping specification.

h.	The supply of paint, primer, painting tools shall be in Erection Agency scope.
i.	All site erected impulse lines are subject to hydro test, radiography test in line with mother pipe requirements, same shall be in erection agency scope.
j.	Calibration of instruments before erection shall be carried out by Erection Agency.
k.	Installation of field instruments along with necessary impulse pipes and mounting materials as per the installation drawings. Installation of Junction boxes along with necessary angles/channels etc. shall be in Erection Agency Scope.
l.	The Erection Agency shall carry out complete loop-checking starting from primary field instrument up to the secondary instrument.
m.	Erection Agency shall arrange their own test equipment, erection tools, workshop equipment, erection consumables etc.
n.	Erection Agency shall carry out cable termination at bother ends of cables/ tubes.
o.	Loop checking from control room up to final control element & vice versa as required are in Erection Agency scope.
p.	Performing continuity and insulation test for all cables.
q.	Cable & cores dressing inside the control room & Junction boxes.
r.	Re-calibration of field instruments /loop if required.
s.	Agency shall provide necessary assistance /co-operation to other vendors for system integration, as required.
t.	The Instrument Hook up material will be supplied loose to site by BHEL. Fabrication and assembling of the instrument impulse line connections at site as per provided design documents shall be carried out by Erection Agency
u.	Erection agency shall fabricate the instrument supporting structures, stands generally as per drawings issued. However, these support details can be modified to suit site conditions

19. **Wastage allowance**

Contractor shall carefully plan the cutting schedule of each cable drum in consultation with BHEL site engineer such that wastages are minimized. Recovery will be made in case the wastages are exceeding the wastage allowances fixed in this contract.

The erection contractor shall make every effort to minimize wastage during erection work. In any case, the wastage shall not exceed the following limits;

Power Cables: 1.5%

Control & Instrumentation Cables: 2.0%

Fabrication steel : 2.0%

Impulse pipe/tubes/GI pipes/copper tube: 1.0%

If however, the bidder quotes for more wastage than specified above, the excess portion will be considered for adjustment during the tender evaluation at the quoted supply rate of material. If the actual wastage be more than the specified figure, then equivalent price of the excess portion will be deducted from the contractor's bill. Cable cut-pieces in lengths 10 m & above in both the above categories will be considered as useable and shall be taken in to account for computing net issued quantity when returned to BHEL stores/storage yard.

20. **CABLE TRAYS/CABLE DUCTS:**

a. Installation of cable tray/cable duct shall include cutting, laying, jointing, fixing tee/reducers/ bends/clamps, fixing of tray covers, hardware, welding of tray supports as per tray route layout etc.
b. Supply, Fabrication of bends/tee/ reducers from straight length is within the scope of work and rate quoted shall be inclusive of this. All site welds of cable trays shall be painted with approved primer and cold galvanizing paint, which shall be arranged by the contractor.

c. Cable trays/duct etc may have to be routed underground in cable trench, overhead on structure, along the walls, floors etc. for various applications.

21. **Earthing installations**

a. All equipments shall be earthed by two separate and distinct connections. Earthing terminals will be available in all equipment supplied by BHEL.

b. The earthing conductors supplied by BHEL shall be of mild steel/GI strip/ wires. All connections from equipment to main earthing conductors shall be made as illustrated in earthing drawing / as per instruction of BHEL engineer.

c. A continuous earthing conductor shall be installed in all cable 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 in parallel, a continuous earthing conductor shall be provided on trays only with tap offs to the control cable trays.

d. Earthing connections shall be free from tinning scale paint, enamel, grease, rust or dirt at the time of making joint.

e. Metallic sheaths, screens/shields and armor of all multicore cables shall be bonded and earthed.

22. **CALIBRATION, ALIGNMENT CHECK, TESTING, AND COMMISSIONING OF MISC. INSTRUMENT/ EQUIPMENT, PRE-INSTALLED AT SITE.**

(All the works mentioned hereunder shall be carried out within the accepted rate of SOQR (Schedule of quantity and rates) item no. D (1) (Pre-commissioning & Commissioning…..) unless otherwise specified:

a. contractor shall carry out testing & commissioning of panels, electrically operated valves, pneumatic control valves, pneumatic trip valves, solenoid valves, limit switches, HT/LT motors including drying out, and any other integral devices forming part of various mechanical skids/equipment, & piping etc.

b. The scope of commissioning of electrically operated actuators for valves, dampers, gates etc., will include meggering, adjustments of mechanical/ electrical or electronic position transmitters, setting of limit/torque switches, cable checking, internal wiring checking, cleaning / heating for increase in IR value, local/remote operation, replacement of limit/torque switches if required, etc.

c. The scope of commissioning of devices like solenoid valves, feedback position transmitters, limit switches, air filter regulators, airlock relays, positioners etc., which are integral part of pneumatic control valves / power cylinders / trip valves electrically operated valves etc., will involve adjustments / servicing, calibration etc. As incidental to work, contractor shall remove such devices prior to erection either at site or at store to avoid damage/pilferage and for keeping in safe custody. These shall be installed at appropriate stage as instructed by BHEL. The above removal and re fixing will be done within the quoted rates.

d. Whenever additional instrumentation work viz gauges, transmitters, temperature elements and laying of impulse piping, is to be carried out for performance guarantee test, the same has to be executed by the contractor.

23. **Pre-commissioning, testing and commissioning and performance testing of the equipment/system for Test Firing/Demonstration of Methanol firing in one unit of Rajiv Gandhi Combined Cycle Power Plant, Kayamkulam (2 X 115 MW + 1 X 120 MW) shall be as per BHEL specification and NTPC customer specification "BIDDING DOCUMENT NO.: CS-0011-130A-9".**

23.1 Commissioning of the GTG equipment shall involve the following tests though not limited to these, various testing, trial runs of various equipment erected and systems installed;

(a) Trial run of Pumps other various rotating machineries/pumps.

(b) Trial run of all motors/ drives for various auxiliaries.

(c) As required, Chemical Cleaning of various systems & piping, Oil flushing of lube oil system, Air cleaning/blowing of pipelines, closed systems, tanks and Vessels.

(d) Flushing of all pipelines by air/oil/water/Chemicals/steam as the case may be.

(e) As required, Servicing of all valves, Hydraulic Power cylinders, fittings.

(f) Manual/mechanical cleaning of Pumps, tanks /vessels and other various equipment erected by the contractor. This may have to be repeated several times during the commissioning process.

(g) Chemical cleaning of piping systems as per requirement. Contractor shall carry out disassembly and reassembly of vulnerable components like gauges, instruments etc. as instructed by BHEL during this process.

(h) Cranking of GT

(i) FSNL and synchronization.

(j) Trial operation

(k) Full load operation

The above activities/tests/trial runs may have to be repeated till satisfactory results are obtained and also to meet the technical and statutory requirements.

24. **Post-commissioning**

- Contractor shall rectify the defect observed/informed by customer during the trial run.
- Contractor shall submit the as- built drawing as per guidelines and instruction of BHEL engineer.
- After trial run/handing over of the equipment, if due to unforeseen reasons, certain works crop up, the contractor shall provide all the assistance.

25. 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(s) and printer(s) at his site office, along with suitable operator(s), consumables, etc. Non-establishment of above equipment will attract penalty @ Rs.10000 (Rs Ten thousand only) per month.

26. **Troubleshooting During Test Firing/Demonstration of Methanol Firing.**

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/demonstration. The contractor will be required to put such personnel in shifts in both electrical and C&I area. The bidder must also take this aspect into consideration.

Chapter III- Facilities in the scope of BHEL/Contractor

S. No.	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.1	**ESTABLISHMENT**			
3.1.1	**FOR CONSTRUCTION PURPOSE**:			
a	Open space for office (as per availability)	Yes		Location shall be finalized after joint survey with customer.
b	Open space for storage (as per availability)	Yes		Location shall be finalized after joint survey with customer.
c	Construction of bidder's office, canteen and storage building including supply of materials and other services		Yes	
d	Bidder's all office equipment, office / store / canteen consumables		Yes	
e	Canteen facilities for the bidder's staff, supervisors and engineers etc.		Yes	
f	Firefighting equipment like buckets, extinguishers etc.		Yes	
g	Fencing of storage area, office, canteen etc. of the bidder		Yes	
3.1.2	**FOR LIVING PURPOSES OF THE BIDDER**			
a	Open space for labor colony (as per availability)		Yes	
b	Labor Colony with internal roads, sanitation, complying with statutory requirements		Yes	
3.2.0	**ELECTRICITY**			
3.2.1	Electricity For construction purposes		Yes	Electricity shall be provided by BHEL/NTPC at one point on non-chargeable basis. Further distribution shall be done by contractor
3.2.2	Electricity for the office, stores, canteen etc. of the bidder		Yes	
3.2.3	Electricity for living accommodation of the bidder's staff, engineers, supervisors etc.		Yes	
3.3.0	**WATER SUPPLY**			

S. No.	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.3.1	For construction purposes		Yes	Water shall be provided by NTPC at one point on non-chargeable basis. Further distribution shall be done by contractor
3.3.2	Water supply for bidder's office, stores, canteen etc.		Yes	
3.3.3	Water supply for Living Purpose		Yes	
3.4.0	**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 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	
3.5.0	**COMMUNICATION FACILITIES FOR SITE OPERATIONS OF THE BIDDER**			
a	Telephone, fax, internet, intranet, e-mail etc.		Yes	
3.6.0	**COMPRESSED AIR wherever required for the work**		Yes	
a	Supply of Compressor and all other equipments required for compressor & compressed air system including pipes, valves, storage systems etc		Yes	
b	Installation of above system and operation & maintenance of the same		Yes	

S. No.	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
c	Supply of the all the consumables for the above system during the contract period		Yes	
3.7.0	**Demobilization of all the above facilities**		Yes	
3.8.0	**TRANSPORTATION**			
a	For site personnel of the bidder		Yes	
b	For bidder's equipment and consumables (T&P, Consumables etc.)		Yes	

Sl. No	Description PART II	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.9.0	**Erection Facilities**			
3.9.1	**Engineering works for construction:**			
a	Providing the erection drawings for all the works covered under this scope	Yes		Drawing schedule shall be finalized at the time of kick off meeting.
b	Drawings for erection methods	Yes	Yes	In consultation with BHEL
c	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	In consultation with BHEL
d	Not used			
e	Preparation of site erection schedules and other input requirements		Yes	In consultation with BHEL
f	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
g	Weekly erection schedules based on S. No. e. hard copy to Construction manager, by email to HO.		Yes	In consultation with BHEL
h	Daily erection / work plan based on S. No. g. hard copy to Construction manager, by email to HO.		Yes	In consultation with BHEL

Sl. No	Description PART II	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
i	Periodic visit of senior official of the bidder to site to review the progress so that works are completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two Weeks.		Yes	
j	Arranging the materials required for Work		Yes	
k	Coordination for inspection & checking and getting clearance from customer		Yes	
l	Preparation of formats, loop files& protocol for completion of activities.		Yes	
m	Preparation of preassembly bay		Yes	
3.10	**Work Permits for daily work at site, gate pass etc. from customer for manpower, machinery and material**		Yes	
3.11	Provision of necessary first aid all the time at site. Ambulance Services and facilities for contractor's site staff as and when the situation warrants.		Yes	

3.12 Open Space:

i) Minimum Open space as made available by customer will be provided at free of charges to the contractor, for construction of temporary office shed, fabrication yard and storage area at the job site, contractor's stores shed(s). This is subjected to availability of space from customer. Non-availability of space due to any reason whatsoever shall not entitle the vendor for any claim against BHEL because of cost and time implications.

ii) BHEL shall not provide to the contractor any residential accommodation to any of his staff and the contractor has to make his own arrangements.

iii) Contractor has to make his own arrangements for labour colony and rest shad at site for resting of labor during lunch/dinner time in consultation with BHEL site engineer.

iv) Location and area requirement for office / storage sheds / fabrication yard shall be discussed and mutually agreed to.

3.13 Construction power will be provided to the contractor at one points within plant area by BHEL/NTPC on non-chargeable basis.

i. The required digital Energy meter for measuring the consumption and MD shall be provided and installed by the contractor. Any dispute regarding consumption, the BHEL engineer's decision is final. The contractor shall make his own arrangement for further distribution (as required within plant boundary and outside plant boundary) with necessary isolator / LCB etc within the accepted contract price.

ii. Provision of distribution of electrical power from the given points to the required places with proper distribution boards, approved cables and cable laying including supply of all materials like cables, switch boards, pipes etc., observing the safety rules laid down by electrical authority of the State/ BHEL / their customer with appropriate statutory requirements shall be the responsibility of the tenderer / contractor.

iii. The required energy meter for measuring power consumption shall be arranged by the contractor and taken care by the contractor. Necessary "Capacitor Banks" to improve the Power factor to a minimum of 0.9 shall be provided by the contractor at his cost. Penalty if any levied by customer on this account will be recovered from contractor's bills.

iv. Contractor has to make their own arrangements for electricity requirement for labour colony at their cost.

v. BHEL is not responsible for any loss or damage to the contractor's equipment as a result of variations in voltage / frequency or interruptions in power supply.

vi. However, in case BHEL/NTPC is not able to provide construction power due to any reason whatsoever, CONTRACTOR shall make arrangements for Construction power from other sources at their own, so that work is not stopped. Any statutory requirements/ documentation etc. to this effect shall be met by the CONTRACTOR.

Non-availability of construction power due to any reason shall not entitle the CONTRACTOR for any claim for time extension.

3.14 Construction Water: Subject to availability, Construction water shall be provided by NTPC on non-chargeable basis.

However, in case BHEL/ NTPC is not able to provide construction water due to any reason whatsoever, CONTRACTOR shall make arrangements for Construction water from other sources at their own, so that work is not stopped. Any statutory requirements/ documentation etc. to this effect shall be met by the CONTRACTOR.

Non-availability of water due to any reason shall not entitle the CONTRACTOR for any claim for time extension.

3.15 ONLINE SITE CONSTRUCTION MANAGEMENT SYSTEM (SCMS):

Sufficient Nos of computers and printers (MFP) of latest configuration (preferably i5 processor, 8GB Ram, 1 TB Hard disk, with internet provision on all the computers), along with one data entry operator per computer to be arranged by contractor for reporting of daily progress, billing, updating details in online SCMS package of BHEL, etc., within the quoted rate.

3.16 CONSUMABLES: All electrodes required shall be arranged by the contractor at his cost. The Contractor shall use the BHEL / Customer approved quality electrodes only.

i) As required for the project: The contractor shall provide within finally accepted price / rates, all consumables like welding electrodes , all gases , soldering material, dye penetrants, radiography films. Other erection consumables such as wrap cloth, tapes, jointing compound, grease, lubricants, M-seal, Araldite, petrol, CTC / other cleaning agents, grinding and cutting wheels are to be provided by the contractor. Steel, H&S, packers, shims, wooden planks, scaffolding and pre-assembly materials, hardware items etc. required for works such as supports, scaffoldings and bed are to be arranged by him. Sealing compounds, gaskets, gland packing, wooden sleepers, required for completion of work except those, which are specifically supplied by BHEL, are also to be arranged by him.
ii) All consumables to be used for the job shall have to be approved by BHEL prior to use.
iii) In the event of failure of contractor to bring necessary and sufficient consumables, BHEL shall arrange for the same at the risk and cost of the contractor. The entire cost towards this along with standard BHEL overhead shall be deducted from the contractor's immediate due bills.

3.17 GASES:

i) All the required gases like Oxygen / Acetylene / Argon / Nitrogen required for work shall be supplied by the Contractor at his cost. It shall be the responsibility of the contractor to plan the activities and store sufficient quantity of these gases. Non-availability of gases shall not be considered as reason for not attaining the required progress.
ii) BHEL reserves the right to reject the use of any gas in case required purity is not maintained.
iii) The contractor shall submit weekly / fortnightly / monthly statement report regarding consumption of all consumables for cost analysis purposes.
iv) The contractor shall ensure safekeeping of the inflammable cylinder at a separate place away from normal habit with proper security etc.

3.18. ELECTRODES SUPPLY AND STORAGE

i) It shall be the responsibility of the contractor to obtain prior approval of BHEL, before procurement, regarding suppliers, type of electrodes etc. On receipt of the electrodes at site, it shall be subject to inspection and approval by BHEL. The contractor shall inform BHEL details regarding type of electrodes, batch number and date of expiry etc. Test certificates for electrodes and other consumables should be submitted to BHEL Engineer as per requirement.

ii) Shortage of any of the electrodes or the equivalent suggested by BHEL shall not be quoted as reason for deficiency in progress or for additional rate. Contractor shall submit weekly/ fortnightly/ monthly statement/ report regarding consumption and available stock of all types of electrodes for avoiding stoppage of work on consumable scarcity.

iii) Storage of electrodes shall be done in an air conditioned / controlled humidity room as per requirement, at his own cost by the contractor.

iv) All low hydrogen electrodes shall be baked / dried in the electrode-drying oven (range 375 deg. C - 425 deg. C) To the temperature and period specified by the BHEL Engineer before they are used in erection work and each welder should be provided with one portable electrode drying oven at the work spot. Electrode drying oven and portable drying ovens shall be provided by contractor at his cost.

v) In case of improper arrangement of procurement of above electrodes BHEL reserves the right to procure the same from any source and recover the cost from the contractor's first subsequent bills at market value plus departmental charges of BHEL communicated from time to time. Postponement of such recovery is not permitted.

vi) BHEL reserves the right to reject the use of any electrodes at any stage, if found defective because of bad quality, improper storage, date of expiry, unapproved type of electrodes etc. It shall be the responsibility of the contractor to replace at his cost without loss of time.

3.19 POSSESSION OF GENERATORS

As there are bound to be interruptions in regular power supply, power cut/ load shedding in any construction sites, suitable extension of time, if found necessary only be given and contractor is not entitled for any compensation. It shall be the responsibility of the tenderer / contractor to provide, and maintain the complete installation on the load side of the supply with due regard to safety requirements at site. It shall be responsibility of the contractor to have at least one diesel operated welding generator sets to get urgent and important work to go on without interruptions. The consumables required to operate the generators are to be provided by tenderers. This may also be noted while quoting. No separate payment shall be made for this contingency.

3.20 LIGHTING FACILITY:

Adequate lighting facilities such as flood lamps, hand lamps and area lighting shall be arranged by the contractor at the site of construction, pre assembly yard and contractor's material storage area etc. at his cost.

3.21 CONTRACTOR'S OBLIGATION ON COMPLETION

On completion of work, all the temporary buildings, structures, pipelines, cables etc. shall be dismantled and leveled and debris shall be removed as per instructions of BHEL by the contractor at his cost. In the event of his failure to do so, the expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard shall be final.

3.22 POTABLE/DRINKING WATER: Contractor shall make his own arrangements of water suitable for drinking purpose to have uninterrupted work. No separate payment shall be made, for any contingency water arrangement made by contractor, due to delay / failure for providing water supply. Contractor has to make his own arrangements for his water requirement for his labour colony at his cost.

3.23 Other Facilities

i) Adequate portable urinals (male & female both) shall be arranged by the contractor within quoted rates, proper disposal arrangement for their staff & workers
ii) Vendors have to comply requirements of HSE & Statutory requirement in line with NTPC/ BHEL HSE plan.
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 proper experience and they will issue fitness certificates for safe use, if required. 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) First aid facilities shall be maintained by contractor at no. of working places as required as per instruction of BHEL Engineer. The basic medical facility will be maintained by BHEL at site.
viii) Vendor has to arrange land within his quoted rate for making labour colony. Vendor's 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, and upkeepment of labour colony. BHEL/Customer & local

statutory authorities will visit labour colony from time to time and all healthy conditions are to be maintained by vendor.

ix) Scaffolding pipes, clamps, safety nets, floor grills for working platforms are to be made of good quality with proper certifications as per IS Codes.

3.24 Dewatering: Contractor shall ensure at all times that the 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. All equipments/materials required for dewatering such as pumps, pipes and accessories shall be arranged by the contractor. No separate claim in this regard shall be admitted by BHEL.

3.25 SITE ORGANISATION

i) The contractor shall provide adequate staffing in the following areas in addition to the staffing requirements of execution as instructed/informed by BHEL:
   a) Overall planning, monitoring & control.
   b) Quality control and quality assurance.
   c) Materials management.
   d) Safety officer, fire & security.
   e) Industrial relations and fulfilment of labour laws and other statutory obligations.

ii) 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.

iii) 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.

Chapter IV- Tools & plants to be deployed by Contractor

LIST OF TOOLS AND PLANT:

The following tools and equipment but not limited to, are required for the efficient execution of the works in the scope of this tender. The contractor shall make them available for construction purposes, including all consumables likely to be used at his own cost at the time of mobilization.

Table-I

SL NO	ITEM	QUANTITY
1.	Hydra/crane of appropriate capacity Note: Including cost of fuel, operators, associated tools etc. all-inclusive.	AS REQUIRED
2.	TRACTOR-TRAILOR	-DO.
3.	ELECTRICAL WINCH 2T/ 5T/ 10T	-DO.
4.	HYDRAULIC TEST PUMP 0-16 KG/SQCM	-DO.
5.	RESISTANCE HEATING MACHINES WITH ACCESSORIES	AS REQUIRED
6.	WELDING GENERATOR, K-320	-DO.
7.	WELDING TRANSFORMER (300/450 AMP)	-DO.
8.	WELDING RECTIFIER	-DO.
9.	INVERTER TYPE RECTIFIER	-DO.
10.	HYDRAULIC PIPE BENDING MIC	AS REQUIRED
11.	CHAIN PULLEY BLOCK 5T, 3T,	-DO.
12.	PULL LIFT (6T, 5T, 3T, 1.5T)	-DO.
13.	HYDRAULIC JACK (20T, 10T, 5T)	-DO.
14.	SINGLE SHEAVE SNATCH PULLEY (10T, 5T)	-DO.
15.	D SHAKLES (20T, 10T, 5T)	-DO.
16.	TURN BUCKLES (3T, 5T, 8T, 10T, 15T)	-DO.
17.	TIG WELDING SET	-DO.
18.	OXYGEN REGULATOR	-DO.
19.	ACETYLENE REGULATOR	-DO.
20.	CUTOGEN 5	-DO.
21.	OXYGEN HOSE 10 MM	-DO.
22.	ACETYLENE HOSE 10 MM	-DO.
23.	ELECTRODE DRYING OVEN	-DO.
24.	PORTABLE ELECTRODE DRYING OVEN	-DO.

25.	COPPER WELDING CABLE 600 AMP. 400 AMP	-DO.
26.	ALUMINIUM CABLE 600 AMP, 400 AMP	-DO.
27.	THERMAL-CHALK 100 DEG c TO 800 DEG C	-DO.
28.	ELECTRODE BAKING OVEN	-DO.
29.	THEODOLITE (1 SEC ACCURACY)	-DO.
30.	SPIRIT LEVEL 12 INCH, 0.1 MM ACCURACY	-DO.
31.	MAGNETIC PARTICLE TESTING M/C	-DO.
32.	HARDNESS TESTER WC	-DO.
33.	DRILLING M/C OF DIFFERENT SIZES	-DO.
34.	GRINDING M/C OF DIFFERENT SIZES	-DO.
35.	TRIP TORQUE WRENCH	-DO.
36.	ALUMINUM TELESCOPIC LADDER	-DO.
37.	MANILA ROPES OF DIFFERENT SIZES	-DO.
38.	STEEL WIRE ROPES OF DIFFERENT SIZES	-DO.
39.	DYE PENETRANT TEST KIT	-DO.
40.	RECORDABLE UT MACHINE	As Required
41.	PMI MACHINE	As Required
42.	RADIOGRAPHY ARRANGEMENT INCLUDING THE SOURCE AND FILM VIEWER	As Required
43.	NON CONTACT TEMPERATURE GAUGE	As Required
44.	DEWATERING PUMP 5 HP	-DO.
45.	AIR COMPRESSOR	As Required
46.	DG SET (FOR WELDING IN AREAS IN CASE OF NON AVAILABILITY OF ELECTRCIAL POWER	As Required
47.	TIG WELDING SET	As Required
48.	STRESS RELIEVING EQUIPMENT WITH TEMPERATURE RECORDERS	As Required
49.	MIXER FOR GROUTING OF EQUIPMENT FOUNDATIONS	As Required
50.	VACUUM CLEANER (INDUSTRIAL)	As Required
51.	PIPE CUTTING AND BEVELLING MACHINE	As Required
52.	PIPE BENDING M/C	As Required

Table-II

Sl No	Description	Capacity and Quantity minimum
1	Safety Net (Conforming IS 11057:1984) Safety Net (Net Size: 10m x 5m, Mesh Size: 25 mm, Mesh Rope: 2mm double cord, Border/Tie Cord: 12 mm diameter polypropylene rope (tested as per IS: 5175).Two meters length shall be provided at all four corners.	As required
2	**Fall Arrester** 'Rope grab fall arrester' & anchorage line. Anchorage Line: 14 mm- 16 mm diameter, three strand twisted Polyamide rope. **Rope Grab fall arrester:** Openable & Guided type Fall Arrestor (on flexible line) conforming EN 353-2 & works on 14-16 mm diameter polyamide rope. Material: Nickel Chrome plated Steel Connector: Karbiner conforming to EN 362 (Minimum Strength 22 KN), material: Steel	As required
3	**Horizontal lifeline** Stainless Steel Wire rope of 8 mm diameter. Minimum six nos. of steel U-bolt clips are required for clamping each wire rope to a rigid support (03 nos. of U-bolt clips at each end).	As required

- **Other Requirements of Contractor's Instruments and T&P**

a) All the distribution boards, connecting cables, hoses etc., and temporary connection work including electrical connections shall have to be arranged by the contractor at his cost.

b) The contractor at his cost shall arrange all T&P like cranes, truck/tractor, and trailers required for material handling purpose.

c) Equipment, vehicles, tools and plants and materials brought to site by the contractor from his resources shall have distinctive identification marks and the description and quantity shall be intimated to BHEL in writing by the contractor.

d) All construction materials brought by the contractor shall have prior approval regarding quality and quantity by BHEL. The contractor shall also provide without extra cost necessary enclosures containers and protective materials for proper storage of materials inside, whenever so instructed by the purchaser without any extra cost.

e) No material or equipment or tools etc. shall be taken out of the worksite without the written consent of BHEL.

f) BHEL shall not be responsible for the safety and protection of the materials of the contractor and the contractor shall make his own arrangements for proper watch and ward for his materials.

g) Until such time the work is taken over by BHEL/Execution Agencies, the contractor shall be responsible for proper protection of material. The contractor shall during the progress of work properly cover up and protect any part of the work liable to damage by exposure to the weather and shall take every reasonable precaution against accident or damage to the work from any cause.

NOTE:

THIS ABOVE LIST IS ONLY INDICATIVE AND NEITHER EXHAUSTIVE NOR LIMITING. CONTRACTOR SHALL DEPLOY ALL NECESSARY T&P AND CONSUMABLES TO MEET THE SCHEDULES & AS PRESCRIBED BY BHEL ENGINEER AND REQUIRED FOR COMPLETION OF WORK.

- **LIST OF CONSUMABLES TO BE PROVIDED BY CONTRACTOR WITHIN ACCEPTED RATES:**

Table-III

SI.NO.	Description	Quantity	Remarks
1.	Gases like O2, CO2, Argon, DIA, LPG and Others as per requirement (FOR CONSTRUCTION PURPOSE AND NOT FOR COMMISSIONING USES)	As required	Sufficient stock to be been maintained by contractor.
2.	Filler wire for both SS and others as required	As required	.--do--
3.	Lapping compound	.--do--	For valves servicing by contractor
4.	Hydraulic oil	.--do--	For uses in different equipment and hydraulic jacks, pumps and Other applications by contractor
5.	Not used	Not used	Not used
6.	Different types of electrical lamps, tube lights, halogen lamps, sodium vapor lamps with fixtures	As required	As required
7.	Electrodes / Filler wires as per requirement	.--do--	.--do--
8.	Test pieces for welders test like plates, pipes etc.	.--do--	.--do--
9.	Brazing Rods	.--do--	.--do--
10.	Soldering consumables	.--do--	.--do--
11.	Consumables for welding and NDTs	.--do--	.--do--
12.	Thermal chalks Of different ranges	.--do--	.--do--
13.	Consumables for Pre-heating, Stress Relieving, Post heating etc.	.--do--	.--do--
14.	Consumables for arranging welders' qualifying works	.--do--	.--do--
15.	Welders accessories	.--do--	.--do--
16.	Services for effluent disposal	.--do--	.--do--

17.	Rustling	.--do--	.--do--
18.	CTC, Acetone as per requirement	.--do--	.--do--
19.	Petrol	.--do--	.--do--
20.	Diesel	.--do--	.--do--
21.	Red Lead	.--do--	.--do--
22.	Hemp Fibre	.--do--	.--do--
23.	Asbestos Rope (Pure) 2,4,6,8,10, 12,25 mm and Other sizes as required	.--do--	.--do--
24.	Insulation Adhesive Tape 20 mm Width and other sizes as per requirement	.--do--	.--do--
25.	Emery Tape as per requirement	.--do--	.--do--
26.	Hack-shaw of different sizes as per requirement	.--do--	.--do--
27.	Emery Paper Gr. 60, 80, 100, 120. 150 , 220 and others as per requirement	.--do--	.--do--
28.	Asbestos Cloth in Wax Paper IXI M —as required	.--do--	.--do--
29.	PACKING BLACK PAPER IXI M	.--do--	.--do--
30.	ADHESIVE TAPE 0.3 mm THICKNESS-as required	.--do--	.--do--
31.	WHITE COTTON TAPE 12 mm WIDTH-as required	.--do--	.--do--
32.	GRAPHITE POWDER FINE QUALITY - as required	.--do--	.--do--
33.	GRAPHITE FLAKES as required	.--do--	.--do--
34.	RAW LINESEED OIL as required	.--do--	.--do--
35.	DOUBLE BOILED LINSEED OIL AS REQUIRED	.--do--	.--do--
36.	CYLINDER OIL AS REQUIRED	.--do--	.--do--
37.	ENAMEL PAINT (OF REQUIRED COLOUR) AS REQUIRED	.--do--	.--do--
38.	MOBILE VELOCITE OIL 'S' AS REQUIRED	.--do--	.--do--
39.	TURPENTINE OIL AS REQUIRED	.--do--	.--do--
40.	TRICHLORO ETHYLENE AS REQUIRED	.--do--	.--do--
41.	METHYLATED SPIRIT AS REQUIRED	.--do--	.--do--
42.	MOBILOX GREASE 2 (IOC) AS REQUIRED	.--do--	.--do--

43.	SERVOGEM -2,3 GREASE AS PER REQUIREMENT	.--do--	.--do--
44.	OTHER SPECIAL GREASE AS PER REQUIREMENT	.--do--	.--do--
45.	RUST BAN (ESSO) AS PER REQUIREMENT	.--do--	.--do--
46.	MOLYKOTE PASTE AS PER REQUIREMENT	.--do--	.--do--
47.	BIRKOSITE AS PER REQUIREMENT	.--do--	.--do--
48.	WASHING SODA AND SOAP AS PER REQUIREMENT	.--do--	.--do--
49.	COTTON WASTE AS PER REQUIREMENT	.--do--	.--do--
50.	CLEAN RAGS AS PER REQUREMENT	.--do--	.--do--
51.	WHITE CLOTH (CEARSE) AND USED CLOTHS AS REQUIRED	.--do--	.--do--
52.	SACK CLOTH AS PER REQUIREMNT	.--do--	.--do--
53.	JELLEY SOAP OR BAR SOAP AS PER REQUIREMENT	.--do--	.--do--
54.	EMERY CLOTH 100 mm WIDTH ROLL GR. 60,	.--do--	.--do--
	100, 120, 150,220 AND OTHERS AS PER	.--do--	.--do--
	REQUIREMENT	.--do--	.--do--
55.	SAND PAPERS GR. 60, 80 ,120 AND OTHER AS PER REQUIREMENT	.--do--	.--do--
56.	EMERY PASTE (VALVE LAPPING COMPOUND) GR. 60, 80, 100 & 220 AND OTHERS AS PER REQUIREMENT.	.--do--	.--do--
57.	GRINDING WHEELS, STONES OF DIFFERENT SIZES AS PER REQUIREMENT	.--do--	.--do--
58.	WELDING ELECTRODES (CARBON STEEL, CS NACE, CS HIC+NACE, M.S., ALLOY STEEL AND FILLER WIRES, STAINLESS	.--do--	.--do--
59.	STEEL BOTH FERROUS AND NON FERROUS) EXCEPTING THOSE SUPPLIED BY BHEL	.--do--	.--do--
60.	REQUIREMENT	.--do--	.--do--

61.	SOLDERING STICK (LEAD -TIN ALLOY) AS PER REQUIREMENT	.--do--	.--do--
62.	SOLDERING WIRE (SILVER ALLOY) AS PER REQUREMENT	.--do--	.--do--
63.	SOLDERING FLUX (SILVER ALLOY) AS PER REQUIREMENT	.--do--	.--do--
64.	BRZING FLUX,'BORAX AS REQUIRED	.--do--	.--do--
65.	SOLDERING FLUX (LEAD-TIN ALLOY) AS REQUIRED	.--do--	.--do--
66.	MS GAS WELDING WIRE AS REQUIRED	.--do--	.--do--
67.	DP TEST KIT WITH MAGNIFYING GLASS AS REQUIRED	.--do--	.--do--
68.	IRON AND STEEL SECTIONS AS REQUIRED	.--do--	FOR ARRANGING SCAFFOLDING AND FIXTURES ETC.
69.	MS BOLTS AND NUTS WITH TWO PLAIN WASHERS AND ONE SPRING WASHER AS REQUIRED.	.--do--	As required
70.	MS ANGLES ASSORTED AS REQUIRED	.--do--	.--do--
71.	MS CHANNELS ASSORTED AS REQUIRED	.--do--	.--do--
72.	ROUNDS FLATS,MS PLATES ASSORTED AS REQUIRED	.--do--	.--do--
73.	ENGINEERS BLUE / PRUSSIAN BLUE AS REQUIRED	.--do--	.--do--
74.	CHALK PIECES- WHITE,COLOUR AND POWDER AS REQUIRED	.--do--	.--do--
75.	TEINE AS REQUIRED	.--do--	.--do--
76.	BATTERY CELLS 1.5 VOLTS TORCH LIGHT	.--do--	.--do--
77.	CELLS, PENCIL BATTERY ETC.AS REQUIRED	.--do--	.--do--
78.	RED AND BLUE PENCILS AS REQUIRED	.--do--	.--do--
79.	GALVANISED STEEL WIRE Imm DIA AND OTHER SIZES AS REQUIRED	.--do--	.--do--
80.	FLANNEL CLOTH 1M WIDTH AS PER REQUIREMENT	.--do--	.--do--

81.	SPLIT PINS 2mm TO 6 mm AND OTHER SIZES	.--do--	.--do--
82.	WOOD SCREWS 3/4' TO 3 AS PER REQUIREMENT	.--do--	.--do--
83.	LEAD SHEET 3 mm AND 4 mm THICKNESS AS PER REQUIREMENT	.--do--	.--do--
84.	TARPAULINE3X3 M AND M AND M AND OTHER SIZES AS PER REQUIREMENT	.--do--	.--do--
85.	VULCANISED RUBBER FIBRE 0.5 MXO.5 MX15 mm THICKNESS AS PER REQUIREMENT	.--do--	.--do--
86.	PLYWOOD 1M X 2M X 3mm AND OTHER SIZES AS PER REQUIREMENT	.--do--	.--do--
87.	NAILS-WIRE 1' TO 3'AS PER REQUIREMENT	.--do--	.--do--
88.	CANDLES MEDIUM SIZE AS PER REQUIREMENT	.--do--	.--do--
89.	PORTABLE SWITCH BOARD CONTAINING 15 AMPS TP METAL CLAD SWITCH WITH FUSE 3X15 AMPS, SWITCHES AND 3 PLUG SOCKETS AS PER REQUIREMENT	.--do--	.--do--
90.	WOODEN PLANK PULLEYS AS REQUIRED	.--do--	.--do--
91.	ANY OTHER WE-MS AS REQUIRED TO COMPLETE THE JOBS	.--do--	.--do--

Chapter V- Time Schedule

5. TIME SCHEDULE and MOBILIZATION

5.1 Initial mobilization: After receipt of Email LOI/LOA to contractor, Contractor shall discuss with Project Manager / Construction Manager regarding initial mobilization. Contractor shall reach site, make his site establishment and be ready to commence the erection work within seven (07) days from the date of issue of Letter of Intent or as per the directions of Construction Manager/ Project Manager of BHEL. Such resources shall be progressively augmented to match the schedule of milestones and commissioning.

5.2 MOBILIZATION FOR ERECTION, TESTING, ASSISTANCE FOR COMMISSIONING ETC.

The activities for erection, testing etc. shall be started as per directions of Construction Manager of BHEL. Contractor shall mobilize further resources as per requirement to commence the work of erection, testing etc. and progressively augment the resources to match schedule of the project.

5.3 The entire work as detailed in the Tender Specification shall be completed within **07 Months** from the date of commencement of work at site.

5.4 During the total period of contract, the contractor has to carry out the activities in a phased manner as required by BHEL and the program of milestone events.

5.5 The work shall be commenced on the mutually agreed date between the bidder and BHEL engineer. The decision of BHEL in this regard shall be final and binding on the contractor. The scope of work under this contract is deemed to be completed only when so certified by the site Engineer.

5.6 COMMENCEMENT OF CONTRACT PERIOD

The date of commencement of contract period shall be the mutually agreed date between the bidder and BHEL engineer to start the work. In case of discrepancy, the decision of BHEL engineer will be final.

5.7 Tentative Schedule

Sl No	Activity Description	Start Date	End Date
1	Piping Works/Other Mechanical work/NDT work	November 2024	March 2025
2	Electrical & C&I work	January 2025	March 2025
3	FP&SD/Other balance work	January 2025	March 2025
4	Pre-commissioning works	1st April 2025	30th April 2025
5	Commissioning and Handing Over	1st May 2025	31st May 2025

5.8 CONTRACT PERIOD

For the purpose of contract, the period shall be taken as **07 (Seven) Months.** Completion of the work shall be as per BHEL Bar Charts revised from time to time. In order to expedite the work, the contractor has to deploy manpower as per site requirement without any extra cost to BHEL.

5.9 GUARANTEE PERIOD

The guarantee period of twelve months shall commence from the date of completion of all works as certified by the BHEL site engineer.

5.10 PROTECTION OF WORK

The contractor shall have total responsibility for protecting his works until it is taken over by the Employer. No claim will be entertained by the Employer or the representative of the Employer for any damage or loss to the Contractor's works and the Contractor shall be responsible for complete restoration of the damaged works to original conditions to comply with the specification and drawings. Should any such damage to the Contractor's Works occur because of other party not being under his supervision or control, the Contractor shall make his claim directly with the party concerned.

If disagreement, conflict, or dispute develops between the Contractor and the other party or parties concerned regarding the responsibility for damage to the Contractor's Works the same shall be rectified. The Contractor shall not cause any delay in the repair of such damaged Works because of any delay in the resolution of such disputes. The Contractor shall proceed to repair the Work immediately and no cause thereof will be assigned pending resolution of such disputes.

Chapter VI- Statutory Regulation

6.1 BUILDING & OTHER CONSTRUCTION WORKERS (REGULATION OF EMPLOYMENT AND CONDITIONS OF SERVICE) ACT, 1996 (BOCW Act) AND RULES OF 1998 READ WITH BUILDING & OTHER CONSTRUCTION WORKERS CESS Act, 1996 & CESS RULES, 1998 and

INTER-STATE MIGRANT WORKMEN ACT, 1979 (IN CASE BIDDER ENGAGE MANPOWER FROM OTHER STATE)

In case any portion of work involves execution through building or construction workers and/or inter-state migrant workers, then compliance to the above titled Acts as applicable shall be ensured by the contractor and contractor shall obtain license and deposit the cess under the Act. In the circumstances, it may be ensured as under:-

It shall be the sole responsibility of the contractor in the capacity of employer to forthwith (within a period of 15 days from the award of work) apply for a license to the Competent Authority under the BOCW Act and/or ISMW Act as applicable and obtain proper certificate thereof by specifying the scope of its work. It shall also be responsibility of the contractor to furnish a copy of such certificate of license / permission to BHEL within a period of one month from the date of award of contract.

It shall be the sole responsibility of the contractor as employer to ensure compliance of all the statutory obligations under these acts and rules including that of payment / deposit of cess as per the applicability under above referred Acts within a period of one month from the receipt of payment.

It shall be the responsibility of the sub-contractor to furnish the receipts / challans towards deposit of the cess together with the number, name and other details of beneficiaries (building/Inter-state Migrant workmen) engaged by the sub-contractor during the preceding month.

It shall be the absolute responsibility of the sub-contractor to make payment of all statutory payments & compensations to its workers including that is provided under the Workmen's Compensation Act, 1923.

6.2 Contractor has to comply with statutory requirement as specified in GCC clause no.2.8, they are required to submit all relevant document complying to having fulfilled these requirements on monthly basis not later than one month from the last day of the previous month. In case of failure to submit these documents within the schedule specified as above an amount of 10% of the running bill of the corresponding month of the default shall be withheld and shall only be released once the contractor submit those documents**.**

Chapter VII: HSE (Health, Safety, Environment) and PPE (personal Protective Equipment) Guidelines

1. Contractor shall follow all the HSE guidelines as mentioned chapter IX off SCC and NTPC (Annexure-II).
2. Contractor shall deploy one (1) or as required number of qualified and experienced safety officer for the entire period of contract.
3. Contractor shall submit the biodata of safety officer to BHEL/Customer (NTPC), for approval.
4. PPE (personal Protective Equipment) shall be as per BHEL and NTPC guideline.
5. In case of any dispute/ contradiction, NTPC HSE rules and guidelines shall prevail.

Chapter VIII- Field quality control plan

1. Work shall be executed as per approved field quality control plan (FQCP). Contractor shall prepare, submit the field quality control plan to BHEL within seven days after mobilization of work at site.

Submitted FQCP shall be reviewed and approved by BHEL/NTPC.

Chapter IX- General Terms and Instruction

1. Worker/Supervisors/Engineers, consumables etc., required for the scope of work shall be provided by the contractor. All the 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.

2. It shall be specially noted that, the contractor may have to work round the clock (24x7) to achieve the completion schedules / plans / targets during the entire course of erection, testing and commissioning works, which may involve payment of considerable overtime. Hence contractor's quoted rate shall take into consideration of all expenses that will be incurred for such arrangement of personnel including labors, engineers / supervisors, T&Ps etc.

3. The terminal points can be inferred from the relevant drawings and any further clarifications can be obtained / decided by BHEL and that is final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals. Carrying out work as per the specification between equipments constituting terminal points, whether the terminal equipments fall within the scope of work/specification, contractor shall carry out the terminal joints at either end. Also where the piping connection to the terminal points involve flanged joints, matching of flanges, fixing gaskets, bolting and tightening as per BHEL Engineers instructions is in the scope of work. In case piping connected to equipment, matching of flanges for achieving the parallelism and alignment at the equipment end, by suitably resorting to heat correction or other method as instructed by BHEL Engineer, with in the quoted rate.

4. The work shall conform to dimensions and tolerances given in various drawings and quality manuals provided by BHEL. If any portion of work is found to be defective in workmanship not conforming to drawings or other stipulations, the contractor shall dismantle and redo the work duly replacing the defective materials at his cost, failing which the job will be carried out by BHEL by engaging other agencies / departmentally and recoveries will be effected from contractor's bill towards expenditure incurred including BHEL's overhead charges.

5. Contractor has to work in close co-ordination with other erection agency at site. BHEL engineer will co-ordinate area clearance. In a project of such magnitude, it is possible that the area clearance may be less/more at a particular given time. Activities and erection program have to be planned in such a way that the milestone events are achieved as per schedule/ plans. Contractor shall arrange & augment the resources accordingly.

6. During the course of erection, testing and commissioning, certain rework / modification / rectification / repairs / fabrication etc will be necessary on account of feedback/revision from various relevant sources, and also on account of design discrepancies/ alterations, manufacturing defects, site operations/ maintenance requirements. This will also include modifications / re-works suggested by BHEL / customer / other inspection group. Contractor shall carry out such rework / modification / rectification / fabrication / repairs etc promptly and expeditiously. Daily log sheets indicating the details of work carried out, man-hours etc shall be maintained by the

contractor and got signed by BHEL engineer every day. Claim of Contractor if any, for such works will be governed by relevant clauses of 'General Conditions of Contract'.

7. The scope of work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, engineering and construction management and green belt management. The contractor should ensure successful and timely completion of the work. The contractor must have adequate quantity of tools, construction aids, equipments etc., in his possession. He must also have on his rolls adequate trained, qualified and experienced supervisory staff and skilled personnel. The manpower deployment identified by contractor shall match with above scope of works.

8. Contractor shall execute the work as per sequence and procedure prescribed by BHEL at site. The erection manuals, which are available with BHEL site office, are to be referred for compliance and guidance before taking up the work. Any failure to comply with the above might lead to rework and the cost for the same shall be borne by the contractor only. BHEL engineer, depending upon the availability of materials, fronts etc., will decide the sequence of erection and methodology. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the method of erection adopted in erection of similar jobs or for any reason whatsoever.

9. Contractor shall remove all scrap materials periodically generated from his working area in and collect the same at one place earmarked for the same. Load of scraps is 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 at contractor's risk and cost if there is any failure on the part of contractor in this respect.

10. The contractor shall ensure that his premises are always kept clean and tidy to the extent possible. Any untidiness noted on the part of the contractor shall be brought to the attention of the contractor's site representative who shall take immediate action to clean the surroundings to the satisfaction of the Engineer-in-Charge

11. The Contractor may have to execute work in such a place and condition where other agencies also will be under such circumstances.

12. The work shall be executed under the usual conditions without affecting project work and in conjunction with other operations and contracting agencies at site. The contractor and his personnel shall cooperate with the personnel of other agencies, co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

13. All the work shall be carried out as per instructions of BHEL engineer. BHEL engineer's decision regarding the correctness of the work and method of working shall be final and binding on the contractor.

14. All necessary certificates and licenses required to carry out this work are to be arranged by the contractor expeditiously at his cost.

15. The contractor shall make adequate security arrangements to prevent from theft, fire, pilferage, damage and loss of materials/equipment kept under bidder custody.

16. All equipment shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc, shall be used for handling of the equipment without the specific permission of the engineer.

17. Access to site for inspection by BHEL and customer engineers shall be made available by the contractor at all times.

Chapter X- Payment Terms

1. Following shall be the payment terms (Refer section details in SOQR):

Sl No	Description	Remarks
1	Section-A1 and C of SOQR	Payment Terms: Payment shall be made as per following methodology: 1. 65% after Installation/ Erection/ Fabrication 2. 15% after Hydro/pneumatic testing 3. 5% Documentation work (Loop file) 4. 10% After pre-commissioning, commissioning. 5. 5% after punch point completion and handing over.
2	section-A2 of SOQR	Payment Terms: Payment shall be made as per following methodology: 1. 95% after completion of work as per specification. 2. 5% after punch point completion and handing over.

3	**Section- B of SOQR**	Payment Terms: Payment shall be made as per following methodology: 1. 85% after Installation/ erection/laying/fabrication & testing/painting. 2. 10% After pre-commissioning, commissioning 3. 5% after punch point completion and handing over.
4	**Section-D of SOQR**	Payment Terms: Payment shall be made as per following methodology: 1. 95% after completion of work as per specification. 2. 5% after punch point completion and handing over

Chapter XI- List of Documents

Technical supporting documents from NTPC customer/ BHEL specifications are attached as per below listed documents:

Sl No	Description	Reference	Remarks
1.	NTPC- CLIMS "Contractors Labour Information Management System"	Annexure-I	enclosed
2.	NTPC-HSE	Annexure-II	enclosed
3.	NTPC Technical specification	Annexure-III	enclosed
4.	Welding Procedure Specification No.: WE 001	NA	enclosed
5.	Welding Procedure Specification No.: WE 003	NA	enclosed
6.	Details Of Welding, Inspection & Testing For Balance Of Plant Piping. Spec.GT 57124	NA	enclosed
7.	Plot plan for tender purpose	NA	enclosed