Bharat Heavy Electricals Ltd.,

(A Government of India undertaking)

Electronics Division

PB No.2606, Mysore Road, Bangalore-560026, India

E-Tender

Quotations are invited under two part bid system for supply, I&C and O&M for BOS and Transmission line of for 10 MW SPV Project, STPP, Pegadapally, SCCL Telangana.

Tender is procured through e-procurement route. Kindly refer website https://bhel.abcprocure.com/EPROC/ for details.

RFQ NO and date	SPKSCPV031 dated 25.05.2019
RFQ due date & time	07.06.2019 up to 13.00 hrs (IST)
Date, Time & Venue of Part-I Bid Opening	07.06.2019 after 13.30 hrs (IST)
Date, Time & Venue of Price Bid opening	Will be intimated later for technically accepted vendors
Address for Communication & Contact Person in BHEL	Mr. S.Pankaj Kumar (08126333426)/ Mr. Ramachandra (09980958476), SC&PV MM Department, BHEL Elecrtronics Division, PB NO 2606, Mysore road, Bangalore-560 026. INDIA Email: spankaj@bhel.in , ramachandra@bhel.in Telephone number: +91 80 26989667, +91 80 26998476
Name and address of the Independent External Monitor for this tender	1. Shri D.R.S Chaudhary,IAS (Retd.), Flat No. L-202 & L-203 (1st Floor)Ansal Lake View Enclave Shamla Hills Bhopal- 462 013 (M.P.) Ph: +91 755 4050495 Email - dilip.chaudhary@icloud.com 2. Mrs. Pravin Tripathi, IA and AS (Retd.) D-243, Anupam Gardens, Lane IB, Sainik Farms, New Delhi- 110 068. Email: pravin.tripathi@gmail.com.

Any Deviations from or additions to the "General Conditions of Contract" or "Special Conditions of Contract" require BHEL's express written consent. The General Terms of Business or Sale of the Bidder shall not apply to this tender.

REQUEST FOR QUOTATION

MMI:PU:RF:003

BHARAT HEAVY ELECTRICALS LIMITED
Electronics Division
PB No. 2606, Mysore Road Bangalore - 560026
INDIA

RFQ NUMBER: SPKSCPV031

RFQ DATE : 25.05.2019

Due Date/Day: 07.06.2019 FRI
Time : 13:00 HRS

(address for communication) :

(for all correspondence)
Purchase Executive : S. Pankaj Kumar
Phone : 080-26989667
Fax :
E-mail: spankaj@bhel.in

Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
1	PS0679079637 Supply of Items for CR and its array * HSN/SAC : 8544 Test Certificate Supply of Items for Control Room (CR) and its associated array in line with BHEL purchase specification	1	ST	1	26.08.2019
2	PS0679079645 Supply of Items for IR and its array * HSN/SAC : 8544 Test Certificate Supply of Items for Inverter room (IR) and its associated array in line with BHEL purchase specification	1	ST	1	26.08.2019
3	PS0679079653 Supply of items for 33KV txn line & bay * HSN/SAC : 8544 Test Certificate Supply of items for 33KV Transmission line, metering yard and substation bay in line with BHEL purchase specification	1	ST	1	26.08.2019
4	PS0679079661 I&C of Items related to CR and its array * HSN/SAC : 9997 I&C of Items related to Control Room (CR) and its associated array as per BHEL purchase specification	1	AU	1	07.10.2019
5	PS0679079670 I&C of Items related to IR and its array * HSN/SAC : 9997 I&C of Items related to Inverter room (IR) and its associated array as per BHEL purchase specification	1	AU	1	07.10.2019
6	PS0679079688 I&C of items for to 33KV Txn line,bay * HSN/SAC : 9997 I&C of items related to 33KV Transmission line, metering yard and substation bay as per BHEL purchase specification	1	AU	1	07.10.2019
7	PS0679079696 Operation and Maintenance * HSN/SAC : 9997 Operation and Maintenance as per BHEL purchase	120	MON	120	07.04.2031

TWO PART BID - SUBMIT TECHNICAL AND PRICE BID

NOTES:
1. This RFQ is governed by:
a) INSTRUCTIONS TO BIDDERS/SELLERS and GENERAL CONDITIONS OFCONTRACT FOR PURCHASE available at **http://edn.bhel.com (RFQ-PO Terms & Conditions)**
b) Any other specific Terms and Conditions mentioned.
2. Bidders / Representatives who would like to be present during opening of offers are required to furnish authorization letter for the same.
* The HSN/SAC no mentioned against the line items in the RFQ are indicative only.

For and On behalf of BHEL.

S. Pankaj Kumar
Semiconductors & Pho

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BHARAT HEAVY ELECTRICALS LIMITED
Electronics Division
PB No. 2606, Mysore Road Bangalore - 560026
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RFQ NUMBER:
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Purchase Executive : S. Pankaj Kumar
Phone : 080-26989667
Fax :
E-mail: spankaj@bhel.in

Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
	specification				

Total Number of Items - 7

1.
2.

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S. Pankaj Kumar
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PRE-QUALIFICATION CRITERIA FOR RFQ SPKSCPV031

1. Vendor should have executed contracts of indoor / outdoor electrical installation of 33kV minimum in power plants or sub-stations in India with scope including both supply, erection & commissioning for cumulative value of minimum Rs. 6.0 Crores with such individual contract values not less than Rs. 1.0 Crores within last three years from date of tender opening. As evidence to this, the vendor shall submit (a) Copies of Purchase orders from the clients.
(b) Certification from clients for completion of supply, erection & commissioning.

2. Vendor should have executed at least one contract of transmission line work of 33 KV and above with scope including both supply, erection & commissioning for total length not less than 5 KMs within last 3 years from date of tender opening. As evidence to this, the vendor shall submit (a) Copies of Purchase orders from the clients. (b) Certification from clients for completion of supply, erection & commissioning.

3. Vendor should have achieved minimum annual average financial turnover of Rs. 8 Crores in last three financial years (15-16, 16-17 and 17-18). Bidder shall submit the audited balance sheets for all the 3 years.

4. Bidder shall submit an undertaking stating that "ALL WORKS RELATED TO 33KV TRANSMISSION LINE, BAY AT SUBSTATION AND LIASIONING WORKS WITH TSNPDCL/TSTRANSCO/SLDC SHALL BE EXECUTED THROUGH RESPECTIVE TSNPDCL/TSTRANSCO/SLDC APPROVED CONTRACTORS AND USING APPROVED MAKES OF EQUIPMENT ONLY".

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Technical specification for Supply of Balance of System items, Installation, Commissioning & Operation & Maintenance for 10 years of 10MW (AC) Solar Photovoltaic Grid-connected Power plant at STPP, Pegadapally, Mancherial Distt, Telangana

Revision details:	Prepared	Approved:	Date:
	Varun Jain	Prachi Rao V	20.05.2019

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5.14	Underground cable trenches and laying of 1Cx400, RS485 and OFC cables in solar array field
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5.19	Installation of electrical panels within inverter room and main control room
5.20	Installation of cable trays, cable laying/dressing etc. in inverter room / main control room
5.21	Laying, termination of LT/HT/aux supply cables/ ACSR conductors in inverter/ main control rooms and in associated 33KV yards
5.22	Laying and installation of Control / data / instrumentation / OFC cables
5.23	Erection of 33kV yard Equipments
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5.25	Design, Supply, erection and Commissioning of 33 KV transmission line from Solar plant to Substation including ROW and Substation bay works
5.26	Supply, erection and commissioning of auxiliary transformer 63kVA, 33kV/415V, Dyn11, Outdoor, ONAN
5.27	Auxiliary AC/DC power supply system
5.28	Supply and installation of security room and Security Cabins-Prefab structures
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1.0 Introduction

1.1 Overall project outline of 10MW (AC) solar photovoltaic power plant

Bharat Heavy Electricals Limited (BHEL), Electronics Division, Bangalore is setting up 10MW (AC) solar photovoltaic (SPV) power plant for SCCL at STPP, Pegadapally, Mancherial Distt, Telangana.

Solar PV modules employed at the plant generates DC electricity that in turn shall be inverted to AC at 350V-380V range Output of each solar block (5MW) with independent Inverter/Control room (IR/CR) / transformer yards shall be stepped up to 33kV. Solar plant comprises of 1 no of Inverter room with associated 5 MW PV array and 1 no. of Main Control Room (MCR/ CR) with associated 5 MW PV array. Output of IR room is combined at CR at 33KV level.
MMS structures are seasonal type.
The total land of solar plant is distributed into four areas Block A, Block B, Block C and Block D all separated by a distance of approx. 100m. IR shall be in Block A and CR shall be in Block C.

Power generated at the above SPV plant shall be transmitted to substation using part 33kV Transmission line and part underground cables. There shall be Highway and railway crossings en-route. Distance between SPV plant and substation is 15 km approximately.

The plant is envisaged to have several other infrastructural support systems such as module cleaning system for SPV modules, plant illumination system, fire alarm system, boundary fencing, approach roads, pathways, drainage system etc.

1.2 Scope of this tender specification

Vendor scope includes supply, installation, testing and commissioning of certain identified activities of the solar photovoltaic power plant including transmission line design, supply, ROW, installation and commissioning as detailed in this specification.

This scope includes activities but not limited to obtaining approval from BHEL/ SCCL/ SECI/ TRANSCO/ TSNPDCL for the datasheets/ drawings/ MQP, manufacture/ testing/ inspection at manufacturer's works, packing, supply, transportation, transit insurance, delivery to site, unloading, storage, installation and commissioning of certain AC and DC side activities of power plant identified under this specification.

Note: The above is only a broad outline of vendor scope for the sake of introduction. The detailed vendor scope is elaborated under various other sections of this specification.

1.3 Enclosures to this tender specification (Tender purpose only)

1	Tentative AC single line diagram of overall Solar PV power plant
2	Tentative SPV plant layout with solar array, control/ inverter rooms, switchyards
3	Tentative layout of main control room
4	Tentative layout of inverter room

2.0 Location/ address of power plant:

10MW (AC) Solar Photovoltaic Power Plant, STPP, Pegadapally, Mancherial Distt, Telangana.

3.0 Vendor scope of supply, Installation and Commissioning

The table below indicates the scope of work for the vendor, as briefly outlined. Vendor shall submit the offer as per this list and quantity.

#	Scope of work (as briefly outlined)	Qty
1	**Supply of Items for Control Room (CR) and its associated array** This includes the supply of MC4 connectors, Y-connectors, cable ties, HDPE pipes, 63KVA ONAN auxiliary transformer, Weather monitoring system, cable lugs, glands, cable tray, earth chambers, Air conditioners, Furniture, cable tags, sign boards, danger boards, nuts, bolts, hardwares, termination kits, jointing kits etc. as per the various clauses of this specification	1 Set
2	**Supply of Items for Inverter room (IR) and its associated array** This includes the supply of MC4 connectors, Y-connectors, cable ties, HDPE pipes, cable lugs, glands, cable tray, earth chambers, cable tags, sign boards, danger boards, nuts, bolts, hardware, termination kits, jointing kits etc. for Inverter room and its associated solar array as per various clauses of this specification	1 Set
3	**Supply of items for 33KV Transmission line, metering yard and substation bay** This includes the supply of Poles, ACSR conductor, HT cable, pin insulators, strain insulators, stay sets, earthwire etc. as per various clauses of this specification	1 Set
4	**I&C of Items related to Control Room (CR) and its associated array** This includes, installation, testing and commissioning of SMB, PCU, Inverter Transformer, Aux Transformer, ACDB, UPS, FCBC, Battery banks, WMS, SCADA, furniture, earthing, cable tray, cable laying and terminations etc. as per the various clauses of this specification	1 AU
5	**I&C of Items related to Inverter room (IR) and its associated array** This includes, installation, testing and commissioning of SMB, PCU, Inverter transformers, Aux transformer, ACDB, UPS, FCBC, Battery banks, SCADA, earthing, cable tray, cable laying and terminations etc. as per the various clauses of this specification	1 AU
6	**I&C of items related to 33KV transmission line, metering yard and substation bay** This includes survey, ROW, pole erection, stringing, testing and commissioning of 33KV transmission line etc. as per the various clauses of this specification	1 AU
7	**Operation and Maintenance** This includes operation and maintenance of solar plant, metering yard, transmission line and substation bay for 10 years period	120 Months

4.0 BHEL scope of supplies and works

For clarity to the vendor, other items and activities within BHEL scope of solar PV plant end of the project are listed below:

1	Supply of 1C x 10 sqmm Solar Cable	~55 KM
2	Supply of DC cable, 1C x 400 sqmm, Al, XLPE, armoured as per IS: 7098 (from SMB to PCU)	~32 KM
3	Supply of LT cable, 1C x 630 sqmm, Al, XLPE, armoured as per IS: 7098 (from PCUs to Inverter transformers)	~1.8 KM
4	Supply of 33kV cable, 1C x 300, Al, XLPE, armoured as per IS: 7098 (for all 33kV connections within solar plant including Aux transformer HV side)	~3KM

5	Supply of OFC cables along with termination kits. Also, termination of the cables at both ends (SCADA panels of inverter rooms, SCADA panels of main control room and at SMBs)	As required
6	Supply of power conditioning units (PCUs) of 1250 kW with ducts	8 Sets
7	Supply of String Monitoring Box and diode box	56 Sets
8	Supply of inverter transformer 2.5MVA, 33kV/350-350 V, ONAN	4 Nos
9	Supply of 33kV breaker panels	2 Sets (9 Nos)
10	Supply of SCADA system including PLC panels, computers, software systems and related peripherals & accessories	1 set
11	Supply of ACDB	2 Sets
12	Supply of UPS with battery bank	3 Sets
13	Supply of FCBC and Battery	2 Sets
14	Supply of Dry type aux transformer for Inverter rooms	1 No
15	Supply and installation of CCTV system	1 Set
16	Supply and Installation of Fire alarm System	2 Sets
17	Supply of Earthing material for PV array, IR and CMCS	1 Set
18	Supply and Installation of Module mounting structure including module mounting	~834 Sets
19	Construction of Inverter and aux transformer foundations including fencing	1 Set
20	Unloading/ storage/ security for BHEL supplied items.	-
21	Construction of RCC inverter rooms, RCC main control room except those vendor scope supply/I&C activities defined under this specification.	1 + 1 rooms
22	Construction of civil works such as approach roads, pathways, drains, overall plant boundary fencing, soak pit, septic tank.	-

5.0 Technical specification for supply, installation and commissioning

#	BHEL specification
5.1	**Temporary site office for vendor use** Vendor shall make necessary office arrangements such as porta cabin, furniture, electrical points/ fittings etc. on their own for their use/ occupation at site during the period of project execution. **Note:** Site offices for BHEL and SCCL/SECI shall be arranged by BHEL.
5.2	**Electrical power / water for construction** Vendor shall organize, on their own, necessary electrical power supply such as DG sets and water supply etc. required for construction activities.
5.3	**Construction of temporary yards for safe storage of vendor supplied items** Vendor shall, at a suitable location at the site, as decided based on discussions with BHEL site engineer, construct temporary yards for safe storage of vendor supplied items.
5.4	**Unloading, safe storage and movement of supply items received at site:** **A. Items supplied by vendor** (1) Vendor shall organize all necessary resources such as labour, machinery and tools (cranes, hydra, forklifts, transportation trucks/ trolleys, lifting accessories etc.) for unloading the items (supplied by the vendor) received at site and subsequent movement to storage yards. (2) Similar arrangements shall also be made by vendor for movement of the stored items from storage yards to the exact construction locations within the project site.

	(3) Vendor shall maintain proper documentation / compilation of all the records related to shipping (invoices, LRs, delivery challans, material receipt certificates etc.) and shall take approval from BHEL site engineer for every consignment. The documents shall be suitably preserved for further handing over to BHEL. (4) Registers shall be maintained for the yard to keep track of incoming/outgoing items. (5) Safety of items shall be in vendor scope. Accordingly, suitable watch and ward shall be deployed on round-the-clock basis. **B. All other items (supplies from BHEL and other vendors)** (1) Receipt, unloading, storage, security guards shall be in scope of BHEL/ other vendors. (2) However, movement of these items from their respective storage locations to the points of construction is in scope of vendor (excluding modules and MMS). Accordingly, vendor shall organize all necessary resources such as labour, machinery and tools (cranes, hydra, forklifts, transportation trucks/ trolleys, lifting accessories etc.) for this purpose. (3) Vendor shall maintain proper documentation / compilation of all the records related to shipping (invoices, LRs, delivery challans, material receipt certificates etc.) and shall take approval from BHEL site engineer for every consignment. The documents shall be suitably preserved for further handing over to BHEL
5.5	**Construction of bore wells including hydro survey, water analysis, electrical cabling and plumbing works.** (1) Hydrological survey shall be carried out for identification the right locations for bore wells. (2) Minimum 2 bore wells shall be dug at locations as identified by hydrological survey and as certified by BHEL. Exact number of bore wells shall be decided during detailed engineering. (3) Bore wells shall be of necessary depth based on water table at the identified locations. (4) Water analysis shall be carried out at a reputed laboratory. Report on its constituents, potable quality etc. shall be submitted to BHEL. (5) Bore wells shall be fitted with submersible AC centrifugal pump of appropriate capacity/rating with all necessary electrical cabling up to main ACDB panel of CMCS room (or) the ACDB panels of the nearest inverter room. (6) Casing as required shall be provided for the pump. (7) Pump and the electrical cables of appropriate rating and cores shall be in vendor scope of supply. (8) Cables shall be directly buried as per relevant clauses of "**Cable installation methodology**" section of this specification. (9) Details of cable (type, rating, size, applicable standard etc) shall be submitted to BHEL/SECI for approval during detailed engineering. (10) Complete layout/scheme of bore well water supply with supporting discharge / pressure calculations, sizing / selection of pumps/valves etc, bill of materials shall be submitted to BHEL/SECI during detailed engineering. This shall be part of the detailed design submitted against "**water washing arrangement for cleaning of SPV modules**" and "**General civil works**" sections of this specification. (11) Pump make: CGL, Suguna, Kirloskar or any other reputed equivalent as shall be approved by BHEL / SECI.
5.6	**Series interconnection of SPV modules to form strings** Supply of SPV modules is in BHEL scope. Type of module: L24270 (~330Wp). Total quantity = ~33,360 Nos Vendor shall interconnect the SPV modules as follows: (a) Each module is fitted integrally with a junction box having positive and negative polarity cables (4 sq-mm).

	(b) Positive cable of one module shall be connected to the negative cable of adjacent module. The cables have MC4 type of connectors. One polarity cable has male type connector, while the other has female type connector. (c) This way, 20 modules shall be connected in series. Each set of connections is called as a sub string. (d) Each Module mounting structure (MMS) contains 40 nos of SPV modules. Thus from each MMS, two sets of sub strings (top row forms one string and bottom row forms other string) will be formed via **leap-frog method**. These two sub strings will be paralleled at MMS itself using Y-connectors to form a combined output as a string. The combined output of Y connector will be connected to 10 sqmm solar grade cable through MC4 connector. Supply of Y connectors and MC4 connectors is in scope of vendor. This 10 sqmm cable will be terminated at the input side of Diode box/SMB as a single input. After placing the purchase order on vendor, BHEL will provide layout drawings that will describe the exact way in which the strings are formed after placement of purchase order. Vendor shall implement the interconnection as per these drawings.
5.7	**Routing of 1Cx 10 cable below the SPV modules** (1) 1Cx10 sq-mm cables connecting the SPV module strings (output of Y connector) to SMBs/ Diode boxes suitably routed below the SPV modules and along the horizontal C-lip purlin member of MMS structure. These cables shall be dressed properly and fastened to the purlin using UV resistant cable ties of suitable length. (2) Cable ties shall be in vendor scope of supply. (3) Cable ties, nylon polyamide 6.6 UV stabilized black, UL94 flammability rating V2, operating temperature up to 85 deg C, shall be used to arrest any possibility of movement or sagging. Cable ties shall be of make: 3M, Phoenix contact, Weidmuller, Hellermanntyton, Panduit or other reputed equivalent subject to approval of BHEL/SECI/SCCL. Width and Length shall be so appropriate as to ensure that the bunched cables are held firmly to the mounting structure. Spacing between two adjacent cable ties shall be so appropriate as to ensure that there is no loose hanging of cables. During detailed engineering, BHEL/SECI/SCCL approval shall be obtained for the selected brand and sizes of cable tie. (4) Spacing between two adjacent cable ties shall be so appropriate as to ensure that there is no loose hanging of cables. (5) Solar cables, wherever exposed to direct sunlight (including gaps between tables) and buried underground, shall be laid through Double Wall Corrugated (DWC) HDPE conduits.
5.8	**Interconnection of SPV module strings to 1Cx10 cable and Supply of Y and MC4 connectors** (1) Vendor shall connect two sub strings (each of 20 SPV modules) to 1Cx10 cable (copper, XLPO insulation cable) using **Y-connector and MC4 connectors**. (2) Vendor shall supply **834 sets** (1 set = 2 nos) each of Y-connectors and 2502 sets (1 set = 1 male + 1 Female connector) MC4 connectors. These quantities are excluding spares requirement. (3) Extra quantity shall be procured for any damages / pilferage during the installation by vendor at site. Such additional quantities will not be paid for. Vendor shall ensure that there shall not be any shortage during execution time. (4) Four sets of tool kits shall be supplied. This shall include crimping plier MC4, open end spanner set MC4, stripping plier MC4, socket wrench insert to tighten, socket wrench insert to secure, inserts for both 4 sq-mm and 10-sqmm (of both pliers). (5) Y-Connectors and MC4 connectors shall have rating of 1000VDC (IEC), rated current of 30A (min), type approved by TUV Rheinland for product safety. (6) Approved make: Multicontact, Bizlink, Sunlont, Elmex or other reputed equivalent subject to BHEL/ SCCL/ SECI approval during detailed engineering.

	(7) In addition, any other required tools and tackles for crimping of cable etc. shall be arranged by vendor.
5.9	**Installation of SMB and Diode boxes including erection of SMB and diode box mounting structures** (1) Positive cable of each string will be connected to SMBs through diodes for reverse current protection. For the same, Diode boxes (16-input, 16-output, independent of SMBs) shall be supplied. Negative cables will be connected to SMBs directly. All SMB and Diode box cable entries shall be with MC4 connectors. Supply of string monitoring boxes (SMB) and diode boxes with mounting structures, 56 sets, is in BHEL scope. Structure Erection, equipment mounting and installation for SMBs and Diode boxes is in Vendor's scope. SMBs are 16-in/1- out type, Diode boxes are 16-in 16-out type. (2) Vendor shall assemble the structures including erection on foundations, install the SMBs and Diode boxes on SMB/ Diode box foundations. Necessary hardware like nuts, bolts, washers etc. and **canopy of SMB and Diode boxes** shall be in the vendor scope of supply. Details of canopy shall be given by BHEL. (3) Drawings and details of SMBs and the fixtures will be provided to the vendor after placement of purchase order. (4) All necessary labour, tools, machinery etc. for shifting from stores and erection work shall be in vendor scope.
5.10	**Routing of 1Cx10 cable in DWC HDPE pipes underground between the rows of solar array** (1) One SMB is connected to 15 strings. SMBs are located in center of a string block. Where 1Cx10 cables run vertically along MMS leg or between two rows of structure (or) where the cables cross over the pathway separation between two adjacent solar array blocks, HDPE double walled corrugated (DWC) pipe shall be provided to route the cables underground from one row/ block to the other. HDPE DWC pipe together with necessary HDPE couplers/ joints (T-joints, elbows, bends etc.) shall be within scope of vendor supply. Where cables run vertically along MMS leg, HDPE pipes shall be routed properly and tied/ clamped to leg. For this, necessary UV protective cable ties of suitable length or clamps shall be in vendor's scope of supply. (2) Specification of HDPE DWC pipe: As per relevant IS; ID shall be selected to accommodate the number of 1Cx10 cables to be guided. A maximum of 7 circuits can be run through single HDPE pipe. Fill ratio will be considered max 50%. However, exact ID shall be selected to ensure that only a maximum of 50% of the ID space is occupied by the cables. Make, part number, sizes/ dimensions shall be submitted for BHEL/SCCL/SECI approval during detailed engineering. (3) Cables with HDPE pipe (and couplers/joints etc.) shall be directly buried underground as per IS: 1255. Continuous trenches shall be excavated on either side of the SMB. In addition, for each SMB, there shall be minimum one pathway crossing, for which trench shall be excavated. a. Trench depth = 400 mm minimum b. Trench width = As per conduit size and number of conduits c. Trench shall, then, be filled with refill soil and compacted. Excavation, laying of pipes, routing of 10 sqmm cables through HDPE pipe, fixing of couplers, sealing end of the HDPE pipes, trench backfilling shall be vendor's scope. Trenches shall be backfilled, compacted and the area shall be neatly levelled. (4) Total length of HDPE DWC pipe and quantity of couplers/joints shall be as required. (5) Bending radii for cables shall be as per IS: 1255. (6) At road crossings, cables shall be routed through Hume pipe of class NP3 of appropriate size that shall be in vendor scope of supply and technical details/ brand etc. shall be submitted for BHEL/ SECI/ SCCL approval during detailed engineering.

	(7) All cable entry openings of conduit pipes, after laying/ termination of the cables, shall be sealed using appropriate sealant (single component thermoplastic insulating compound) to ensure water proof tightness. The sealant supply will be vendor's scope of supply. (8) Solar cables, wherever exposed to direct sunlight and buried underground, shall be laid through Double Wall Corrugated (DWC) HDPE conduits.
5.11	**Interconnection of Diode box and SMB** 1) 1Cx10 cables of positive polarity originating from SPV module strings shall be terminated at the input side of Diode box using MC4 connector. Output of Diode box shall be connected to SMBs using 10 sqmm cable with MC4 connectors. 2) Vendor scope includes removal of sleeve at the cable end, fixing of MC4 connectors of appropriate type/size and connecting the MC4 connector to the SMB/ Diode box. These cables will be supported suitably and dressed neatly. 3) 10sqmm cables will be supplied by BHEL, MC4 connectors will be supplied by vendor. Quantity for this is already considered under clause 5.7 of this specification. 4) 1Cx10 cables of negative polarities originating from SPV module strings shall be terminated directly at the input side of SMBs using 10 sqmm cable with MC4 connectors. 5) All necessary tools such as pliers, strippers, MC4 crimping tools etc. shall be within vendor scope.
5.12	**Termination of 1Cx10 cables on input side of SMBs/DIODE BOXES** (1) 1Cx10 cables of positive polarity originating from Diode box outputs shall be terminated at the input side of SMBs using 10 sqmm cable with MC4 connectors. 1Cx10 cables of negative polarities originating from SPV module strings shall be terminated directly at the input side of SMBs using 10 sqmm cable with MC4 connectors. MC4 connector are already fixed in cable entry/exit of Diode box input-output and SMBs as part of BHEL scope of supply. However, MC4 connectors required for connecting 10 sqmm cables to strings/SMBs/Diode boxes and Supply of Y connectors shall be done by Vendor. (2) Vendor scope includes removal of sleeve at the cable end, fixing of MC4 connectors of appropriate type/size and connecting the MC4 connector to the SMB/ Diode box. Cables shall be dressed properly using suitable UV protected cable ties at SMB/ Diode box ends. Supply of cable ties is in vendor's scope. (3) Any other hardware, if necessary for fulfilling the connection, such as bolts, nuts, screws, washers etc. shall be in vendor scope of supply. All hardware shall be of SS304. (4) All necessary tools such as pliers, strippers, MC4 crimping tools etc. shall be within vendor scope.
5.13	**Ferruling for 1Cx10 cable** 1) For 1Cx10 sqmm DC solar array cable, vendor shall supply and provide UV resistant ferrules printed with source/destination identification of cable. Printing details shall be given by BHEL after placement of order. Printing shall be of appropriate size to ensure readability. 2) Supply of ferrule shall be in vendor scope. 3) Ferrules shall be provided on all termination ends: module end, Diode box end and SMB ends for all 10 sqmm cables.
5.14	**Underground cable trenches and laying of 1Cx400, RS485 and OFC cables in solar array field** (1) DC power cable 1Cx400 sqmm, Al conductor, XLPE, armoured (from SMB to PCU), data cable RS485 (for looping between SMBs to SMBs) and OFC cable (from SMBs to SCADA) shall be laid underground by way of direct burying as per IS:1255. Supply of above the cables shall be in BHEL scope. Cable laying shall be carried out as per **"Cable installation methodology"** defined in this specification. (2) Typical trench details/dimensions are below only for tender purpose. (a) Total trench depth = 850 mm minimum (b) Trench width = As per number of cables laid. (c) Trench shall have layers one over the other as below (from bottom to top):

	1. Bottom layer shall be sand of IS: 383 with 75mm minimum thickness 2. 1Cx400 cable shall be laid over the sand layer 3. Another layer of sand of 75 mm minimum thickness. 4. Single layer of brick as protective cover covering all cables 5. Then, 300mm backfilled with soil. 6. RS485/OFC cables shall be laid in HDPE pipe. 7. Trench shall, then, be filled with refill soil and compacted (3) Data communication (RS 485) cables shall be laid between SMBs to form daisy chain loop (Not more than 7 SMBs in one loop) and from the end SMB of each loop, optical fiber cable shall be laid to the SCADA panel in the inverter room/ control room. These cables shall be laid underground through HDPE pipe at a min depth of 400 mm with clearance of 300 mm min from adjacent running power cables. HDPE pipe for OFC and RS485 cables will be supplied by BHEL. UV resistant ferrules shall be supplied and fixed for identification of cables by vendor. (4) Bending radii for cables shall be as per IS:1255. At road crossings, cables shall be routed through Hume pipe (Class NP3, 300 dia) of appropriate size that shall be in vendor scope of supply. At Nallah crossings, cables shall be routed through Covered cable trays/ structures. Hume pipe and cable trays/ structures of appropriate size shall be in vendor scope of supply, fabrication, grouting and erection. (5) Vendor shall take utmost care in laying the cables in order to prevent wastages and damages on outer sheath and inner insulation. Cable shall be drawn with rollers only to ensure no damage to cable during laying. In case cables found to be damaged/ cut after the laying in trenches, vendor shall implement suitable corrective action such as cable jointing, or re-lay a new cable in consultation with BHEL.
5.15	**Laying of 1Cx400/ OFC cables in inverter rooms and terminations at PCU/SCADA** (1) 1Cx400 cables (Al conductor, XLPE insulation, armoured: BHEL scope of supply) and OFC (unarmoured, BHEL scope of supply) running from SMBs (through outdoor cable trenches) shall be routed into the inverter/ control rooms and laid on the cable trays therein. Supply and laying of cable trays within the rooms shall be in vendor scope. Vendor shall route, lay and dress the cables neatly on the trays. Cable ties shall be in vendor scope of supply. OFC Cable shall be laid inside the HDPE pipe. Cables shall enter in control/inverter room through PVC pipe (dia 150mm min.) provided in entry points. (2) Vendor shall carry out drilling of holes in cable gland plates of the PCUs for the 7 positive and 7 negative DC inputs of 1Cx400 cable. Similarly, holes for entry of OFC cables into SCADA panels. Gas cutting method is strictly not allowed. Vendor shall organize hole-saw cutters of appropriate size for this purpose. All necessary drilling machines / tools etc. shall be made available at site. (3) Prior to termination, each cable shall be checked for continuity and megger. In case any cable found defective, vendor shall implement suitable corrective action such as cable jointing, replacement/re-laying of cable etc. as applicable. (4) Vendor shall carry out glanding of the cables following which the glands shall be fitted to the respective holes of gland plates. (5) Vendor shall carry out the 1Cx400 cable terminations for the 7 positive and 7 negative inputs that include tasks such as unsleeving, crimping, connecting to the tinned copper bus bars, tightening using torque wrench etc. Lugs and glands for power cable termination at PCU is in BHEL scope of supply. (6) Cable glands (metallic, single compression) for OFC cable termination is in vendor scope of supply. (7) Vendor shall arrange torque wrench of appropriate range. Torque setting shall be as per the bolt size and property class. For the setting, approval shall be obtained from BHEL site engineer.

	(8) All tools/accessories such as crimping tools etc. required to carry out the termination shall be within scope of vendor.
5.16	**Termination of 1Cx400 DC power cables and RS 485 cables at SMBs** (1) Cables of 1Cx400 (Al conductor, XLPE insulation, armoured) shall be terminated at the output side of SMBs (positive, negative terminals). Supply of this cable is in BHEL scope. (2) Vendor scope includes removal of sleeve at the cable end, crimping with suitable cable lug of appropriate type/size and connecting the lugged end to the tinned copper bus bar within the SMB. Cables shall enter the SMB through the metallic cable glands that are also supplied by BHEL along with SMBs. (3) Aluminium Cable lug with bimetallic washers/ strip shall be in vendor scope of supply. Total requirement- **112 sets** approx. Make shall be Dowell, or equivalent subject to approval of BHEL/SECI/SCCL Lug shall match the cable conductor material /size and also the tin plated copper bus bar of SMB. (4) Quantity of lug and hardware shall also include contingency requirements arising out of shortage due to various reasons (damage, theft etc) during installation. (5) All necessary tools such as pliers, strippers, crimping tool etc shall be within vendor scope. (6) Similarly, vendor shall carry out RS485 cable terminations at SMBs. Supply of Cable glands is in BHEL scope as part of SMBs. Cable lugs shall be in vendor scope of supply for which details of make, part number, size etc. shall be submitted for BHEL/SECI/SCCL approval during detailed engineering. Shield of the RS485 cables shall be suitably earthed at SMB end.
5.17	**Laying and Termination of 1Cx630 LT AC power cables at PCU and Inverter Transformer** (1) LT Cables 3 runs of 1C x 630 sqmm Al conductor, XLPE, unarmoured per phase shall be laid between AC side of the PCU and the LT side of the Inverter transformer in RCC trench. Supply of this cable is in BHEL scope. Cables shall be laid in trefoil arrangement. Trefoil clamps supply and fixing in in vendor's scope. (2) Vendor scope includes removal of sleeve at the cable end, crimping with suitable Bimetallic Lug or Aluminium Lug with Bimetallic washer/ strip. Cables shall enter the PCU and Transformer through the metallic cable glands. Supply of Lugs and Glands for PCU side termination is in BHEL scope. Supply of Lugs and Glands required for Inverter Transformer side termination shall be in vendor's scope. Required qty- **72 nos of lugs, 72 Nos of glands** approx. (3) Cable lug make shall be Dowell, or equivalent subject to approval of BHEL/SECI. (4) Cable gland metallic type shall be of COMET make or equivalent subject to approval of BHEL/SECI/SCCL. (5) Quantity of lug and hardware shall also include contingency requirements arising out of shortage due to various reasons (damage, theft etc.) during installation. (6) All necessary tools such as pliers, strippers, crimping tool etc. shall be within vendor scope.
5.18	**Identification marking of cables using cable tags** 1) Cable tags shall be provided on all power cables at both ends just before entering the equipment enclosure and every 20 m on cable tray or trench run. 2) Cable tags shall be of rectangular shape. 3) Cable tag shall be of 2mm thick aluminum with number punched (embossed) on it and securely attached to the cable by not less than two turns of 20 SWG GI wire conforming to IS:280. 4) ID numbering scheme shall be provided to vendor after Purchase order placement. Vendor shall submit the technical details of cable tags for BHEL/SECI/SCCL approval during detailed engineering.

5.19	**Installation of electrical panels within inverter rooms and main control room** **Panel installation within inverter room:** Vendor shall organize necessary resources such as labour, cranes, hydra, forklifts, transportation trucks / trolleys and other accessories for movements and positioning of the panels as below (Quantities mentioned are per inverter room): (a) 1250 kW PCU panels: 4 sets (including PCU assembly- DC, AC & PCS cabins) (b) 33kV VCB panels: 1 set (2 incomers + 1 outgoer. This includes assembly of panels together as well) (c) Indoor Dry type Aux Transformer – 1 No (d) Distribution boards: ACDB, UPSDB, AC, DCDB and any extra boards as required (e) SCADA panel: 1 No (f) UPS with battery bank: 1 No (g) FCBC battery charger with Battery bank– 1 No **Panel installation within main control room:** (a) 1250 kW PCU panels: 4 sets (including PCU assembly- DC, AC & PCS cabins) (b) 33kV VCB panels: 1 Set (3 incomers + 1 outgoer + 1 Aux TRF outgoer + 1 Bus PT. This includes assembly of panels together as well) (c) ACDB main panel: 1 set (d) Distribution boards (wall mounted): DCDB, UPS DB, CR DB (room utilities), LDB (plant lighting), PDB (power DB): 1 No each + any extra boards as required (e) SCADA panel: 2 Nos (f) HMI SCADA control desk with PCs and accessories: 1 set (g) UPS with battery bank – 2 Nos (h) FCBC battery charger with battery bank – 1 No (1) Panels shall be moved to the respective positions and placed over the cable trenches in control room, in the exact sequence and locations as per drawings. Drawing shall be provided after placement of purchase order. (2) PCUs, VCB panels shall be placed on cable trench of inverter / main control rooms, with cable entry openings to match cable trench on bottom side. (3) Panels shall be suitably grouted using welding/ bolting methods as per relevant standards and recommendation of OEMs. BHEL approval shall be obtained for the grouting arrangement. All necessary hardware for the same shall be within vendor scope of supply.
5.20	**Installation of cable trays, cable laying/dressing etc. in inverter room / main control room** **A. Installation of cable trays** (1) Vendor shall supply and install cable trays, fittings and accessories within control room for laying 33kV HT, DC/AC LT, control, communication cables etc. Cables trays shall be ladder type with horizontal corner bend pieces and shall have 750mm minimum width, 3mm minimum thickness and 100mm minimum height. Drawings/ make/ part number of these shall be submitted for BHEL/SECI/SCCL approval. (2) Cable trays shall be installed by vendor on MS support angles provided in cable trench by BHEL. (3) Cable trays shall be in three vertical layer arrangements: bottom for 33kV cables, middle for LTAC/DC cables and top for control/data/ communication cables. (4) Suitable cut outs, wherever applicable, shall be made in the cable trays to provide path for the cable to reach the panel. (5) Adjacent cable trays shall be interconnected using suitable hardware items that shall be in vendor scope of supply. (6) Cable trays shall be double earthed to the earth mat grid of the room.

	B. Cable routing, laying, dressing (1) All Cables entering into the inverter/ main control rooms from outside (solar array/ transformer yards) shall be bunched appropriately LT/HT/control category wise. The multiple bunches shall be routed through PVC conduit pipes already provided in the building below the plinth beam of room. (2) Cables (HT, LT, communication, control etc.) shall be laid on cable trays in separate tiers with appropriate spacing as per IS: 1255. (3) Control/ data/ instrumentation cables that run from inverter rooms to marshalling box of inverter transformers shall be routed through HDPE DWC conduit pipes of appropriate size. (4) Cables shall be dressed using appropriate cable ties at appropriate intervals to ensure firmness of their position over the trays. (5) Trefoil clamps shall be used wherever single core cables are used for three phase system. These clamps shall be at appropriate intervals to ensure firmness of bunching of cables. (6) All cable entry openings of conduit pipes, after laying/ termination of the cables, shall be sealed using appropriate sealant to ensure water proof tightness. (7) All cable accessories such as cable conduits/pipes, ties, trefoil clamps, sealants etc for the above purpose shall be in vendor scope of supply. (8) All the supply and installation works as mentioned above shall be as per "**Cable installation methodology**" section of this specification and as per drawings. Drawings shall be provided after placement of purchase order.
5.21	**Laying, termination of LT/HT/aux supply cables/ ACSR conductors in inverter/ main control rooms and in associated 33KV yards** (1) For all electrical panels viz. PCUs/ VCB panels/ ACDB panel/ UPS/ FCBC battery charger/ battery bank /DB boards/ aux transformer and inverter transformers of the inverter rooms, laying and termination of LT/HT/Aux power cables shall be in vendor scope. (2) For all electrical panels viz. PCUs/ VCB panels/ ACDB panel/ UPS/ FCBC battery charger/ Battery bank / DB boards / aux transformers/ inverter transformers/ GOS/ Metering panel/ Metering CT/ Metering PT of the control room, laying and termination of LT/HT/Aux power cables/ ACSR connections, switchyard structure & equipment erection, transmission line work including ROW shall be in vendor scope. (3) 630sqmm AC cables in transformer yards in inverter room and control room yard shall be routed through RCC trenches. Construction of RCC cable trench shall be BHEL scope. (4) Cable glands, cable lugs, 33kV HT cable termination kits (indoor/ outdoor types as applicable), Cable jointing kits, lugs, clamp & connectors for ACSR conductor, bolts, nuts, washers etc. shall be in vendor scope of supply. (5) It is the responsibility of the vendor to assess the actual length requirements duly considering all applicable clearances as per relevant standards, Indian electricity rules, CEA/CEIG requirements etc. For this purpose, tentative (indicative) locations of inverter/Control rooms, internal layouts of inverter/Control rooms are enclosed along with tender. (6) For marshalling box of transformer/ UPS/ SCADA/ DB boards, single compression nickel plated brass glands shall be provided by vendor. Make shall be COMET or reputed equivalent subject to approval of BHEL/SECI/SCCL. (7) HT termination kits (indoor/ outdoor as applicable) shall be of Raychem make as shall be approved by BHEL/SECI/SCCL. HT termination shall be carried out by certified jointers. Credentials / certification of experience from Raychem for the proposed jointers shall be submitted for BHEL/SECI/SCCL approval during detailed engineering.

(8) Quantity of 33KV End termination and straight through jointing kits shall be supplied by vendor as follow (for solar plant connections only, termination kits for transmission line and substation purpose will be additional as per design):
a. Indoor 33KV End termination kit for 1Cx300 sqmm (E) cable = **39 Nos**
b. Outdoor 33KV End termination kit for 1Cx300 sqmm (E) cable = **3 Nos**
These quantities are excluding spares requirement.

(9) The scope of HT cable laying and termination at Control room incomer panels for the cables coming from Inverter room shall be in the scope of the vendor.

(10) All trench excavations, cable laying, sand and brick layer, backfilling etc as per IS 1255 shall be in vendor's scope.

(11) Vendor shall make appropriate holes in the gland plates of PCUs, HT VCB panels, ACDBs, SCADA panels, Inverter transformers, Marshaling boxes, Auxiliary transformer, Battery chargers, Distribution boards etc. for fixing the cable glands. Gas cutting is strictly prohibited. Hole-saw cutters of appropriate sizes with suitable drilling machines shall be made available at site for this purpose.

(12) Bimetallic lugs or aluminium lugs with bimetallic strip/washer shall be used for connecting Cu bus bar and Al cables or vice-versa wherever applicable.

(13) Terminations with M10 and above shall be tightened using torque wrench. Torque setting shall be as per size, property class of bolt. BHEL approval shall be obtained for the settings prior to tightening.

(14) Approximate (indicative) specifications of certain power cables are as follows. Exact specification shall be based on design calculations that shall be submitted for BHEL/SECI/SCCL approval during detailed engineering. Quantity shall be appropriately selected.

(a) PCU to 2.5MVA transformers: **Cable supply in BHEL scope**
3-phase 3-wire system, 3Rx1Cx630 sqmm per phase (with R, Y, B colour coding), 1.1kV grade, aluminium conductor, XLPE insulation, unarmoured, PVC sheathed as per IS: 7098. (Note: cables from inverter/CMCS room shall be laid in RCC trench in trefoil arrangement).

(b) HV (33kV) side connections in VCB panels (incomers, outgoers), 2.5MVA transformer, control room auxiliary transformer: **Cable supply in BHEL scope**
3-phase 3-wire system, 3Rx1Cx300 sqmm, 33kV, aluminium conductor, XLPE insulation, armoured, PVC sheathed as per IS: 7098.

(c) PCU to 30 KVA dry type auxiliary transformer in inverter room: **Cable supply in vendor scope**

(d) Dry/ONAN Auxiliary transformers to ACDB panel in each inverter/ CMCS room: **Cable supply in vendor scope**

(e) Metering CTs, PTs, GOS, LA connections in control room: **ACSR Conductor & termination accessories supply in vendor scope**

(f) LT AC aux power supply cables from ACDB panels in Inverter/control room to the related utility loads such as battery charger, UPS, 33KV Motorised isolator, metering yard kiosks, MCB DB boxes for room appliances, PCU, ABT meters, transformers aux supply, SCADA, VCB panels aux supply, fire alarm system, panel illumination lamps, space heaters of VCB panels etc. **Cable supply in vendor scope**

(g) LT DC aux power supply cables from DCDB panels in inverter/CMCS rooms to the utility loads such as DCDB panels, VCB panel tripping/closing circuits, SCADA, VCB panel spring charge motors in 33kV metering yard etc. **Cable supply in vendor scope**

(15) Supply of all cable accessories (for the above requirements) such as cable trays, cable glands, cable lugs, ferrules, nuts/bolts/washers, cable dressing ties etc shall be in vendor scope.

(16) Laying of above cables, fixing of cable glands, cable termination at the respective terminal bus bars shall be in the scope of vendor

(17) All resources such as labour, machinery, tools and accessories to carry out the above electrical works shall be in vendor scope.

(18) All applicable/relevant clauses under "**General specification of LT cables**" and "**Cable installation methodology**" sections of this specification shall be adopted for all aspects of these cables.

Indicative list and specification of auxiliary power cables to be supplied by vendor:

1.1KV grade, 3.5C X 70 sq.mm, Aluminium conductor, extruded XLPE insulated, extruded PVC type ST2 inner sheathed, galvanized steel strip/wire armoured, extruded PVC type ST2 outer sheathed Cable as per IS 7098 Part-1.
1.1KV grade, 4CX16 sq.mm, Copper conductor, extruded XLPE insulated, extruded PVC type ST2 inner sheathed, unarmoured, extruded PVC type ST2 outer sheathed Cable as per IS 7098 Part-1.
1.1KV grade, 4C X 4 sq.mm, Copper conductor, extruded XLPE insulated, extruded PVC type ST2 inner sheathed, galvanized steel strip/wire armoured, extruded PVC type ST2 outer sheathed Cable as per IS 7098 Part-1.
1.1KV grade, 2C X 16 sq.mm, Copper conductor, extruded XLPE insulated, extruded PVC type ST2 inner sheathed, galvanized steel strip/wire armoured, extruded PVC type ST2 outer sheathed Cable as per IS 7098 Part-1.
1.1KV grade, 2C X 2.5 sq.mm, Copper conductor, extruded XLPE insulated, extruded PVC type ST2 inner sheathed, galvanized steel strip/wire armoured, extruded PVC type ST2 outer sheathed Cable as per IS 7098 Part-1.

5.22 Laying and installation of Control / data / instrumentation / OFC cables

(1) Vendor shall supply all the control/ data/ instrumentation / communication cables except RS485, OFC and Ethernet LAN cables.

(2) All the cable installation accessories such as cable trays, cable conduits, cable glands, cable lugs, ferrules, cable ties, bolts, nuts, washers etc. shall be in vendor scope of supply. Cable laying and cable terminations shall be in vendor scope. All necessary resources such as labour, tools and accessories required to carry out laying and termination works etc. shall be in vendor scope.

(3) **OFC cable** termination kits shall be in BHEL scope of supply. Vendor scope includes laying of the OFC cable underground in the conduit from SMBs to SCADA panel and from inverter room SCADA panels to main control room SCADA panel. Termination of the OFC cables at both the ends shall be in BHEL scope.

(4) Vendor shall lay and terminate the **RS485 cables** to SCADA from all plant equipment e.g. HT panels, ACDBs, transformers, FCBC, UPS etc. These cables shall be laid between the panels of respective inverter/ main control rooms.

(5) Vendor shall lay and terminate the Ethernet cables to SCADA from (a) PCUs, (b) numerical relays of VCB panels. These cables shall be laid between the panels of respective inverter/ main control rooms.

(6) Vendor shall lay and terminate control and instrumentation cables from inverter transformers to SCADA and from HT breakers to SCADA.

(7) Laying and termination of cables in metering yard e.g. from 33 KV motorized isolator, metering CTs, Metering PTs to SCADA/ ABT meters/ HT breakers etc. Distance of Metering yard from control room is 200 m approximately.

(8) Electrical Interconnections of HT breaker panels e.g. outgoer, incomers, Bus PT panels for inverter room and control room HT breakers.

(9) Suitable size ferrules with details shall be provided on either side on either side of each control/ data/ instrumentation cable.
(10) Vendor shall submit cable schedules for approval of BHEL/SECI.
(11) All applicable/relevant clauses under "**Cable installation methodology**" sections of this specification shall be adopted for all aspects of these cables.

Indicative list and specification of control and instrumentation cables to be supplied by vendor:

1.1KV grade, 12C X 1.5 sq.mm, Copper conductor, extruded PVC type A insulated, PVC type ST1 inner sheathed, galvanized steel strip/wire armoured, extruded PVC type ST1 outer sheathed Cable as per IS 1554 Part-1.
500V grade, 5P X 0.5 sq.mm, Copper conductor, extruded PVC type A insulated, twisted pair, individual and overall shielded with Aluminium Mylar tape, 0.50 sq.mm ATC drain Wire, extruded PVC type ST1 inner sheathed, galvanized steel strip/wire armoured, extruded PVC type ST1 outer sheathed Cable as per IS 1554 Part-1 and BS 5308 Part-2.
1.1KV grade, 2C X 2.5 sq.mm, Copper conductor, extruded XLPE insulated, extruded PVC type ST2 inner sheathed, galvanized steel strip/wire armoured, extruded PVC type ST2 outer sheathed Cable as per IS 7098 Part-1.

5.23 Erection of 33kV yard Equipments

(1) Inverter room is attached to two transformer yards each having one inverter transformer.
(2) Control room is attached to one switchyard having two inverter transformers, one Aux transformer 63kVA, 33kV/415V.
(3) Construction of transformer RCC foundations, fencing and gates for transformer yard in control room and inverter room is in BHEL scope. Levelling, stone jelly, cable support structures fabrication & foundation works, all earthing related works-excavation etc shall be in vendor's scope.

TRANSFORMER ERECTION-

(1) Vendor shall erect the inverter and auxiliary transformers on RCC foundation as per transformer GA details. Vendor scope of I&C of transformers shall include:
   a) Movement of transformers and its accessory parts such as radiators, cable boxes, hardware etc from storage yard and placement on foundation pedestal.
   b) Assembly of transformer parts.
   c) Cable laying and terminations at LV/HV/Marshalling boxes of transformers.
   d) All activities applicable to oil filling and filtration including measurement of oil BDV and PPM. Particularly for inverter transformers, filtration of oil shall be carried out to such an extent as to obtain the desired BDV (>60 kV) and PPM (< 15ppm) values.
   e) Testing of transformers as per "**pre-commissioning checks**" section of this section.
(2) After installation of transformers at the transformer yards of each inverter/ main control room, vendor shall level/ compact the ground with an appropriate magnitude and direction of slope to facilitate draining of rain water away from transformer yard. Accordingly, to prevent stagnation of water within transformer yard, vendor shall implement suitable civil works in and around the transformer yard. This shall include filling up the land (wherever necessary) with suitable soil and compact the filled-up

	portions either manually or with rollers, as applicable, as per site conditions, to achieve required compaction/slope. **General Notes-** Vendor shall provide the 100 mm layer of stone gravels in transformer yards as per relevant IS standards / CBIP/ CEIG requirements etc. Vendor shall provide applicable earthing connections to transformers, fencing / gates etc. in the yard as per relevant clauses under the "**Earthing system**" section of this specification. All other items (if any, other than the above) that are required to meet the technical requirements of transformer yard as per applicable standards / electricity rules shall be incorporated by the vendor.
5.24	**Design, supply, installation, testing and commissioning of metering yard & its equipments** (1) Metering yard shall consist of two set of 33KV Metering CTs, two set of 33KV Metering PTs, ABT meters (1 Main, 1 Check and 1 Standby meter), GOS with Earth Switch & LAs which shall be placed at an appropriate location near plant boundary. Approximate distance from control room= 200 m. All equipments and structures shall be in line TSNPDCL/ TSTRANSCO standards and are in scope of supply of vendor. Earthing strip will be supplied by BHEL, installation will be in scope of vendor. (2) Design, supply, construction (including civil works), installation, testing and commissioning of 33KV metering yard, transmission line and substation bay shall be in vendor's scope and shall be in line with TSNPDCL/ TSTRANSCO standards. All necessary clearances, approvals from respective agencies shall be obtained by vendor. (3) Construction of metering yard fencing and gates are in BHEL scope. Structure foundations, erection, Levelling, stone jelly, cable support structures fabrication & foundation works, all earthing related works-excavation etc shall be in vendor's scope. (4) Vendor shall provide the 100 mm layer of stone gravels in transformer yards as per relevant IS standards / CBIP/ CEIG requirements etc. (5) Vendor shall provide applicable earthing connections to transformers, fencing / gates etc. in the yard as per relevant clauses under the "**Earthing system**" section of this specification. (6) All other items (if any, other than the above) that are required to meet the technical requirements of transformer yard as per applicable standards / electricity rules shall be incorporated by the vendor.
5.25	**Design, Supply, erection and Commissioning of 33 KV transmission line from Solar plant to Substation including ROW and Substation bay works** The Vendor scope includes the power evacuation and integration to the designated substation via overhead transmission line/ underground cable at 33 KV level with all necessary infrastructure and equipments such as protection switchgears and metering systems as per the requirement of TSNPDCL/ TSTRANSCO. Length of transmission line is approximately 15 km (Solar plant to substation). All materials related to transmission line and bay works are in scope of vendor. The scope shall include design, supply, ROW clearances, obtaining approvals from BHEL/ TSTRANSCO/ TSTRANSCO, related civil works, erection, testing and commissioning of transmission line and 33KV bay at Substation end. Transmission line route consists of railway crossings and highway crossing. Design shall take care of these crossings.

The contractor shall get the route approval from concerned authorities prior to start of the construction.

The ROW for the Transmission Line shall be obtained prior to the construction of the line from the concerned authorities.

Substation bay shall have Metering CTs, metering PTs, GOS with ES, Metering panel with ABT meters (1 Main, 1 check and 1 standby meter) and breakers with C&R panel.
Data acquisition system with remote monitoring facilities. As per SLDC's Requirement data shall be sent from generating plant to the State Load Dispatch Centre (SLDC). Necessary cabling work for the same shall be under scope of vendor including supply of cables.

Supply of all items and equipments e.g 33KV breaker, CTs, PTs, GOS, LA, insulators, 33KV cables, control/ data/ aux power cables, termination kits, ACSR conductor, earthing material, line poles etc shall be in scope of vendor. Makes and technical parameters of all items shall be as per TSNPDCL/ TSTRANSCO standards.

5.26 **Supply, erection and commissioning of auxiliary transformer 63kVA, 33kV/415V, Dyn11, Outdoor, ONAN**

QTY REQUIRED- 1 NO
Type test reports from NABL accredited lab will be submitted for Auxiliary transformer for approval of manufacturer. Vendor will be approved based on type test report and credential.

1.0 Technical parameters and specifications:

#	Technical parameter	Specification
1	Transformer type	Outdoor, oil-immersion type
2	IP class	Transformer, including cable box and marshalling box shall be of IP55
3	Type of cooling	ONAN
4	Governing Standard	IS: 2026
5	Rating in KVA	63 kVA
6	No. of phases	3
7	Frequency	50 Hz, +/- 3%
8	HV winding	33kV, 3-Ph, with **Delta** connection
9	LV windings	415V, 3-Ph, with **Star** connection
10	Winding material	Electrolytic grade copper for both HV and LV windings
11	Winding Insulation	Class A
12	Neutral on LV side	Neutral terminal shall be brought out separately to facilitate earthing connections.
13	Vector Group	Dyn11
14	Short circuit withstand time (thermal)	2 sec.
15	% Impedance	As per IS: 2026
16	Termination HV/LV/Orientation	Air insulated cable box with disconnecting chamber, for both HV and LV sides. Cable box / Cable box / 180^0.

17	Cable entry on HV side	Bottom entry of cables.
18	Cable entry on LV side	Bottom entry of cables.
19	Cables and accessories	HV & LV Cables, termination kits (for HV), cable lugs (Dowell make), (Comet make) and connecting hardware shall be in vendor scope of supply. Vendor shall provide hole on the bottom-side gland-plate of HV & LV side cable box for cable entry as per the final outer diameter of cable provided by BHEL during detailed Engg.
20	Tapping on HV winding	Off circuit tap changer (OCTC) switch with five tap positions: +5%, +2.5%, 0, -2.5%, -5%.
21	Loading Capability	Continuous operation at rated KVA on any tap with voltage variation of +/-10%. Transformer shall be capable of being loaded in accordance with IS: 6600 / IEC 60076-7.
22	Ambient temperature	Max 50 deg C
23	Temperature rise	For top oil: Max. 50 deg C by thermometer method For winding: Max. 55 deg C by resistance method Both rises shall be over an ambient temperature of 50 deg C irrespective of tap position.
24	Flux density	Not to exceed 1.9 Wb/sq.m at any tap position with +/-10% voltage variation from voltage corresponding to the tap. Transformer shall also withstand following over-fluxing conditions due to combined voltage and frequency fluctuations: a) 110% for continuous rating b) 125% for at least one minute c) 140% for at least five seconds Vendor shall furnish over-fluxing characteristics up to 150%
25	Air Clearance	As per CBIP
26	Load loss principal tap at 75^0C, with IS tolerance	This shall be provided by vendor.
27	No Load loss at rated voltage on principal tapping and at rated frequency, with IS tolerance	This shall be provided by vendor.
28	No load current at rated voltage and rated frequency	This shall be provided by vendor. To be indicated as percentage.
29	Efficiency at 75^0C, UPF	As per IS 1180 and CBIP
30	Regulation at full load, 75 ^{o}C	< 2 % for UPF For 0.8 PF lagging, to be indicated by vendor.

31	Harmonics	Shall be designed to suppress harmonics especially 3rd& 5th.
32	Vibration & noise	Noise level shall be according to NEMA TR-1 standard
33	Highest system voltage	LV side: 1.1kV HV side: 36 kV
34	Insulation levels as per IS:2026 Rated Lightning Impulse withstand voltage / Short duration power frequency withstand voltage	LV side: -- kVp / 3 kV rms HV side: 170kVp / 70kV rms
35	Overall dimensions in mm Length x Breadth x Height	This shall be provided by vendor.
36	Oil capacity (in Litres)	This shall be provided by vendor.
37	Weight of transformer in Kg	This shall be provided by vendor.
38	Constructional features	As per relevant clause of this specification
39	Fittings and accessories	As per relevant clause of this specification
40	Painting	RAL 7032

2.0 Tests on auxiliary transformer will be witnessed by BHEL/SECI/SCCL prior to dispatch clearance.

5.27 **Auxiliary AC/DC power supply system**

Supply of ACDB at control room and inverter room is in BHEL scope. Installation, testing and commissioning is in vendor's scope.

i. Following DB boards for application in main control room shall be in vendor scope of supply, installation and commissioning:
   UPS DB for 230V AC UPS supply to SCADA, weather monitoring system, fire alarm system, emergency loads, CCTV system - 2 Nos
ii. Following DB boards for inverter rooms shall be in vendor scope of supply, installation and commissioning:
   UPSDB 230V UPS supply for PCUs (control circuits), fire alarm system panel, emergency loads, CCTV system etc – 1 No
iii. SLD will be shared after PO placement.
iv. Above DBs shall be wall-mounted board, of reputed make such as Legrand, Siemens, Schneider or any other reputed make as approved by BHEL/SECI/SCCL.
v. Installation of all the above items including all necessary cable terminations/ installation shall be in vendor scope.

5.28 **Supply and installation of security room and Security Cabins-Prefab structures**

i. Vendor shall provide **5 Nos. of security cabins** at strategic locations & at corners of the plot and **1 nos. security room** at Main entry gate.

	ii. The Security room shall be of min. size 4m x 4m x 2.75m height The Security cabin shall be of min. size 1.2 x 1.8m x 2.5m height. iii. Security room/ cabin shall be a pre-engineered & pre-fabricated structure. The walls and roof of the building shall be fabricated with double skin insulated sandwiched Al-Zn alloy coated high tensile steel metal panels (BMT- 0.5mm, Al-Zn alloy coating -150 GSM total on both sides). The insulation shall be of PUF with min. density 40 kg/ cum and adequate thickness. Roof shall be provided with suitable slope, not less than 100 to the horizontal (approx. 1V:6H) for proper drainage of rain water and shall project 300mm beyond the walls. The make and (color) shade of precoated metal panels shall be subject to approval by the Engineer. Min. thickness of color coating shall be 20 micron (DFT) excluding prime coat 5 micron (DFT). The coating system shall confirm to IS; 15965. iv. The Main security room shall be provided with one Aluminum (AL) glazed door (0.75m wide x 2.1m height) on one face and AL glazed sliding windows (1.2m width x 1.0 m height) with AL grill on remaining three sides. Security cabin shall have one AL glazed door (0.75m widex2.1m height) and 1 no. AL sliding window (0.8m width x 1.0 m height) with AL (anodized) grill on one side. All glazing shall be of clear float glass with thickness of 4mm for window and 6 mm for door panel. v. The door and windows shall be provided with all necessary fitting and fixtures like handles, tower bolts, mortise lock for door, stays, door stopper etc. All AL sections for doors and windows shall be anodized (min. average thickness 25 microns) or polyester powder coated (min. DFT 50 microns) with approved color shade for protection against weather. vi. Specially coated/ SS self-drilling screws/ fasteners conforming to class 3 as per ASTM: 3566.1 and 3566.2 shall only be used for all connections. vii. Anchor/ foundation bolts shall be supplied by vendor and shall conform to IS: 5624 and IS 800. viii. The Security Room shall be supported on RCC pedestal & foundations. **RCC foundation shall be constructed by BHEL. Supply of foundation / anchor bolts shall be in vendor scope.** ix. The Design and drawings of pre-fab structure and RCC foundations shall be submitted for approval prior to fabrication and installation. x. Supply and installation of Electrical fittings (lights & fans) in security room and security cabins shall be in vendor scope. Vendor shall submit drawing for approval.
5.29	**Supply and Installation of Weather monitoring system** As part of weather monitoring system (WMS), vendor shall supply, install and commission Pyranometers, Anemometer, Temperature sensors and data logger with all necessary software and hardware such as power supply/ control/ data/ communication cables, support structures etc. required to integrate with SCADA. Scope of vendor shall also include supply and erection of all the mounting arrangements including all necessary civil works/ foundations, clamps arrangement etc. as recommended by manufacturer and required at site. Communication cables shall be laid and terminated at both SCADA station at main control room and data logger at weather monitoring station end. Similarly, power supply cables shall be laid between WMS and DB boards in main control room. Exact location of the weather monitoring station shall be decided during detailed engineering. Detailed specification of WMS items is as below-

Pyranometer (2 Nos)

Vendor shall supply and erect 2 Nos pyranometers secondary standard pyranometers (ISO 9060 classification) for measuring the incidental solar radiation at horizontal and inclined plane of array. One shall be mounted horizontally and one shall be mounted in tilt position on MMS.

Specification of the pyranometer shall be as follows-

Parameter	Specification
Spectral Response	0.31 to 2.8 micron
Time response (95%)	Maximum 15s
Nonlinearity	±0.5%
Temperature Response	±2%
Tilt error	<±0.5%
Zero offset thermal radiation	±7 W/m2
Zero offset temperature change	±2 W/m2
Operating temperature range	0°C to +80°C
Non-stability	Maximum ±0.8%
Resolution	Minimum +/- 1W/m2
Output	Analog output: 4 – 20 mA, Serial output: RS485

Calibration certificate with calibration traceability to World Radiation Reference (WRR) or World Radiation Centre (WRC) shall be furnished along with the equipment. The signal cable length shall not exceed 20m. The Contractor shall provide instrument manual in hard and soft form.

Temperature Sensors

Vendor shall supply and install two thermometers (one for ambient temperature measurement with shielding case and other for module temperature measurement). The thermometers shall be RTD/ semiconductor type measuring instrument with measurement range of 0°C to 80°C. The instrument shall have valid calibration certificate.

Ultrasonic Anemometer and wind vane (wind speed and direction)

Vendor shall supply and install one no. ultrasonic wind sensor (no moving parts) for wind speed and direction monitoring.

Specification of the Anemometer shall be as follows-

Parameter	Specification
Velocity range with accuracy limit	0-60m/s with +/-2% accuracy @12 m/s; Resolution: 0.01m/s
Wind direction range with accuracy limit	0 to 360° (No dead band) with +/-2° accuracy @12 m/s; Resolution: 1°
Mounting Bracket	Anodized Aluminium bracket to reduce corrosion, all mounting bolts of SS
Protection Class	IP66
Output	RS232 and RS485

Data logger and Data Acquisition System

Vendor shall supply and install data logger for weather monitoring system. Data logger for the weather monitoring station should have the following features:
Provision for analog, digital and counter type inputs for interfacing with various type of sensors

(i) Analog Input
- Adequate nos. for all analog sensors with redundancy
- Provision for operation in different current and voltage ranges as per connected sensors
- Accuracy of +/-0.1% of FS

(ii) Digital Inputs
- Adequate no. of Digital inputs and outputs for the application

(iii) Provision for RS232 and RS485 serial outputs
(iv) Built-in battery backup
(v) Connectivity and Data transmission:
- Built-in GSM/ GPRS modem for wireless data transmission to SCADA/ cloud server (procurement of GPRS enabled SIM Card and connection subscription to be the responsibility of Contractor). It should be possible to remotely communicate with the device for configuration settings.
- RS485 MODBUS interface for data collection and storage on SCADA
- Web interface with provision for user login to enable viewing and downloading of weather data in XLS/ CSV format
- Communication protocol should support fast data transmission rates, enable operation in different Frequency bands and have an encryption-based data security layer for secure data transmission

(vi) Display Settings: Graphic LCD screen which should be easily accessible and should display relevant details like all sensor values, battery strength, network strength etc.
(vii) Provision of Time synchronization from telecom time or server time
(viii) Data Storage: Provision for at least 2 MB internal Flash Memory and at least 8 GB Micro SD card (expandable)
(ix) Protection level: IP65 or better

Support structure for weather monitoring device-

(a) POA Pyranometer will be mounted on MMS table structure. Suitable arrangement for the same shall be made at site by Vendor.
(b) Module temperature sensor will be fixed on back sheet of nearby module.
(c) Other WMS items including datalogger will be fixed on an independent pole in the vicinity. Minimum 3m height of Anemometer shall be considered above GL.
(d) Weather monitoring device shall be mounted on tubular steel pole of required height. The pole shall conform to IS: 2713.
(e) The pole shall be secured to an independent RCC foundation structure through Base plate and Anchor bolt assembly.
(f) 200 long 20 dia. rods shall be welded to the pole at 300 mm C/c for access to the device for maintenance purpose.
(g) The support structure shall be hot dip galvanized.

5.30 Installation and commissioning of SCADA integration systems

(1) SCADA system, supply of which shall be in BHEL scope, comprises of data station panels and PC based control desks with software to collect, store, process and report the data parameters of power plant and also to control the operations of the power plant by integrating the various equipment at the segments as follows:

(a) String monitoring boxes (56 Nos) in solar array field
(b) Weather monitoring equipment: Pyranometers for solar irradiation (2 Nos), thermometer for ambient temperature (1 No), thermometer for module surface temperature (1 No), anemometer for wind speed and direction with datalogger.
(c) Power conditioning units (8 Nos): DC input / AC output parameters of inverters, grid data, fault status and events logged, etc.
(d) Inverter transformers (4 Nos): Alarm/Trip signals, WTI/OTI temperature values.
(e) 33kV VCB breaker panels (as per SLD): status of VCB breakers, status of protection relays of transformers, oil / winding temperatures, AC parameters at every 5MW level of the plant.
(f) ACDB multifunction meters (2 Nos): AC auxiliary utility consumption parameters
(g) Fire alarm system (all inverter/ main control rooms): status signals
(h) CCTV system

(2) BHEL scope of SCADA:

(a) Supply of Data station panels with necessary data loggers / PLCs and other accessories such as power supply etc to integrate the data signals as listed below. This includes main panel at main control room and intermediate (linking) panels at inverter room.
(b) Supply of Desktop PCs (HMI control desks) provided with necessary software packages and remote monitoring features.
(c) Supply of OFC, RS 485 and LAN cables for SCADA.
(d) Termination of OFC cable at SCADA panels.

(3) Vendor scope of supply and installation of SCADA system:

(a) Vendor shall install the BHEL supplied SCADA system in the SCADA room in main control room. Vendor shall also install SCADA panels in the inverter rooms.
(b) Cable laying/ terminations of all SCADA cables at respective rooms/ panels / equipments including cable trenche works shall be in vendor scope. BHEL will provide the necessary cabling schedule during detailed engineering.
(c) Supply of all SCADA related control / communication cables except OFC, RS485 and LAN cables shall be in vendor scope.
(d) INTERNET CONNECTION: (Internet/Intranet at Plant with Static IP: Public or private network access shall be provided at the plant through any broadband/VSAT connectivity of 2Mbps or higher bandwidth. In case no broadband/VSAT connectivity can be provided at the plant, a 3G/4G data card from any Internet Service Provider (ISP) may be provided. SCADA system shall be capable of sending all plant data in real time to the Remote Server.) All required hardware items such as Modem / Router / Wifi facility etc. shall be in vendor scope.
(e) Data Communication to SLDC: Vendor shall provide required interface to integrate plant SCADA with TRANSCO-SLDC, in compliance with grid code, to send any parameters specified by SLDC.

	Note: The methodology and specification of SLDC interface will be provided separately by SLDC/TRANSCO and it shall be the responsibility of the vendor to obtain and implement the same as per SLDC/ TRANSCO requirements.
5.31	**Supply and installation of lightning protection system (ESE type lightning arrestors) to protect the electrical equipment of SPV power plant and Buildings from lightning.** Lightning Protection System (LPS) for entire plant against direct lighting strokes shall be provided as per IEC 62305:2010 or NFC 17-102:2011. Protection level for the entire plant shall be Level-I with radius of coverage of 79 metres. Quantity of Lightning arresters: 12 Nos with 7m height and 2 Nos with 11m height above ground level. Lightning Protection System shall consist of following accessories: (i) Early Streamer Emission (ESE) air terminal (ii) Highly insulated poly-plastic adaptor to fix the ESE air terminal with the FRP mast (iii) Fiberglass Reinforced Plastic (FRP) mast (iv) Coupler to connect FRP mast with GI mast (v) Galvanized Iron mast with base plate and guy wire kit (vi) Down-conductor: PVC insulated flexible copper cable of suitable size complying with EN 50164-2 or equivalent standard. It shall be routed along the mast with suitable fixings and connecters (vii) Test joint with each down conductor (viii) Lightning event counter complying with EN 50164-6 or equivalent standard. It shall be fixed at suitable height in series with the down conductor. (ix) Earth termination system in accordance with NFC 17-102. Earth electrodes shall comply with the EN 50164-2 or equivalent standard. Earth enhancing compounds complying with EN 50164-7 or equivalent standard shall be used as per OEM requirements. Accessories listed above are indicative only and any other fittings or accessories, which are usual or necessary for satisfactory operation of the lightning protection shall be provided by the vendor without extra charges. Necessary foundation/anchoring for holding the lightning mast in position to be made after giving due consideration to maximum wind speed and maintenance requirement at site in future. Vendor shall submit design calculations of LA mast and foundation for approval during detailed engineering. Construction of foundation, installation of lightning arresters shall be in scope of vendor. Type test reports as per IEC 62305:2010 or NFC 17-102:2011 shall be submitted during detailed engineering for approval.
5.32	**Water washing arrangement for cleaning of SPV modules** (1) Vendor shall provide permanent arrangement for module washing in the SPV Plant. The vendor shall design and install the effective module cleaning system. Drawings shall be submitted for these arrangements for BHEL/SECI approval. (2) A regular supply of suitable quantity of water shall be ensured by the contractor to cater day-to-day requirement for cleaning of PV modules during entire O&M period. The vendor shall estimate the water requirements for cleaning the photovoltaic

	modules at least once in two week or at closer frequency as per the soiling conditions prevailing at site, in order to operate the plant at its guaranteed plant performance. However, min. consumption of 2 Ltr / Sqm of surface area of SPV module shall be considered in estimation of required quantity of water storage. (3) This shall include installing tube well(s) / bore well(s) with pump(s) and motor (including 1 set as standby), and laying network of GI pipe. System shall also include booster pumps, valves (NRV, Butterfly valve, Ball valve, Gate valve, PRV, scour valve etc.), Water hammer arrester(s), pressure gauge, flow meter, GI pipelines, bends/ joints/ couplers, tap assemblies (at delivery points), nozzles, hose pipes etc. Opening from the GI pipe with manual isolating valves should be provided at regular intervals. Vendor shall install flow meter for measurement of water consumption. Water level indicator shall be provided for automatic stopping of water pumping. Pressure gauge shall be installed at every pump end. Underground/ above ground water storage tanks will be constructed by BHEL. (4) The water supply mains could be either of GI, uPVC or HDPE, however, the vertical pipe connecting supply main to the discharge point shall be of GI. (5) Masonry chamber shall be provided for Main gate valve at pump end. Whereas, as per requirements, at other locations either a masonry or GI/ HDPE pipe chamber may be provided. (6) Module cleaning procedure and pressure requirement at discharge point shall be as per the recommendation of PV module manufacturer. However, discharge pressure at outlet shall not be less than 50kg/cm2 (5 MPa) (7) All the pipes thus laid shall be buried in ground at least 150mm below FGL or laid above ground clamping on suitable concrete support blocks. In case of above ground piping only GI pipes shall be used. (8) Water supply pipe for module cleaning crossing the road shall be laid through Medium class GI steel pipe conforming to IS: 1161 of dia minimum 150 mm. (9) Suitable RCC pedestals shall be constructed for mounting the booster pumps that shall be housed within suitable shed/shelter arrangement. (10) Supply, laying and termination of electrical cables shall be in vendor scope. Cables from inverter/CMCS rooms to the pumps/motors shall be laid underground as per "**cable installation methodology**" section of this specification. (11) Vendor shall design and submit layout drawings (showing locations of tubewells/ bore wells, pipelines, valves, delivery tap points etc as superimposed on the solar array layout), Bill of materials (item-wise description, type / rating, make, model number / part number, quantity) of water washing arrangement with necessary calculations of water flow / pressure / discharge etc for BHEL / SECI approval during detailed engineering. All necessary labour, machinery, tools, instruments shall be in vendor scope
5.33	**Earthing for solar array structures and SMBs** Vendor shall install the earthing system for solar array, MMS structures, SMBs and various other electrical equipments in line with IS 3043 latest amendment. Earth electrode shall be of 17mm dia, 3 m length. Earth electrode shall be vertically installed at a depth of 1.25m from NGL. Electrode connection shall be brought out upto ground level. The Material for earthing like, Earth electrode with back fill compound, GI strips etc. will be part of BHEL scope of supply. Earthing cables, 50X6 mm copper strips (for transformer shield and neutral connections), all necessary hardwares like nut, bolts, bimetallic lugs etc. shall be in

vendor's scope of supply. BHEL will provide the earthing drawing during detailed engineering.

Vendor has to supply and fix the earth chamber precast/prefab type for each earth electrode with following details.
(a) Minimum Inner diameter shall be 300mm. Exact size shall be chosen to ensure ease of maintenance operation using spanners etc.
(b) Projection of chamber above FGL = 150mm minimum
(c) Cover plate with suitable lifting hooks and padlocking arrangement.

Supply and installation of all materials related to Earth chambers shall be in vendor scope.

Array Earth mat grid shall have following dimensions:
(1) Earth mat grid (25X6 mm GI flat) shall be buried 600mm minimum below ground level. Where it crosses trenches, pipes, ducts, channels etc, it shall be at least 300mm below them. Back filling soil to be placed over buried conductors shall be free from stones and harmful mixtures. Back filling shall be placed in layers of 150 mm. Backfilled surface shall be well compacted.
(2) Inner branches (along the solar array rows) shall be with GI flat 25x6mm (Supply of GI strip by BHEL). Inner branches shall be connected to outer grid. All excavations related to earthing in each row shall be in scope of vendor.

Earthing of PV Modules shall be as follows:
(1) Each PV Module frame shall be earthed using copper wire of 2.5 sqmm XLPO. The copper wire shall be connected to the earth hole provided in the module frame using suitable arrangement. The earthing arrangement shall use stainless washers to prevent galvanic corrosion between aluminium frame and copper wire. In order to achieve effective earthing, serrated washers shall be employed to penetrate the anodization layer of the module frame. Supply of copper cable, hardware for module earthing is in scope of vendor.
(2) Continuous copper earthing wire shall be run to connect a group of modules and both ends of the loop shall be bolted to the DC earth grid/ MMS leg using bimetallic lugs and stainless-steel fasteners. The copper earthing wire shall be routed in such a way to avoid physical contact with the module aluminium frame.

Earthing of MMS structures shall be as follows:
(1) Solar array MMS structure shall be connected to earth mat using GI flat 25x6 mm minimum; Bolting on structure (M10 minimum), Welding on earth mat end.
(2) Adjacent structures shall be connected to one another using GI flat 25x3 mm minimum. Both ends shall be bolted (M10 minimum).
(3) Wherever the clear distance between the adjacent structure is 2m, 25x6 GI strip shall be laid below the ground at a depth of 600mm from GL.
(4) Earth strips shall be bend properly and taken along the support structure.

Earthing of SMBs and Diode boxes shall be as follows:
(1) SPD earth point shall be earthed using 1Cx16 flexible copper (unarmoured) green cable from SPD to SMB structure. Both ends of cable shall be suitably lugged and connected using matching hardware.
(2) Data card of the SMB shall be earthed using 1Cx2.5 flexible copper (unarmoured) green cable from Data card to SMB structure. Both ends of cable shall be suitably lugged and connected using matching hardware.
(3) Lugs for these earthing cable shall be in vendor's scope of supply.

	(4) SMB structure shall be connected from structure legs (2 independent connections) to MMS leg using 25X6 GI strip for earth continuity. Earth strips shall be bend properly and taken along the support structure. (5) Earth bus bar in Diode box shall be earthed using 1Cx16 sqmm flexible copper (unarmoured) green cable to Diode box structure. Both ends of cable shall be suitably lugged and connected using matching hardware. (6) Diode box structure shall be connected from structure legs (2 independent connections) to MMS leg using 25X6 GI strip for earth continuity. Earth strips shall be bend properly and taken along the support structure. **General points:** (a) **Stainless steel**, nuts, plain washers shall be used. Spring washers shall be zinc/epoxy coated. (b) All connections to equipments and earth electrodes shall be bolted connections. (c) Weldings ahall be allowed only in case of inner earth grid to outer earth grid connections. Welding for GI flats shall be using electric arc welding. Both the flats shall be overlapped for the full width where they are in perpendicular direction in same plane. Where the connection is along same line, both flats shall be overlapped for a minimum of 50mm. L-bend with weld length of 50mm minimum shall be adopted wherever overlap length to be ensured. (d) Resistance of welded joint shall not be more than that of GI flat. (e) All Welds shall be treated with red lead for rust protection and then coated with bitumen compound for corrosion protection. (f) Bimettalic lugs/ washers shall be used wherever copper to GI earthing is made. Supply of bimetallic lug/ washer is in vendor's scope. (g) While laying earthing electrodes, adding/mixing of chemical compound and water around the electrode in the dug hole shall be as per instructions of OEM. (h) In compliance to Rule 11 and 61 of Indian Electricity Rules, 1956 (as amended up to date), all non-current carrying metal parts shall be earthed with two separate and distinct earth continuity conductors to an efficient earth electrode.
5.34	**Earthing system for inverter rooms, main control room, 33kV transformer yards and metering Yards** (1) Vendor shall install and commission earthing system for protection against faults as guided by IEC 60364 for the inverter rooms, main control room, 33kV transformer yards and metering yards. (2) Earthing system Layout for Inverter room, Control Room and Transformer yards will be provided by the BHEL during detailed Engg. (3) Earthing electrodes of 3m minimum long, 17.2 mm minimum diameter, copper bonded MS, chemical compound filled will be supplied by BHEL. Earth electrode shall be vertically installed at a depth of 1.25m from NGL. Electrode connection shall be brought out upto ground level. (4) Bore holes of appropriate diameter shall be made by vendor on the earth for insertion of such chemical earthing electrodes with filling of mix of chemical compound and water around. Inverter rooms and main control room shall be provided with separate earth grids. (5) Earthing connections to electrical panels within the inverter room/ main control room: Flats GI 65x8 (BHEL scope of supply) shall be provided for double earthing of 33kV VCB panels, UPS/ FCBC/ Battery banks, C&R panel, ABT metering panels, cable trays. The earthing for PCU shall be done through 1Cx 70 flexible copper cable and for SCADA through 1Cx 16 sqmm copper cable. Supply of 1CX70 sqmm cable, 1CX16 sqmm cable, cable lugs and hardware is in scope of vendor.

(6) Earthing of inverter transformers in the transformer yards of inverter/control room, Aux transformer, Metering CTs, PTs, Metering panels, GOS and LA in 33kV switchyard near main control room:
   (a) Flats GI 65x8 minimum shall be provided for interconnecting various parts of the inverter transformer (for body earthing) viz tank, conservator, disconnecting chambers, cable boxes, marshaling box, radiators etc.
   (b) Such interconnected local grid shall be double earthed to the main earth mat grid running underground through GI flats 65x8 outside 2 m from yard fence.
   (c) Flats shall be bolted on transformer side and overlap welded to earth mat grid. Two earth pits shall be located close to each transformer for body earthing.
   (d) Shield earthing of inverter transformers shall be separate and connected to two earth pits (connected together, isolated from earth grid) using copper flat 50x6mm.
   (e) Neutral of aux transformer shall be connected to two earth pits (connected together, isolated from earth grid) using copper flat 50X6 mm.

(7) Transformer yard fencing shall be earthed at every alternate post using GI flats 25x6 mm minimum to the earth grid. Gate shall be looped to the fencing mesh by way of GI wire of suitable size.

(8) Switchyard/ metering yard structure and equipments shall be earthed using GI flats 65x8 minimum.

(9) The metallic frame work of all switchyard equipment, cable trays and support structures shall be connected to the earth grid by means of two separate and distinct connections

(10) Earth grid shall be buried underground up to a depth of 600mm minimum from NGL. Back filling soil to be placed over buried conductors shall be free from stones and harmful mixtures. Back filling shall be placed in layers of 150 mm. Backfilled surface shall be well compacted.

(11) Vendor has to provide the earth chamber precast/prefab type for each earth electrode with following details
   a) Minimum Inner diameter shall be 300mm. Exact size shall be chosen to ensure ease of maintenance operation using spanners etc.
   b) Projection of chamber above FGL = 150mm minimum
   c) Cover plate with suitable lifting hooks and padlocking arrangement.

(12) Supply and installation of all materials related to Earth chambers shall be in vendor scope. Earth electrodes will be supplied by BHEL.

(13) Earth electrode shall be bolted to a horizontal GI flat 65x8 minimum that in turn bolted (M10 minimum) to two GI flat 65x8 minimum raisers on either side of horizontal flat. Raisers shall be connected to earth mat grid by way of overlap welding.

General points:

(a) All earthing electrodes, GI flats is in BHEL scope of supply

(b) All earthing cables, 50X6 mm copper strip, lugs, hardware etc shall be in vendor scope of supply.

(c) **Stainless steel** bolts, nuts, plain washers shall be used. Spring washers shall be zinc/epoxy coated.

(d) Welding for GI flats shall be using electric arc welding. Both the flats shall be overlapped for the full width where they are in perpendicular direction in same plane. Where the connection is along same line, both flats shall be overlapped for a minimum of 50mm. L-bend with weld length of 50mm minimum shall be adopted wherever overlap length to be ensured.

(e) Resistance of welded joint shall not be more than that of GI flat.

(f) Welds shall be treated with red lead for rust protection and then coated with bitumen compound for corrosion protection.

(g) While laying earthing electrodes, adding/mixing of chemical compound and water around the electrode in the dug hole shall be as per instructions of OEM.

5.35 Firefighting systems

Firefighting systems: Fire extinguishers and sand buckets

Vendor shall provide fire extinguishers/ sand buckets as follows for fighting fire of oils, solvents, gases, paints, varnishes, electrical wiring, live machinery fires and flammable liquid/ gas as per recommendation by relevant fire safety authority and as per relevant standards IS: 2171 and IS: 10658 marked.

All buildings shall be installed with required no. of fire extinguishers as per relevant BIS standard and NBC. LiquefiedCO_2/ foam/ ABC type fire extinguisher shall be upright type of capacity 10kg conforming to IS: 2171, IS: 10658.

- DCP type (ABC) 10 Kg designed/tested IS 15683/ IS 2171 with safety release valve, NRV and CE approved valve. Dry powder IS 14609 with standard accessories.
- CO2 type 10 Kg with wheel. Designed/tested IS 2878/ IS 15683/ IS 8149 complete with hose, screw valve, CO2 gas IS 1522, cylinder IS 7285, valve IS 3224. Tested at 250 Kgf/cm2.
- Sand bucket should be wall mounted made from at least 24 SWG sheet with bracket fixing on wall conforming to IS 2546 at strategic locations.

Minimum Quantity requirements:

Type of extinguisher	DCP type (ABC) 10 Kg	CO2 type Hand 10 Kg	Sand bucket stand (4 sand bucket on one stand)
Main control room	2	2	-
Inverter room	2	2	-
Inverter room transformer yard	2	2	2
Control room transformer yard	2	2	2
Metering Yard	2	2	2
Security room (2 Nos)	-	1	1

5.36 Identification marking using painting

Following items shall be identified by way of artistic painting in black letters with yellow background. For danger symbol/text, white letters in red background. Identification number/ text to be painted shall be submitted for BHEL/SECI/SCCL approval during detailed engineering for the following.

(1) Solar array structures: ~834 Nos
(2) String monitoring boxes: 56 Nos
(3) Size/ source/ destination of DC cable 1Cx400 with arrow mark (power flow direction) to be painted on SMBs and PCUs
(4) PCUs front side: PCU ID number (1 to 8) with rating 1250kW, AC chamber/ DC chamber, Danger text/symbol.
(5) PCUs DC chamber back side: SMB ID numbers, cable size (1Cx400 +,-) with upward arrow mark, danger text/symbol
(6) PCUs AC chamber back side: Inv Trnfmr ID, cable size (3Rx1Cx630 / ph) with downward arrow mark, danger text/symbol
(7) Same way as above, the corresponding panel ID with rating, cable destination with arrow mark in power flow direction, danger text/symbol shall be painted for all VCB panels, Inverter transformers (HV and LV sides), Aux transformer (HV and LV sides), ACDB panel.
(8) For UPS/ FCBC/ SCADA/ ABT metering panels, C&R panel, all DB boards/ fire alarm panels ID number shall be painted. Cable size/ destination/ arrow marks not required

to be painted as cable tags shall be adequate.

(9) For earth chambers of inverter rooms, main control room, switchyard, array, ID number with resistance value and due date shall be painted.

(10) All switchboards shall be painted with ID number.

5.37 Cable markers and cables tags

(1) Cable markers and joint markers for underground cables shall be provided along the route of the cables as per section "**Cable installation methodology**" of this specification.

(2) Cable tags shall be provided at either of the cable (at the entry point to the panel / equipment to which it is connected / terminated) shall be provided as per section "**Cable installation methodology**" of this specification.

(3) Cable tags details shall be provided by BHEL during detailed engineering.

5.38 Display boards and sign boards

Sl. No	Description	Qty for Inverter room	Qty for Control room
1	Board displaying instruction chart for restoration from Electric Shock	1 No	1 No
2	Board displaying instruction chart for artificial respiration	1 No	1 No
3	Board displaying dos and don'ts.	1 No	1 No
4	Board displaying fire extinguishers details and operations	1 No	1 No
5	"No smoking" board	2 Nos	5 Nos
6	Danger boards: 33000V with danger symbol in Hindi, Telugu, English	As required	As required
7	Identification boards, of suitable sizes, within and outside control room such as Inverter room, Main control room, Executive lounge, Store room, Gents toilet, Ladies toilet, SCADA room, Battery room, Pantry room etc. BHEL will provide list.	1 set	5 set

(a) 5mm thick sun board with LG make vinyl sticker (computerized cutting and pasting) shall be used for Sl Nos 5, 6 and 7.

(b) For others, flex banner with design & printing shall be used.

5.39 Electrical insulation mat

(1) Vendor shall supply electrical insulating mats as follows:

- (a) Reputed make as shall be approved by BHEL/SECI/SCCL
- (b) As per IS: 15652:2006
- (c) Class C
- (d) Thickness 3 mm minimum
- (e) Size = 2m x 1m minimum, exact size shall be as approved by BHEL/SECI/SCCL during detailed engineering.
- (f) Colour: to be approved by BHEL/SECI/SCCL
- (g) Max use voltage = 33 kV
- (h) Marking of IS standard on the mat

(2) Test certificate shall be provided by vendor

(3) Vendor shall lay the mats in front of all the indoor electrical panels viz. PCUs, VCB panels, ACDB panels, SCADA panels, UPS panels, FCBC battery charger, battery banks etc.

5.40 Supply and Installation Miscellaneous Items

(1) Split Air conditioner of 1.5 tonne (4 Nos) of split type for SCADA room, conference room and office room of Voltas/ Hitachi/ Samsung/LG make.

(2) Furnitures for SCADA room as below

- Table with drawer for desktop PC – 5 Nos
- Chair, industry standard, revolving type, with wheels, arm rest, provisions for adjustment of height (hydraulic/ gas lift):5 Nos
- Storage almirah: 4 No
- Filing cabinet: 4 No
- Printer table: 1 No

(3) Furniture for Conference Room

- 1 number of LED TV of 50 inch of Sony/ Phillips / Samsung make,
- 1 no of conference table of 10 person equipped power sockets and 10 chairs revolving type with wheels.

(4) Furniture for security room and security cabins

- Table with drawers – 2Nos
- Chairs revolving type with arm rest – 10 Nos

Note : Make of the above mentioned furniture shall be Godrej or equivalent.

5.41 Tool kits and instruments

A. Measuring instruments

1	Earth Resistance Tester	Reputed make	2 No
2	Array tester	Reputed Make	1 No
3	Insulation tester	Reputed make	2 No
4	Digital multimeter	Reputed make	2 No
5	Clamp meter	Reputed make	2 No
6	Infra-red thermal imaging camera	Reputed Make	1 No
7	Digital lux meter	Reputed Make	1 No

Note: Make / model number etc shall be approved by BHEL/SECI prior to procurement. All testing equipment shall possess valid calibration certificate issued from approved NABL labs.

B. Tool kits

1	Double ended spanner Set of sizes 10-11, 12-13, 14-15, 16-17, 17-18	1 No each
2	Screwdriver Set	1 Set
3	Crimping tool with Dye range 50-630sq-mm cable, mechanical gear power, hand operated	1 Set
4	Crimping tool up to 10 sq-mm cable	1 set
5	Drilling machine AC, hand operated, with bit size up to 20 mm	1 set
6	Measuring Tape, 5m	1 No
7	Measuring Tape, 50 m	1 No
8	Allen Key set	1 Set
9	Adjustable spanner 2-inch size	1 No
10	Hammer	1 No
11	Rough file kit	1 Set
12	Platform balance, 50Kg range	1 No
13	Cutting Pliers	1 No
14	Nose Pliers	1 No

15	Vacuum cleaner, of industrial type, for control room sweeping / cleaning.	1 No
16	Blowers for cleaning the panels	1 No

Note: Prior to procurement, vendor shall obtain approval from BHEL for the make and specification of the items.

Detailed specification of the instruments are as below-

Earth resistance tester

Parameter	Specification
Display	Backlit LCD or LED display
Range	Earth Resistance: up to 2000 Ω Earth Voltage: 200 V
Accuracy	± (2% + 5)
Safety Ratings	IP 56
Programmable Limits setting	Enabled

Accessories-
Earth Ground Stakes (4 Nos)
Three cable reels with cable length up to 20 m
Carry Case-1 (capable of handling tester along with accessories)
1 set of spare battery

Array tester

Parameter	Specification
Display	Backlit LCD or LED display
Functionality	All electrical tests required by IEC 62446-1:2016
Memory	Up to 200 records & USB downloadable to Computer

Accessories
A set of two, 4mm fused leads for extra protection during installation tests.
Leads which enable the array tester to connect directly to PV arrays
1 set of spare battery

Insulation tester

Parameter	Specification
Display	Backlit LCD or LED display
Insulation Test Range	0.1 MΩ to 10 GΩ
Test Voltage	250V, 500V, 1000V, 5000V
Test Voltage accuracy	+20% on positive side only no negative variation is allowed
Insulation Test Current	1 mA nominal
Auto Discharge	Discharge time< 0.5 Second for C = 1
Open Circuit test Voltage	>4 V, <8 V

Accessories
Heavy duty Test Lead Set – 4 Nos.
Carry Case with sufficient space for accommodating accessories.

Digital Multimeter

Parameter	Specification
Display	Backlit LCD or LED display; Minimum resolution: 5 ¾ places for DC, 4 ¾ places for AC
Measuring Category	1000V CAT III as per IEC Standard 61010-1; wave shape independent RMS measurement (True RMS) suitable for operation in the site conditions.
Additional Functions	Resistance (Ω), Temperature (oC), Continuity, Diode, Capacitance, Frequency, Duty cycle measurement

Accessories
Temperature Probe
Silicon Test Lead
Alligator Clip
Carry Case with sufficient space for accommodating accessories.

Clamp meter

Parameter	Specification
Display	Backlit LCD or LED display
Measuring Category	1000V CAT III as per IEC Standard 61010-1; wave shape independent RMS measurement (True RMS) suitable for operation in the site conditions.
Current Range	AC&DC Current up to 1000A/400 A
Voltage range	AC&DC Voltage upto 1000V
Additional Functions	Resistance, continuity, diode and non contact voltage detection, Active, Reactive and Apparent Power, THD, PF

Accessories
Test leads
Electrical test leads
Probe light & extender
Carry Case with sufficient space for accommodating accessories.

Infra-red thermal imaging camera

Parameter	Specification
Spectral response	8 µm to 14 µm (LW)
Temperature-sensitivity and calibration range	–20 °C to +120 °C
Atmospheric air temperature	-10 °C to +40 °C
Thermal sensitivity	NETD ≤ 0.1 K at 30 °C

Geometric resolution	640 x 480 pixels
Photo camera resolution	Approx. 30 times of IR camera resolution
Absolute error of measurement	< ± 2 K
Adjustable parameters	Emissivity, ambient temperature
Adjustable functions	Focus, temperature level and span
Measurement functions	Measuring spot, measuring area with average and maximum temperature
Calibration	The measuring system (Camera, lens, aperture and filter): The camera has to be traceably calibrated at least every two years. The calibration has to be documented. If the camera is not compliant, it has to be readjusted by the manufacturer.
Documentation	Storing of the infrared picture with the radiometric data

Digital lux meter

Parameter	Specification
Range	0 – 1000 lux
Accuracy	± (2% + 5)
Resolution	1 lux
Display	3½ digits, Backlit LCD/LED

All the tools and instruments are required for post-commissioning of the plant. Items shall be handed over to BHEL in new condition. Used tools and instruments will not be accepted. Any tools and instruments required by Vendor during I&C activities will be arranged separately by vendor.

5.42 Cable installation Methodology

1. CODES AND STANDARDS

All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions as on date of opening of bid. In case of conflict between this specification and those (IS codes, standards, etc.) referred to herein, the former shall prevail. All work shall be carried out as per the following standards/ codes as applicable.

IS:513	Cold rolled low carbon steel sheets and strips.
IS:802	Code of practice for the use of Structural Steel in Overhead Transmission Line Towers.
IS:1079	Hot Rolled carbon steel sheet & strips
IS:1239	Mild steel tubes, tubulars and other wrought steel fittings
IS:1255	Code of practice for installation and maintenance of power cables upto and including 33 KV rating
IS:1367 Part-13	Technical supply conditions for threaded Steel fasteners. (Hot dip galvanized coatings on threaded fasteners).
IS:2147	Degree of protection provided by enclosures for low voltage switchgear and control gear
IS:2309	Code of Practice for the protection of building and

	allied structures against lightning.
IS:2629	Recommended practice for hot dip galvanizing of iron & steel
IS:2633	Method for testing uniformity of coating on zinc coated articles.
IS:3043	Code of practice for Earthing
IS:3063	Fasteners single coil rectangular section spring washers.
IS:6745	Methods for determination of mass of zinc coating on zinc coated iron & steel articles.
IS:8308	Compression type tubular in- line connectors for aluminium conductors of insulated cables
IS:8309	Compression type tubular terminal ends for aluminium conductors of insulated cables.
IS:9537	Conduits for electrical installation.
IS:9595	Metal - arc welding of carbon and carbon manganese steels - recommendations.
IS:13573	Joints and terminations for polymeric cables for working voltages from 6.6kv up to and including 33kv performance requirements and type tests.
BS:476	Fire tests on building materials and structures
IEEE:80	IEEE guide for safety in AC substation grounding
IEEE:142	Grounding of Industrial & commercial power systems
DIN 46267 (Part-II)	Non tension proof compression joints for Aluminium conductors.
DIN 46329	Cable lugs for compression connections, ring for Aluminium conductors
VDE 0278	Tests on cable terminations and straight through joints
BS:6121	Specification for mechanical Cable glands elastomers and plastic insulated cables.
	Indian Electricity Act
	Indian Electricity Rules.

Equipment complying with other internationally accepted standards such as IEC, BS, DIN, USA, VDE, NEMA etc. will also be considered if they ensure performance and constructional features equivalent or superior to standards listed above. In such a case, the Bidder shall clearly indicate the standard(s) adopted, furnish a copy in English of the latest revision of the standards along with copies of all official amendments and revisions in force as on date of opening of bid and shall clearly bring out the salient features for comparison.

2. DESIGN AND CONSTRUCTIONAL FEATURE

Inter Plant Cabling

Interplant cabling for main routes shall be laid in Cable trenches/duct banks. Cables from main plant to control room shall be laid in Cable trenches/duct banks. In case of Duct banks, pull-pits shall be filled with sand and provided with a PCC covering. Directly burried cables, if essential ,shall not have concentration of more than 4 cables in one route. All buried cables shall be armoured.

Trenches

PCC flooring of built up trenches shall be sloped for effective drainage with sump pits and sump pumps.

No subzero level cable vault/trenches shall be provided below control building/switchgear rooms in plant.

General

The cable slits to be used for motor/equipment power/control supply shall be sand filled &

covered with PCC after cabling.

Sizing criteria, derating factors for the cables shall be met as per respective chapters. However for the power cables, the minimum conductor size shall be 6 sq.mm. foraluminium conductor and 2.5 sq.mm. for copper conductor cable.

Conscious exceptions to the above guidelines may be accepted under special conditions but suitable measures should be taken at such location to:

- Meet all safety requirements
- Safeguard against fire hazards, mechanical damage, flooding of water, oil accumulation, electrical faults/interferences, etc

3. Cable accessories

3.1 Cable trays, Fittings & Accessories

a) Cable trays shall be ladder/perforated type as specified complete with matching fittings (like brackets, elbows, bends, reducers, tees, crosses, etc.) accessories (like side coupler plates, etc. and hardware (like bolts, nuts, washers, G.I. strap, hook etc.) as required. Cable tray shall be ladder type for power & control cables and perforated for instrumentation cables.

b) Cable trays, fittings and accessories shall be fabricated out of rolled mild steel sheets free from flaws such as laminations, rolling marks, pitting etc. These (including hardware) shall be hot dip galvanized as per relevant IS.

c) Cable trays shall have standard width of 150 mm, 300 mm & 600 mm and standard lengths of 2.5 metre. Thickness of mild steel sheets used for fabrication of cable trays and fittings shall be 2 mm. The thickness of side coupler plates shall be 3 mm.

d) Cable troughs shall be required for branching out few cables from main cable route. These shall be U-shaped, fabricated of mild steel sheets of thickness 2 mm and shall be hot dip galvanised as per relevant IS. Troughs shall be standard width of 50 mm & 75 mm with depth of 25 mm.

3.2 Support System for Cable Trays

(a) Cable tray support system shall be pre-fabricated similar or equivalent to "Unistrut make".

(b) Support system for cable trays shall essentially comprise of the two components i.e. main support channel and cantilever arms. The main support channel shall be of two types: (i) C1:- having provision of supporting cable trays on one side and (ii) C2:-having provision of supporting cable trays on both sides. The support system shall be the type described hereunder:

1. Cable supporting steel work for cable racks/cables shall comprise of various channel sections, cantilever arms, various brackets, clamps, floor plates, all hardwares such as lock washers, hexagon nuts, hexagon head bolt, support hooks, stud nuts, hexagon head screw, channel nut, channel nut with springs, fixing studs, etc.
2. The system shall be designed such that it allows easy assembly at site by using bolting. All cable supporting steel work, hardwares, fitings and accessories shall be prefabricated factory galvanised.
3. The main support and cantilever arms shall be fixed at site using necessary brackets, clamps, fittings, bolts, nuts and other hardware etc. to form various arrangements required to support the cable trays. Welding of the components shall not be allowed. However, welding of the bracket (to which the main support channel

is bolted) to the overhead beams, structural steel, insert plates or reinforcement bars will be permitted. Any cutting or welding of the galvansied surface shall be brushed and red lead primer, oil primer &aluminium paint shall be applied.

4. All steel components, accessories, fittings and hardware shall be hot dip galvanised after completing welding, cutting, drill ing and other machining operation.
5. Support system shall be able to withstand
   - weight of the cable trays
   - weight of the cables (75 Kg/ Metre run of each cable tray)
   - Concentrated load of 75 Kg between every support span.
   - Factor of safety of minimum 1.5 shall be considered.

3.3 Pipes, Fittings & Accessories

a) Pipes offered shall be complete with fittings and accessories (like tees, elbows, bends, check nuts, bushings, reducers, enlargers, coupling caps, nipples etc.) The size of the pipe shall be selected on the basis of maximum 40% fill criteria

b) GI Pipes shall be of medium duty as per IS:1239

c) Duct banks shall be High Density PE pipes encased in PCC (10% spare of each size, subject to minimum one) with suitable water-proof manholes.

d) Hume pipes shall be NP3 type as per IS 458.

3.4 Junction Boxes

a) Junction Boxes with IP:55 degree of protection, shall comprise of a case with hinged door constructed from cold rolled sheet steel of thickness 2mm. Top of the boxes shall be arranged to slope towards rear of the box. Gland plate shall be 3mm thick sheet steel with neoprene/synthetic rubber gaskets. All junction boxes shall be of adequate strength and rigidity, hot dip galvanised as per relevant IS, and suitable for mounting on wall, columns, structures etc. The boxes shall include brackets, bolts, nuts, screws M8 earthing stud etc. required for installation.

b) Terminal blocks shall be 1100V grade, 10Amps rated, made up of unbreakable polyamide 6.6 grade. The terminals shall be screw type or screw-less (spring loaded) / cage clamp type with lugs. Marking on terminal strips shall correspond to the terminal numbering in wiring diagrams. All metal parts shall be of non-ferrous material. In case of screw type terminals the screw shall be captive, preferably with screw locking design. All terminal blocks shall be suitable for terminating on each side two (2) nos. stranded copper conductors of size upto 2.5 sq mm each. All internal wiring shall be of minimum 1.5 sq. mm cu. Conductor PVC wire.

3.5 Terminations & Straight Through Joints

a) Termination and jointing kits for 33kV,11kV, 6.6 kV and 3.3 kV grade XLPE insulated cables shall be of proven design and make which have already been extensively used and type tested. Termination kits and jointing kits shall be pre-moulded type, taped type or heat shrinkable type. 33kV, 11kV and 6.6 kV grade joints and terminations shall be type tested as per IS: 13573. 3.3kV grade joints and terminations shall be type tested as per VDE0278. Critical components used in cable accessories shall be of tested and proven quality as per relevant product specification/ESI specification. Kit contents shall be supplied from the same source as were used for type testing. The kit shall be complete with the aluminium solderless crimping type cable lugs & ferrule as per DIN standard.

b) Straight through joint and termination shall be capable of withstanding the fault level for

the system.

c) 1.1 KV grade Straight Through Joint shall be of proven design and make shall be approved by BHEL.

3.6 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 (for armoured cables) 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 micron. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene or better synthetic material and of tested quality. Cable glands shall be suitable for the sizes of cable supplied/erected.

3.7 Cable lugs/ferrules

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 equipments. Cable lugs and ferrule shall conform to relevant standard.

3.8 Trefoil clamps

Trefoil clamps for single core cables 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.

3.9 Cable Clamps & Straps

The cable clamps required to clamp multicore cables on vertical run shall be made up of Aluminium strip of 25x3 mm size. For clamping the multicore cables, self-locking, de-interlocking type nylon clamps/straps shall be used. The clamps/straps shall have sufficient strength and shall not get affected by direct exposure to sun rays and outdoor environment.

3.10 Receptacles

Receptacles boxes shall be fabricated out of MS shet of 2mm thickness and hot dipped galvanized or of die-cast aluminium alloy of thickness not less than 2.5 mm. The boxes shall be provided with two nos. earthing terminals, gasket to achieve IP55 degree of protection, terminal blocks for loop-in loop-out for cable of specified sizes, mounting brackets suitable for surface mounting on wall/column/structure, gland plate etc. The ON-OFF switch shall be rotary type heavy duty, double break, AC23 category, suitable for AC supply. Plug and Socket shall be shrouded Die-cast aluminium. Socket shall be provided with lid safety cover. Robust mechanical interlock shall be provided such that the switch can be put ON only when the plug is fully engaged and plug can be withdrawn only when the switch is in OFF position. Also cover can be opened only when the switch is in OFF position. Wiring shall be carried out with 1100 V grade PVC insulated stranded aluminium/copper wire of adequate size. The Terminal blocks shall be of 1100 V grade. The Terminal blocks shall be of 1100 V grade made up of unbreakable polymide 6.6 grade with adequate current rating and size. The welding receptacles shall be provided with inbuilt ELCB rated for suitable mA sensitivity.

3.11 Galvanising

- Galvanising of steel components and accessories shall conform to IS: 2629, IS: 4759 & IS: 2633. Additionally galvanising shall be uniform, clean smooth, continuous and

free from acid spots.

- The amount of zinc deposit over threaded portion of bolts, nuts, screws and washers shall be as per IS: 1367 . The removal of extra zinc on threaded portion of components shall be carefully done to ensure that the threads shall have the required zinc coating on them as specified.

3.12 Welding

The welding shall be carried out in accordance with IS: 9595. All welding procedures and welders qualification shall also be followed strictly in line with IS: 9595.

4. CABLE INSTALLATION

4.1 Cable tray and Support System Installation

a) 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.

b) 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 2000 mm in general. For vertical cable risers/shafts cable trays shall be supported at an interval of 1000mm 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. Vendor shall design the support system along with tray, spacing etc in line with relevant standard.

c) The cantilever arms shall be positioned on the main support channel with a minimum vertical spacing of 300 mm unless otherwise indicated.

d) The contractor shall fix the brackets/ clamps/ insert plates using anchor fasteners. Minimum size of anchor fasteners shall be M 8 X 50 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. Make of anchor fasteners subject to QA approval.

e) 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 75 mm. For long lengths of trays, the identification shall be painted at every 10 meter. Risers shall additionally be painted/ stenciled with identification numbers at every floor.

f) 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 aluminium paint.

4.2 Conduits/ Pipes/ Ducts Installation

a) The Contractor shall ensure for properly embedding conduit pipe sleeves wherever necessary for cabling work. All openings in the floor/roof/wall / cable tunnel/cable trenches made for conduit installation shall be sealed and made water proof by the Contractor.

b) GI pull wire of adequate size shall be laid in all conduits before installation. Metallic conduit runs at termination shall have two lock nuts wherever required for junction boxes etc.

c) Conduit runs/sleeves shall be provided with PVC bushings having round edge at each end. All conduits/pipes shall have their ends closed by caps until cables are pulled. After cables are pulled, the ends of conduits/pipes shall be sealed with Glass wool/Cement Mortar/Putty to prevent entrance of moisture and foreign material.

d) Exposed conduit/pipe shall be adequately supported by racks, clamps, straps or by other approved means. Conduits /pipe support shall be installed square and true to line and grade with an average spacing between the supports as given below, unless specified otherwise

Conduit /pipe size (dia).	**Spacing**
Upto 40 mm	1 M
50 mm	2.0 M
65-85 mm	2.5 M
100 mm and above	3.0 M

e) For bending of conduits, bending machine shall be arranged at site by the contractor to facilitate cold bending. The bends formed shall be smooth.

4.3 Junction Boxes Installation

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.

4.4 Cable Installation

a) Cable installation shall be carried out as per IS: 1255 and other applicable standards.

b) For Cable unloading , pulling etc following guidelines shall be followed in general :

- 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.
- 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 Project Manager.

c) Cables shall be laid on cable trays strictly in line with cable schedule

d) Power and control cables shall be laid on separate tiers in line with approved

guidelines/drawings. The laying of different voltage grade cables shall be on different tiers according to the voltage grade of the cables. In horizontal tray stacks, HT cables shall be laid on topmost 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 meter. All multi core cables shall be laid in touching formation. Power and control cables shall be secured fixed to trays/support with self locking type nylon cable straps with de-interlocking facilities. For horizontal trays arrangements, multi core power cables and control cables shall be secured at every five meter interval. For vertical tray arrangement, individual multi core power cables and control cables shall be secured at every one meter by nylon cable strap. After completion of cable laying work in the particular vertical tray, all the control cables shall be binded to trays/supports by aluminium strips at every five meter interval and at every bend.

e) Bending radii for cables shall be as per manufacturer's recommendations and IS: 1255.

f) Where cables cross roads/rail tracks, the cables shall be laid in hume pipe/ HDPE pipe.

g) 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 procure the cable drum length.

h) In each cable run some extra length shall be kept at suitable point to enable one LT/two HT straight through joints to 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.

i) Wherever few cables are branching out from main trunk route troughs shall be used.

j) Wind loading shall be considered for designing support as well Cable trays wherever required.

k) Where there is a considerable risk of steam, hot oil or mechanical damage cable routes shall be protected by barriers or enclosures.

l) 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.

4.5 Separation

At least 300mm clearance shall be provided between :

- HT power & LT power cables,
- LT power & LT control/instrumentation cables,

4.6 Segregation

a. Segregation means physical isolation to prevent fire jumping.

b. All cables associated with the unit shall be segregated from cables of other units.

c. 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.

d. In switchyard, control cables of each bay shall be laid on separate racks/trays.

4.7 Minimum number of spare cores required to be left for interconnection in control cables shall be as follows:

No. of cores in cable	No. of spare cores
2C,3C	NIL
5C	1
7C-10C	2
14C and above	3

4.8 Directly Buried Cables

a) Cable trenches shall be constructed for directly buried cables. Construction of cable trench for cables shall include excavation, preparation of sieved sand bedding, riddled soil cover, supply and installation of brick or concrete protective covers, back filling and compacting, supply and installation of route markers and joint markers. Laying of cables and providing protective covering shall be as per IS: 1255. Reference drawing for buried cables is included as a tender drawing and enclosd with this specification.

b) RCC cable route and RCC joint markers shall be provided wherever required. The voltage grade of the higher voltage cables in route shall be engraved on the marker. Location of underground cable joints shall be indicated with cable marker with an additional inscription "Cable Joint". The marker shall project 150 mm above ground and shall be spaced at an interval of 30 meters and at every change in direction. They shall be located on both sides of road crossings and drain crossings. Top of cable marker/joint marker shall be sloped to avoid accumulation of water/dust on marker.

4.9 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.

4.10 While crossing the floors, unarmoured cables shall be protected in conduits upto a height of 500 mm from floor level if not laid in tray.

5. Cable Terminations & Connections

a) The termination and connection of cables shall be done strictly in accordance with cable termination kit manufacturer" instructions, drawings and/or as directed by Project Manager. 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.

b) 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 (where applicable), connecting to cable terminal, shorting and grounding as required to complete the job to the satisfaction of the Project Manager.

c) 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.

d) 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.

e) 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. Supply of ferrules is in Vendor's scope.

f) All cable terminations shall be appropriately tightened to ensure secure and reliable connections.

5.43 Pre-commissioning inspections/ checks/tests, MRT tests, coordination/liaison with state /central departments/CEIG etc. for necessary approvals/clearances for commissioning, synchronization with grid/ plant commissioning

#	**Scope description** **Vendor shall be responsible for carrying out following minimum tests/ checks for the respective IR, CR, metering yard, transmission line and substation bay and any other tests as per requirements of SECI / SCCL/ concerned state / central departments / TSTRANSCO/ TSNPDCL/ CEIG/ CEA etc**.
1	Pre-commissioning inspections / checks / tests, MRT tests and coordination / liaison activities with state / central departments / Transco/ DISCOM/ CEIG/ CEA etc for necessary approvals / clearances for commissioning, synchronization with grid and post-commissioning operation of the plant. (Clearances shall include obtaining prior approvals for all applicable drawings/ documents etc from concerned state / central departments / Transco/ DISCOM/ CEIG/ CEA etc.)

A	Basic checks		
	A1	Tightness checks:	
		1) Terminations of AC/DC power cables at SMBs, PCUs, Inverter transformers, Aux transformer, ACDB panel, UPS/ FCBC/ Battery banks, Aux AC/DC DB boards, ABT metering panel, 33kV VCB panels, metering CT/PT, GOS, LA, LV side of Inverter transformer, SCADA panels etc. 2) Terminations of Control/ Instrumentation/ Data/ Communication cables wherever applicable. 3) Terminations of earthing at all electrical equipment/ panels of inverter rooms/ control room/metering yard/Transmission line/ Substation bay 4) Terminations of earthing of inverter transformers, aux transformer 5) Terminations of earth chambers of vendor scope. **Note:** For M10 and above, torque wrench settings shall be followed for reference.	
	A2	Electrical continuity checks	
	A3	Megger (5kV) checks for all HT (33kV) cables and Line	

				A4	Hi-pot testing for all HT (33kV) cables prior to connection to the panels/ transformers.		
				A5	Megger (1kV) checks for all 1.1kV grade cables		
				A6	AC/DC supply checks at TBs of all electrical panels/ DBs/ Transformers.		
				A7	Transmission line testing		
				B	Pre-commissioning electrical tests:		
				B1	Power conditioning units (with the support of PCU service engineer at site)		
					1) DC side open circuit voltage and verification with SMB side measurements 2) Vendor to provide technician support to PCU service engineer for all other pre-commissioning tests as per OEM checklist 3) Functioning of duct fans (operation, direction of rotation)		
				B2	Inverter transformers and Aux transformer		
					1) Oil filtration: Equipment of adequate evacuation/ heating/ oil circulation capacity shall be deployed at site for this purpose. Filtration shall be carried out adequately in order to achieve the BDV, ppm, tan delta values within the limits as per relevant standards and as measured by NABL accredited laboratory. The machine shall have built-in BDV measuring set up for in-situ checking of BDV during filtration process. DG if required for oil filtration shall be arranged by vendor. 2) IR tests LV-HV, HV-E, LV-E 3) Vector group 4) Voltage ratio 5) Magnetizing current 6) Magnetic balance 7) Winding resistance at all taps 8) Fault simulation checks (at VCB breaker panels): Buchholz, OTI, WTI, PRV, LOLA etc 9) Alarm, trip settings (S1, S2) for WTI, OTI 10) Oil level at conservator (to be topped up, if required)		
				B3	CTs 33kV at plant and substation		
					1) IR tests (all cores): Pri-Sec, Sec-Sec, Pri-E, Sec-E 2) Ratio tests / primary injection		
				B4	PTs 33kV at plant and substation		
					1) IR tests (all cores): Pri-Sec, Sec-Sec, Pri-E, Sec-E 2) Voltage ratio test 3) Polarity test		
				B5	33KV breakers at plant and substation		
					IR tests Contact resistance measurement (CRM) Timing test: close/ open/ close-open Functional checks: breaker open/close, spring-charged motor Remote operation from SCADA panels: open/close, command/ status, lamp indications		
				B6	Numerical relays at 33KV breaker/C&R panels at plant & substation		
					1) Relay calibration using applicable kit/ software		

					2) IDMT, DT curves with timing/pickup settings in all relays based on gradation across from downstream to upstream taking into account settings at substation 3) Overcurrent/ earth fault pickup/ tripping time tests		
				B7	CT ratio / PT ratio to be set in meters/relays		
					i. All MFM meters ii. ABT meters iii. Protection relays		
				B8	ACB breaker settings (with the help of PCU service engineer)		
					1) Over load, Short time fault, ground fault		
				B9	Earth resistance measurements for all chambers of vendor scope		
					1) With electrode connected to grid 2) Without connecting electrode to grid		
				B10	UPS/ FCBC charger/ Battery banks		
					1) All functional checks: battery charging/ discharging, FCBC/ battery output parameters etc. as per OEM checklists		
				B11	Transmission line testing		
				B12	Tests on 30KV LA		
				B13	Tests on GOS Isolator		
			C	Testing agency			
					Credentials of testing agency shall be submitted to BHEL for approval prior to awarding of work.		
			D	Coordination and Liaison activities to be carried out by vendor:			
					1) Vendor shall lead in the process of obtaining approval from Transco/ DISCOM/ CEIG/ CEA etc as applicable for line charging/ grid synchronization/ plant commissioning. 2) Liaison responsibility for getting the approvals rests with the vendor. Wherever technical clarifications are required by the approving agencies with regard to SPV portions (including solar array) up to metering yard, transmission line and substation bay, vendor shall suitably coordinate/liaison with the concerned state/central approving agencies to make the approval process successful. Accordingly, vendor shall participate in direct discussions with the approving agency whenever necessary. Also, all the necessary payments/expenditures to be incurred with ref to such coordination/ liaison in this regard shall be borne by the vendor. 3) Following are the areas of approval, as applicable (a) GTP/ datasheets/ GA drawings/ Bill of materials, MQP etc of all (BHEL's/vendor's) supply items. (b) Site test reports of transformers, transformer oil, VCB breakers, CTs, PTs, LAs, resistance of earth mat grids etc (c) Interaction with supervising/ inspection agency such as MRT departments, Transco, CEIG, CEA etc, as applicable, for applying to them/ inviting them for supervision/ inspection at site. (d) Interaction/ coordination with customer in the above process as and when required. (e) All necessary testing kits/ instruments shall be arranged as per the requirements of inspection agency. Basic instruments such as digital multimeter, 5kV digital megger with PI feature, earth		

					resistance meter, VCB open/close timing test kit, clamp meters etc shall be organized at site at the time of inspection. Competent electrical technician shall also be made available at the site. (f) Subsequent to site inspection by the concerned agency, vendor shall obtain the clearance for grid synchronization after implementation of all the observations of CEIG. (g) Vendor shall also coordinate with DISCOM for obtaining approvals such as grid connectivity approval etc.		
				E	Commissioning of Substation bay equipment, Transmission line and Solar Power Plant		
					1) Vendor shall organize all necessary tools/ measuring instruments required to operate the various electrical equipment at the time of commissioning: Digital megger 5KV with PI feature, Earth resistance tester, Phase sequence meter, Clamp meters etc., discharge rods, PPE safety gadgets (helmets, shoes etc.). 2) It is the responsibility of the vendor to successful charge 33kV transmission line followed by charging of 33kV yard at SPV plant end and grid synchronization of inverters/ plant commissioning for full DC capacity. 3) Vendor shall participate actively in the commissioning until it is established that there is successful export of power from all the strings PCUs and through the 33kV transmission line/ switchyards/ substation bay.		
				F	Trial run and Performance Guarantee test		
					After commissioning and completion of all works including clearing of all punch points, trail run of the plant will be commenced for 7 consecutive days based on acceptance by SECI. Immediately after trial Performance Guarantee test shall start for a period of 30 days. During trial run and PG test vendor shall deploy manpower, operate and maintain the plant and ensure that there are no breakdowns in any equipment, all required tools and spares are available. After successful completion of PG test, Operation and maintenance period will start. It is the responsibility of vendor to maintain the plant in all respects as per regular O&M procedures during PG test period.		

5.44 Spares required to be supplied along with main consignment:

1) Fuses of all types: 1 % of total population of respective items
2) MCB of all types: 1% of total population of respective items
3) Indicating lamp set of all types: 1% of total population of respective items
4) Surge protection devices/ MOV: 1% of total population of respective items
5) Lamps for peripheral lighting- 10 Nos
6) Y-connectors: 100 Sets (1 set = 2 nos)
7) MC4 connectors: 250 sets (1 set = 2 nos)
8) 33KV, 1C, 300 sqmm (E) Indoor End termination kits- 4 Nos
9) 33KV, 1C, 300 sqmm (E) Outdoor End termination kits- 2 Nos
10) 33KV, 1C, 300 sqmm (E) Straight through jointing kits- 3 Nos
11) Spares of aux transformers:
    a) HV bushings with metal parts and gaskets: 1 set
    b) LV bushings with metal parts and gaskets: 1 set
    c) Neutral bushing with met metal parts an gaskets: 1 set
    d) Gaskets : 2 sets
    e) Silica gel breather with charge: 1 set

	f) Diaphragm of explosion vent: 1 set g) Prismatic oil level gauge: 1 set h) Valves: 1 set Notes: (a) 1 set refers to total quantity of the item used in one transformer. (b) In case quantity arrived based on percentage is a decimal figure, it shall be rounded off to next higher integer.

6 Operations and Maintenance

6.1	Vendor scope includes operation and maintenance of solar plant, metering yard, transmission line and substation bay for 10 years period from zero date of O&M.
6.2	Date of commencement of operations and maintenance: Zero date for O&M shall be the actual date on which the performance guarantee test is successfully completed.
6.3	O&M personnel 1. Vendor shall deploy following minimum personnel: (a) Technical / administrative / office personnel (i) One technical-cum-administrative in-charge having degree in electrical / electronics engineering and experience in solar plants with overall responsibility for complete plant operations. The in-charge shall have competence to handle technical and operational / crisis problems. (ii) Three working level staff with ITI / diploma qualifications in engineering with competence for operating electrical / electronics / mechanical equipment, taking measurements, data logging / maintaining registers, preparation of reports in computer. (iii) Six unskilled persons for regular house-keeping (cleaning / mopping etc), water cleaning of SPV modules, grass cutting and other maintenance works. (iv) **Note:** At least one among the technical personnel shall essentially be a certified / licensed person for HT operations (33KV minimum). This is a mandatory requirement. (b) Security personnel Minimum Ten (10) security guards to be deployed in three shifts with competence to handle tough situations and safeguard the plant from miscreants. (c) In case, any of the above O&M personnel is on leave, reliever shall be arranged by the vendor so that there is no effect on O&M activity. 2. Similarly, O&M personnel shall be provided with raincoats, toolsets, earthing rods, safety gloves, safety goggles, gumboots, helmets and all other personal protective equipment (PPE) that will be relevant to ensure human safety. 3. Names, qualification, work responsibility of personnel shall be listed on a display board within control room. 4. Attendance register shall be maintained for both the teams. 5. Vendor shall ensure statutory requirements such as ESI, PF and labour license for their O&M personnel posted at site. 6. BHEL shall have right to disallow any O&M employee, if found unfit to perform. BHEL instructions issued in writing shall be binding on vendor who shall replace the person. 7. O&M personnel at site shall conform to general regulations in force at site and to any special instructions from local administration/SCCL.

	8. O&M personnel at site shall be deemed to be aware of damages and risks incidental to conditions of BHEL land and works from time to time and BHEL shall not be responsible for any injury to personnel arising there from. 9. Training to O&M personnel It is the absolute responsibility of vendor to ensure imparting of necessary training to their O&M personnel to get them acquainted with the operations of various electrical and mechanical equipment of the power plant. For this purpose, vendor shall identify the O&M personnel well in advance and involve them during installation and commissioning stages so that they become well versed with various functional aspects of the power plant. 10. Availability of O&M personnel at power plant (a) Vendor shall ensure that operating staff are present in the power plant during plant operation (6:00 AM – 6:30 PM) every day. (b) Vendor shall ensure that certain minimum operating staffs are present at the power plant even on festivals, public holidays and any other unique occasions so that the plant is run under competent supervision on all days. (c) Security guards shall be available at the power plant on round the clock basis and on all the days. In case of any break in duty of security guard(s), replacement with alternate guard(s) shall be ensured during the break time. 11. O&M personnel shall, strictly, not use any part of the power plant for their personal / residential purposes. Their presence at the plant shall, strictly, be meant only for the purpose of operation and maintenance of plant. 12. In case of Maintenance activity / failure or damage/accident / replacement / repair required for equipment as Solar modules, CRP panel, VCB, CT and PT, Auxiliary, Main transformer, Battery bank / charger etc, all site related activities e.g. unloading, erection, installation, charging, co-ordination with agencies involved, etc., shall be in O&M contractor's scope. Arrangement of JCB/ crane / hydra / additional labour hiring / Ladder, etc., for arranging replacement of failed equipment will be in the scope of the vendor.
6.4	O&M operations – daily basis (1) Water cleaning of SPV modules (at least once in two week or at closer frequency as per the soiling conditions prevailing at site) (2) Control room and inverter room cleaning – dry sweeping, wet mopping (3) Water wash cleaning of toilets, urinals. (4) Logging of DC, AC, grid parameters (current, voltage, power, energy) at PCUs & VCB/ C&R panels, transformer temperatures, equipment tripping/ breakdown, grid outage etc as per BHEL formats. (5) SCADA data station / PC operations for daily monitoring of weather parameters, trend graphs and urgent reporting to BHEL in case of any problems / anomalies observed with any of the parameters. (6) Drinking water to be arranged for O&M personnel at site. (7) Contractor shall prepare and send Forecasting and Scheduling (F&S) generation reports as per extant regulations (SERC/CERC) for Forecasting, Scheduling, Deviation Settlement Mechanism and related matters. The scope under this Clause shall also include establishing and maintaining forecasting tools and appointment of QCA/Aggregator, if required. % Error (Deviation) shall be calculated as per the said regulations and DSM Charges in case of deviation beyond the permissible limits shall be borne by the vendor.
6.5	O&M activities – weekly basis (1) Removal of garbage from solar array field, switchyard, roads, drains, pathways, sand buckets; logging in registers with signatures of operating persons and in-charge. (2) Monitoring and logging of fire extinguisher levels / pressures as per BHEL formats
6.6	O&M activities – monthly basis

	(1) Inspection of fire extinguishers (weight, pressure indication, physical status etc) followed by refilling actions, if necessary, based on indications. Report to be submitted as per BHEL approved recording formats. (2) Earthing resistance measurements for solar array structures, control room equipment, switchyard equipment, lightning arrestors (ESE): measured values shall be recorded in registers and reported to BHEL as per BHEL approved recording formats. (3) Submission of values / status of plant parameters and events for the corresponding month, as below, as per BHEL approved formats: a. Daily values of solar array strings (SMB parameters) b. Daily values of weather parameters (solar energy, wind speed, ambient temperature) c. Daily energy generation d. Events (with date, time) of faults / tripping / breakdown of equipment e. Events (with date, time) of grid outage f. Events (with date, time) of equipment damages, accidents and thefts g. Activities of module cleaning (4) Monthly reports shall be submitted to BHEL for all the above data. (5) Energy generation / meter reading report to be prepared and submitted to the concerned department (STATE ELECTRICITY SUPPLY & TRANSMISSION BOARDS etc). Signatures from BHEL's customer and substation representatives shall be obtained wherever required. (6) Co-ordination with STU/SLDC/other statutory organizations as per the requirement on behalf of Employer for Joint Metering Report (JMR), furnishing generations schedules as per requirement, revising schedules as necessary and complying with grid requirements (7) Inspection of transmission line and Substation bay equipment
6.7	O&M activities - quarterly basis (1) Cleaning of PCUs, VCB panels, C&R panels, ACBD, IRDB, FCBC, battery banks etc. to remove accumulated dust at plant and substation end. (2) Monitoring and status review, followed by rectification / calibration / replenishment / replacement actions as necessary and applicable for following: (a) Spare items of all electrical equipment (b) First aid box items - medicines and accessories (c) Safety gadgets (d) Tool kits and measuring instruments (e) Yard lights (f) Pumps, starters (g) Control room appliances: air conditioners, lights, fans, exhaust fans, switch boards etc. (3) Pest control for control room and inverter room(rats, snakes etc.) – sprays, chemicals, medicines etc. to be applied wherever required. (4) Submission of quarterly report on above activities to BHEL. (5) Cleaning of water storage tanks
6.8	O&M activities – half yearly basis Tilting of Solar PV Module structures
6.9	O&M activities – yearly basis (1) BDV measurements for oil samples from all the transformers and submission of report to BHEL. (2) Filtration of oil to be arranged, if required, based on BDV measurement report. (3) Testing and calibration of VCBs, relays, CTs, PTs, LA, GOS, ABT meter etc (4) Lubrication of moving contacts (VCBs, GOS switches, Earth switches etc) with appropriate grease etc for plant, line and substation equipments (5) Cleaning of sewerage lines, septic tanks (if found necessary)

	(6) Painting of switchyard gate / fencing, earthing chambers, other steel structures within control room and switchyard if required based on conditions of rusting etc for plant, line and substation equipments. (7) Checking tightness of hardware in solar array structures and tightening wherever required. (8) Checking tightness of power cable terminations in SPV modules (MC4), SMBs, electrical panels of control room, Inverter room, Transformer yards, Metering yard, transmission line and substation equipments
6.10	O&M activities - as and when required (contextual basis) (1) Monitoring and operation of plant electrical equipment as and when required: (a) GOS Air break switches (b) VCB on/off: local operations from outdoor HT panel and remote operations from indoor remote annunciation panel (c) Settings of numerical relays in HT panels/ C&R Panles: review and revision in consultation with BHEL. (d) ACB on/off operations on LT side. (e) PCU operations: emergency close, LCD displays (selection of settings, monitoring the DC/AC/event/fault status parameters), operation of duct fans. (f) Battery and battery charger operations (g) Bore well pump operations to fill the storage tanks. (2) Coordinating, on behalf of BHEL, and obtaining renewal of statutory licenses, clearances and approvals from state departments. (3) Repair and replacement of vendor supplied items, by vendor, with urgent action plans and implementation, when the items are found non-working / damaged. The same shall be reported to BHEL within 12 hours from time of observation. (4) All the equipment required for Testing, Commissioning and O&M for the healthy operation of the Plant must be calibrated, time to time, from the NABL accredited labs and the certificate of calibration must be provided prior to its deployment. (5) Reporting, on an immediate basis (within max 2 hours) of functional problems / damages in BHEL supplied items to facilitate repair / replacement by BHEL. Further, vendor shall correspond / coordinate with respective equipment vendors / service centers, on behalf of BHEL, for getting the service engineers to the site. Later, coordinating with the service engineers during their visit to site, and assisting them in the trouble shooting process until the problem is resolved. Vendor shall report to BHEL (within max 2 hours) immediately after the problem is resolved. (6) Vendor shall keep updating the spares inventory at the site every time there is consumption of spare items towards replacement. In case of shortage of spares, the same shall be reported on an urgent basis (with max 2 hours) to BHEL. (7) Coordinating with authorities upon failures at sub-station bay, grid failures, line problems etc and implementing the needful steps to restore the plant to normal operation. (8) The electrical charges for the auxiliary consumption and broadband internet, telephone charges, if any, of the SPV plant during the entire period will be in scope of the vendor (9) Theft incidents: immediate reporting to BHEL, filing FIRs with police stations on behalf of BHEL, coordination for site inspection by insurance companies and clearance of insurance claims, logging of events (date, time) and maintaining records. (10) Accidents: immediate reporting to BHEL, coordinating with hospitals, logging of events (data, time) and maintaining records. (11) Procurement of all O&M consumables for fulfilling the activities detailed above will be in the scope of vendor. (12) Grass cutting – quarterly once or if when the height of grass start touching more than 500mm from ground level whichever is earlier.

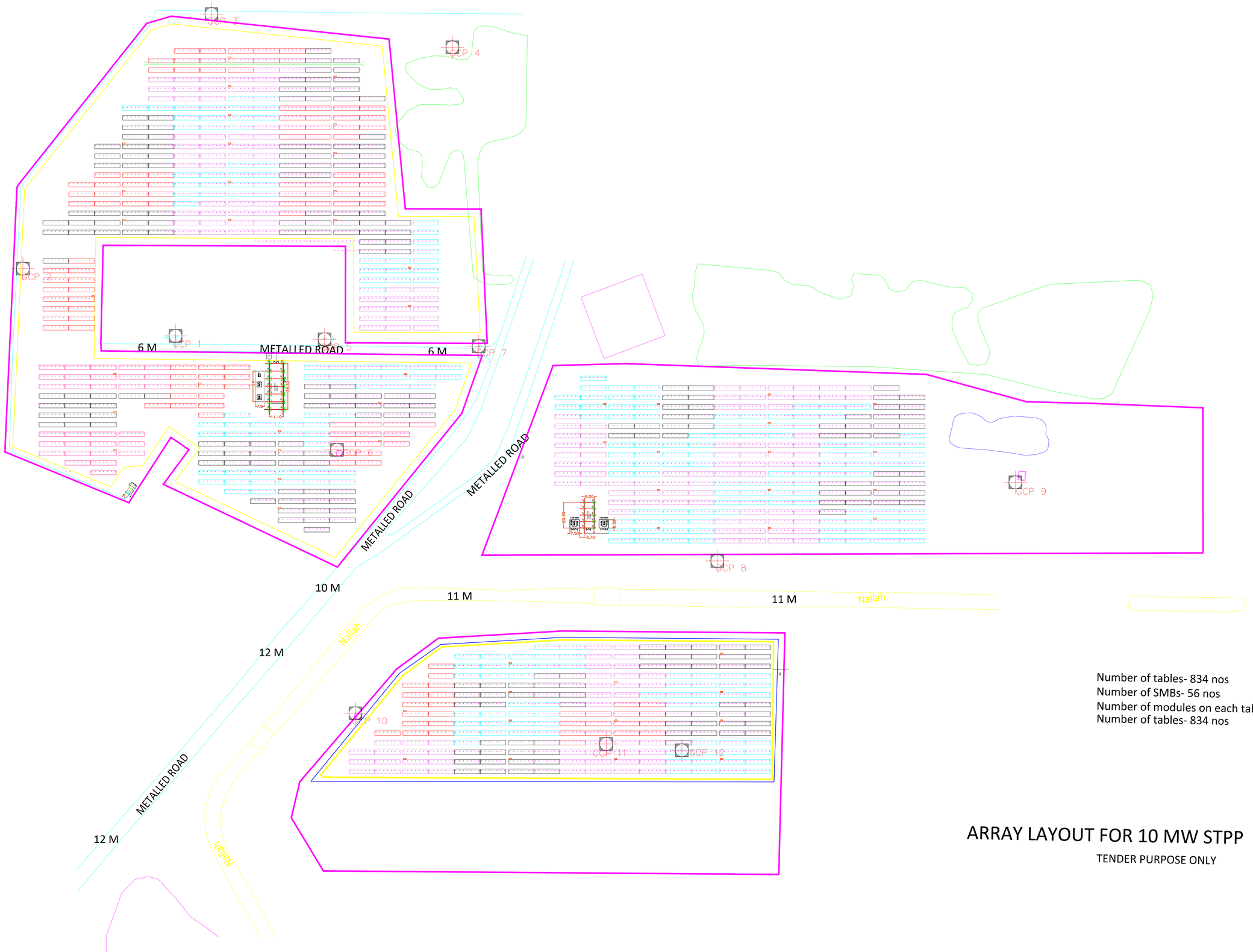
7 General conditions applicable during supply, installation, commissioning and O&M

7.1	As already mentioned in previous clauses, vendor shall organize power supply on their own. Accordingly, DG sets of suitable capacity shall be deployed by the vendor for construction works.
7.2	Similarly, water required for construction works shall be organized by vendor (tankers etc).
7.3	All machinery such as cranes, hydra, JCBs, forklifts, transport trucks, trolleys etc necessary for movement and installation of materials / panels / equipment etc shall be organized by the vendor.
7.4	All necessary tools and tackles such as crimping tool (including heavy duty tools for crimping copper/ aluminium cables up to 630 sq-mm), screw driver set, power screw drivers, cutting pliers, nose pliers, spanner sets, adjustable spanners, hole-saw cutter set, bending tools, torque wrenches, hack saw blades, pipe wrenches, flat / round files, HV termination tools, drilling machines, welding machines, concrete mixers, steel bar bending tools / templates/ shuttering materials for RCC works, spade, shovel, hammer etc shall be organized by the vendor.
7.5	All necessary measuring instruments such as digital multimeters, measuring tapes, vernier calipers, electrical testers, digital meggers (1kV, 2.5kV, 5kV), earth resistance meters, clamp meters, transformer oil BDV kit, relay testing kit (secondary injection), primary injection kit, infrared thermal imaging handheld temperature meter etc. All these instruments shall possess valid calibration certificate issued from approved NABL laboratory.
7.6	Vendor shall make their own arrangements for necessary food, drinking water and accommodation for their labour and employees posted at the site. Similarly, food and drinking water required at the site, during the construction operations, shall also be in scope of vendor.
7.7	Vendor shall organize all necessary steps to meet statutory requirements such as labour license, PF, ESI etc and also ensure compliance with relevant acts such as minimum wages act, income tax act, employee insurance act etc for their labour deployed at site.
7.8	Vendor shall maintain updated labour register, with name, age, qualification, salary, attendance details etc. at the site.
7.9	Vendor shall use danger boards, wherever required, to ensure safety of the persons during the work at site.
7.10	Vendor shall adhere to all necessary safety norms such as use of helmet, goggles, hand gloves, gumboots, aprons etc. It is the ultimate responsibility of the vendor in all respect to prevent accidents at the site and safeguard their labour from accidents.
7.11	Vendor shall, at the completion of every work, clear off the debris, which resulted out of the work. In case of excavation work such as cable trench etc, vendor shall finish the land neatly with necessary leveling, rolling etc.
7.12	Vendor shall carry out the work without causing inconvenience to other contract groups at the site. In case of conflicts with other groups, vendor shall ensure that the matter is resolved at once amicably so that the progress of work is not affected.
7.13	Any damages on the building, structures etc. attributable to the acts of labour / employees of vendor shall be rectified and made good by the vendor at their own cost.
7.14	No child labour shall be employed for execution of the present contract.
7.15	Any miscellaneous materials, which are found essential for technical completion of the contract but not mentioned explicitly in this specification, shall be deemed to be included in the specification. Accordingly, such materials shall be included by the vendor as part of the offer.
7.16	Special instruction for earthing: In compliance with Rule 33 and 61 of Indian Electricity Rules, 1956 (as amended up to date), all non-current carrying metal parts shall be earthed with two separate and distinct earth continuity conductors to an efficient earth electrode. Accordingly, all cases such as cable support structures, cable ladders, cable trays (control room) etc. shall be earthed.

7.17	BHEL/SECI shall witness routine/ acceptance/ type tests performed at manufacturer works for the items supplied by vendor. Vendor shall accordingly provide inspection call to BHEL with submission of quality assurance plan in advance. For the items bought out from dealers, test certificates, as per relevant IS / IEC standards, as issued by manufacturer shall be submitted to BHEL. However, prior approval shall be obtained from BHEL/SECI for procurement of the item from dealers.
7.18	Field Quality Plan / Quality control system (if applicable) Vendor shall set up a field quality control laboratory with full set up to facilitate testing of all construction materials in accordance with FQP (Field quality control plan) as approved by BHEL/SECI. Vendor shall deploy a well experienced quality control engineer to monitor all QC activities at site as per approved FQP. Specifically with reference to civil works, vendor shall submit all concrete mix designs and bituminous mix designs for BHEL/SECI approval before starting of the work. All the third party testing should be conducted in NABL approved laboratories only. Vendor shall submit the FQP for the civil construction works before starting of the works for approval of BHEL/SECI.
7.19	Any deviations shall be discussed with BHEL/SECI site engineers and implementation shall be taken up only after approval from BHEL /SECI.
7.20	Vendor shall submit periodic status report, on daily as well as weekly consolidated basis, to BHEL on the progress of the contract.
7.21	Vendor shall, as and when required by BHEL/SECI, participate in the review meetings conducted by BHEL/SECI at project site, BHEL-EDN (Bangalore), BHEL-Corporate office (New Delhi), SECI office, New Delhi etc
7.22	**General Guidelines** a) Any civil or electrical work which is not mentioned or included in this tender document but necessary for functional requirements of the plant shall be carried out by vendor. b) Vendor shall prepare all designs / drawings based on the specifications given in the tender and in light of relevant BIS/IS/ equivalent standard. c) Vendor shall provide type test reports and datasheet/ GTP for all equipments covered under vendor scope of supply. d) BHEL reserves right to modify the design at any stage to meet local site conditions / project requirements. e) All work shall be carried out in accordance with the latest edition of the Indian Electricity Act and rules formed thereunder and as amended from time to time.
7.23	For all current carrying parts and earthing, S.S hardware shall be provided and all other places, G.I hardware shall be provided. M.S hardware shall not be used in any place.

8 Documents to be submitted for BHEL/SECI approval during detailed engineering

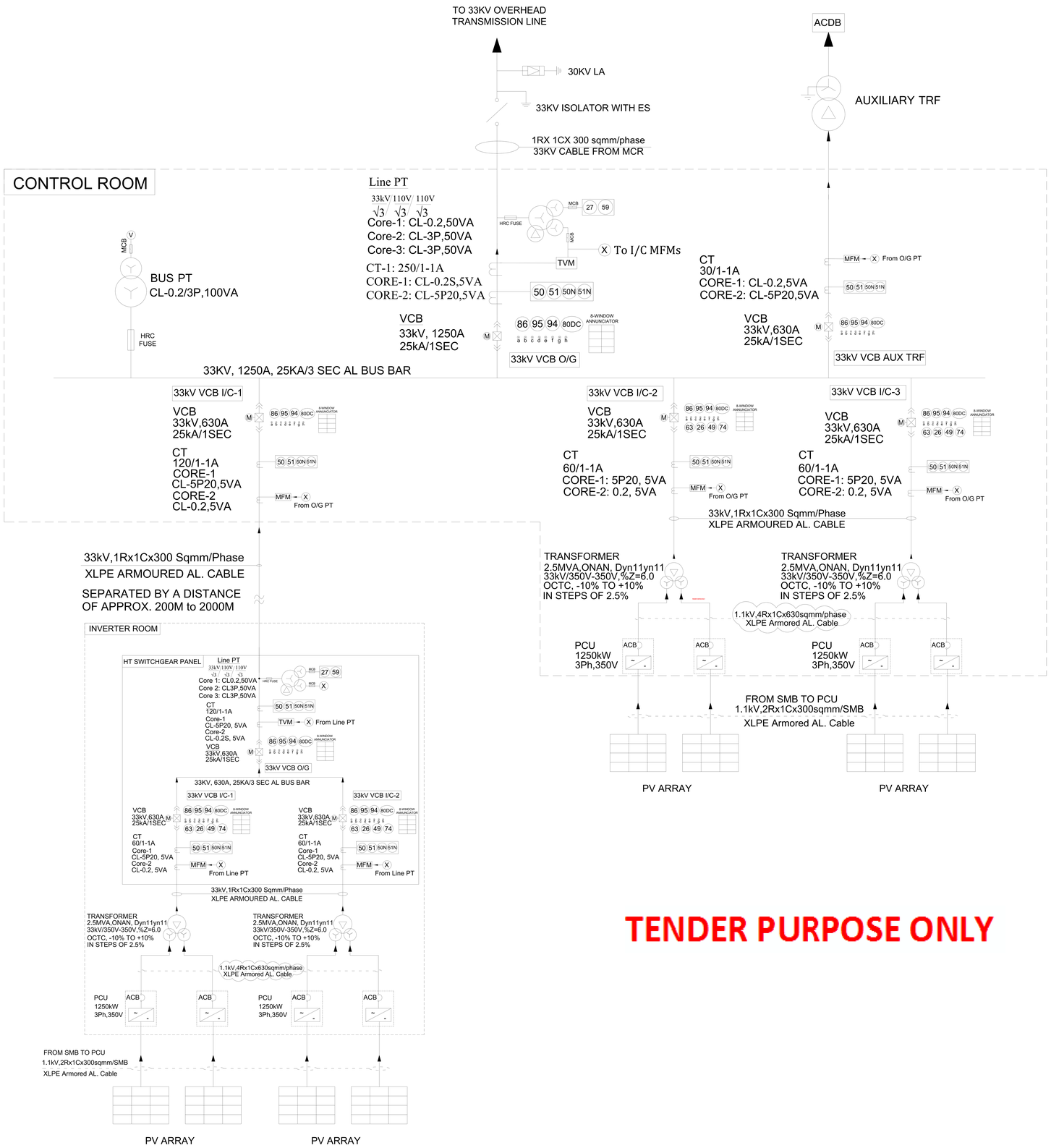
8.1	BHEL/SECI approval shall be obtained for the following technical documents, which shall be submitted to BHEL in phased manner based on priority sequence of activities during detailed engineering (after receipt of purchase order from BHEL).
8.2	Name of vendor/ make, model number/ part number, specification/ sizes/ dimensions/ drawings/ datasheets shall be submitted for all the vendor supplied items.
8.3	Design calculations/ general arrangement drawings/ single line diagrams/ GTP particulars/ datasheets/ schemes/ layouts/ bill of materials etc., as applicable.
8.4	Manufacturing Quality Plans for all the vendor supplied items
8.5	Field quality plan for the field work: civil works, electrical works
8.6	Detailed activity-time chart for project implementation
8.7	Detailed manpower deployment schedule



Number of tables- 834 nos
Number of SMBs- 56 nos
Number of modules on each table- 40 nos
Number of tables- 834 nos

ARRAY LAYOUT FOR 10 MW STPP

TENDER PURPOSE ONLY



LEGEND DETAILS

SL. NO.	SYMBOL	DESCRIPTION
1		INVERTER TRANSFORMER / POWER TRANSFORMER
2	M	33KV VACUUM CIRCUIT BREAKER
3		132 kV SF6 BREAKER
4	86	MASTER TRIP RELAY
5	95 195 295	TRIP CIRCUIT SUPERVISION RELAY
6	94	ANTI PUMPING RELAY
7	63	BUCHHOLZ RELAY
8	26	MAGNETIC OIL LEVEL GAUGE
9	49	WINDING TEMP INDICATOR AND OIL TEMP INDICATOR
10	74	PRESSURE RELIEF DEVICE
11	50	INST OVER CURRENT RELAY
12	51	IDMT OVER CURRENT RELAY
13	50N	NEUTRAL INSTANTANEOUS OVER CURRENT RELAY
14	51N	IDMT EARTH FAULT RELAY
15	MFM	MULTI FUNCTION METER
16		CURRENT TRANSFORMER
17	27	UNDER VOLTAGE RELAY
18	59	OVER VOLTAGE RELAY
19		POTENTIAL TRANSFORMER
20		FUSE
21	ABT	ABT TARIFF ENERGY METER
22	80DC	DC FAILURE INDICATION
23	~ -	INVERTER, 1250kVA
24		ACB
25		LIGHTNING ARRESTER
26	64R	RESTRICTED EARTH FAULT RELAY
27	87T	TRANSFORMER DIFFERENTIAL RELAY
28	30	ANNUNCIATOR RELAY
29	50LBB	LOCAL BREAKER BACKUP PROTECTION
30	87L	LINE DIFFERENTIAL PROTECTION RELAY
31		ISOLATOR WITH DOUBLE EARTH SWITCH
32		ISOLATOR WITH SINGLE EARTH SWITCH

TENDER PURPOSE ONLY

REV.	DATE	ALTERED / CHECKED / APPROVED
02	08.03.19	Revised as per customer comments.
00	15.02.19	FIRST ISSUE

DRAWN 11.01.2019

PROJECT : STPP 10MW SOLAR POWER PLANT
CUSTOMER : SCCL

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

TITLE: AC SINGLE LINE DIAGRAM

No. OF SHEETS 01 | SHEET No. 01 | REV 01

BHEL DRG. No. BHEL-SECI-SD-SCCL10-DWG-ELE-002

A0 SIZE

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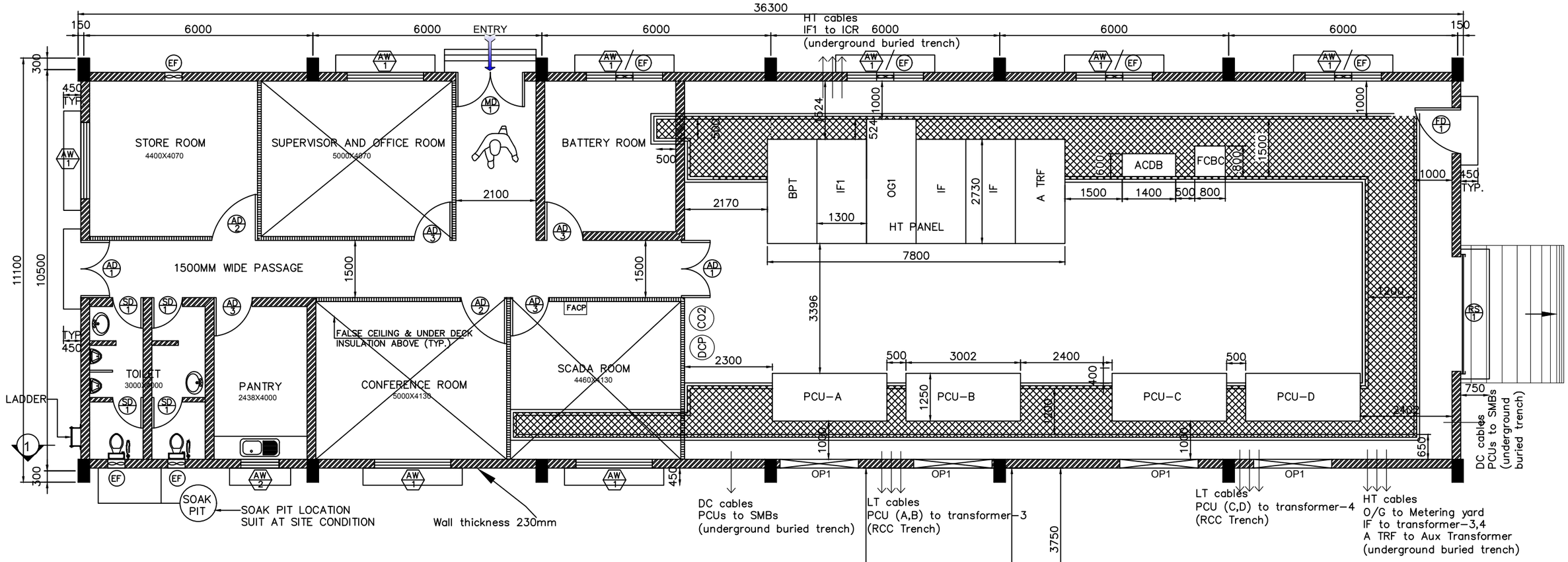
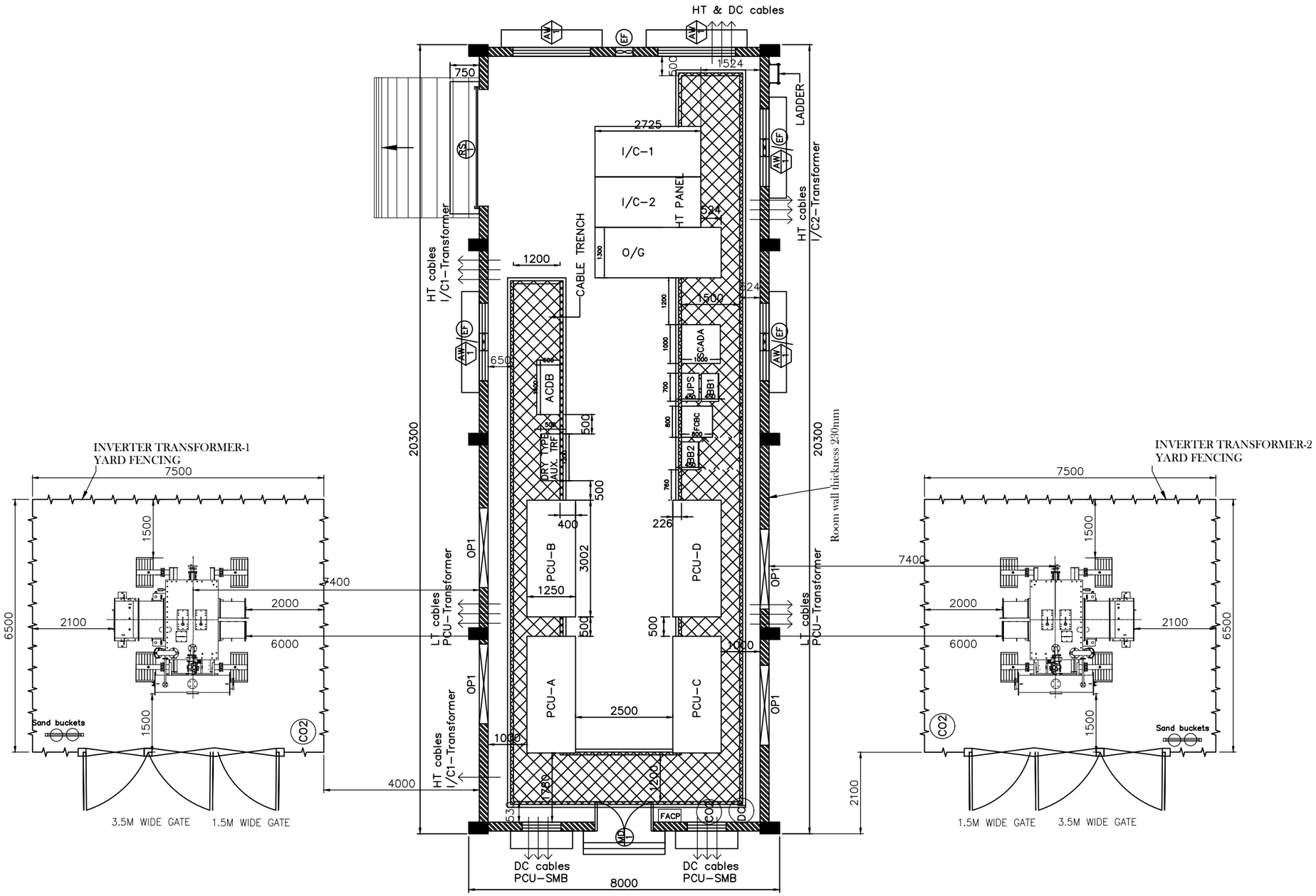


PCU–Power Conditioning unit
ACDB– AC Distribution Board
FACP– Fire Alarm Control panel
OP1– Cutout for PCU duct
AW– Air Window
EF– Exhaust Fan
RS– Rolling Shutter

All dimensions are in mm.

TENDER PURPOSE ONLY

CONTROL ROOM LAYOUT



All dimensions are in mm.

PCU–power Conditioning unit
ACDB– AC Distribution Board
I/C–1– Incomer–1
I/C–2– Incomer–2
O/G– Outgoer
BB1– Battery bank for UPS
BB2– Battery bank for FCBC
FACP– Fire Alarm Control panel
OP1– Cutout for PCU duct
AW– Air Window
EF– Exhaust Fan
RS– Rolling Shutter
MD– Main door
CO2 Carbon Di–Oxide Fire extinguisher
DCP Dry Chemical Powder Fire extinguisher

TENDER PURPOSE ONLY

INVERTER ROOM LAYOUT

List of Documents to be submitted by Vendors/Subcontractors for SPV Contracts.		Confirmation on submission	Deviation / Remarks
IR Documents (Type - A): For all Civil & I&C & O&M			
Sl No.	**Documents**		
1	Wage Sheet (Form 17)	YES / NO	
2	Attendance Register (w.r.t Sl No.1)	YES / NO	
3	Workman Policy & Additional Insurance (Automotive Liability, Group Serivs Insuarnce Policy et	YES / NO	
4	PF Challan	YES / NO	
5	ESI (Employee State Insurance)	YES / NO	
6	ECR (Electronic Challan Receipt)	YES / NO	
7	Bank Statement for PF deposit	YES / NO	
8	RCS (Remittance Confirmation Slip)	YES / NO	
Quality Documents (Type - B): For all MMS Civil Works			
Sl No.	**Documents**		
1	FQA (Field Quality Assuarance)	NA	
2	Field Content, Slump Test	NA	
3	Gradiation of Aggregate (10mm, 20mm)	NA	
4	Fine Aggregate Test (for Sand)	NA	
5	Cube Test Registered	NA	
6	Material Test Certificate for Steel & Cement	NA	
7	Consumption Register for Steel & Invoice	NA	
8	Pour Card for Concreting purpose	NA	
9	Royalty Reports (10mm, 20mm, Sand)	NA	
10	Sand Soundess Test Reports	NA	
11	Slump Test Register	NA	
12	Sieve Analysis, Flakiness Index, Elongation Index - Register to be maintained	NA	
13	Moisture Content Coarse and Fine Aggregate - Register to be maintained	NA	
14	Water Test Report for Concrete	NA	
15	Design Mix Report for Concrete	NA	
Quality Documents (Type - B): For all Civil related Works			
Sl No.	**Documents**		
1	FQA (Field Quality Assuarance)	YES / NO	
2	Field Content, Slump Test	YES / NO	
3	Gradiation of Aggregate (10mm, 20mm)	YES / NO	
4	Fine Aggregate Test (for Sand)	YES / NO	
5	Cube Test Registered	YES / NO	
6	Material Test Certificate for Steel & Cement	YES / NO	
7	Consumption Register for Steel & Invoice	YES / NO	
8	Pour Card for Concreting purpose	YES / NO	
9	Royalty Reports (10mm, 20mm, Sand)	YES / NO	
10	Sand Soundess Test Reports	YES / NO	
11	Warpage of Bricks Test Reports	YES / NO	
12	Core Cutting (Compaction Test) - Roads & Pathways	YES / NO	
13	Slump Test Register	YES / NO	
14	Sieve Analysis, Flakiness Index, Elongation Index - Register to be maintained	YES / NO	
15	Moisture Content Coarse and Fine Aggregate - Register to be maintained*	YES / NO	
16	Brick Test Reports	YES / NO	
17	Plastering profile and thickness	YES / NO	
18	Compaction test beneath floor of all buildings. - Reports	YES / NO	
19	Test Certificates for Paint, Glan, Glazing, etc.	YES / NO	
20	Test Certificates Aluminium Section for doors and windows (Anodisation Certificates also)	YES / NO	
21	BBS for Buildings	YES / NO	
22	Water Test Report for Concrete	YES / NO	
23	Design Mix Report for Concrete	YES / NO	
Quality Documents: for Electrical & Mechanical Installation Works (BOS)			
Sl No.	**Documents**		
1	FQA (Field Quality Assuarance)	YES / NO	
2	Inspection Reports	YES / NO	
3	Guarantee Certificates	YES / NO	
4	Factory Acceptance Test Reports	YES / NO	
5	Commissioning Reports	YES / NO	

NOTE:

*** This list of documents is indicative and intended towards all Solar Projects.**

*** Apart from the above, any other document required by the Customer and which are mandatory for Billing by BHEL to the Customer, the same needs to be provided by the respective vendors.**

ಭಾರತ್ ಹೆವಿ ಎಲೆಕ್ಟ್ರಿಕಲ್ಸ್ ಲಿಮಿಟೆಡ್
भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division
PB 2606 , Mysore Road Bangalore , 560026 INDIA

SCPV: BOS: ITB - Rev 04

INSTRUCTIONS TO BIDDERS (ITB)

Bidders are requested to read the instructions carefully and submit their quotations covering all the points:

A. GENERAL INSTRUCTIONS:

1. Any Purchase Order resulting from this enquiry shall be governed by the Instructions to Bidders (document reference: SCPV: BOS: ITB – Rev 01), General Conditions of Contract (document reference: SCPV: BOS: GCC - Rev 01) and Special Conditions of Contract (document reference: SCPV: BOS: SCC: I - Rev 01/ SCPV: BOS: SCC: F - Rev 01), if any, of the enquiry.
2. Any deviations from or additions to the "General Conditions of Contract" or "Special Conditions of Contract" require BHEL's express written consent. The general terms of business or sale of the bidder shall not apply to this tender.
3. Bidders (also includes the term suppliers / contractors wherever used in this document) are instructed to quote their most competitive price and best delivery, etc. in the offer. Prices should be indicated in both figures & words. **(Please also refer clause 11 under section B)**
4. Regret letter (either through post or by mail) indicating reasons for not quoting must be submitted without fail, in case of non-participation in this tender. If a bidder fails to respond against 3 consecutive tenders for the same item, he will be liable for removal as a registered vendor of BHEL.
5. Procurement directly from the manufacturers shall be preferred. However, if the OEM / Principal insist on engaging the services of an agent, such agent shall not be allowed to represent more than one manufacturer / supplier in the same tender. Moreover, either the agent could bid on behalf of the manufacturer / supplier or the manufacturer / supplier could bid directly but not both. In case bids are received from the manufacturer / supplier and his agent, bid received from the agent shall be ignored.
6. Consultant / firm (and any of its affiliates) shall not be eligible to participate in the tender/s for the related goods for the same project if they were engaged for consultancy services for the same project.
7. If an Indian representative / associate / liaison office quotes on behalf of a foreign based bidder, such representative shall furnish compulsorily the following documents:
   a. Authorization letter to quote and negotiate on behalf of such foreign-based bidder.
   b. Undertaking from such foreign based bidder that such contract will be honored and executed according to agreed scope of supply and commercial terms and conditions.
   c. Undertaking shall be furnished by the Indian representative stating that the co-ordination and smooth execution of the contract and settlement of shortages / damages / replacement / repair of imported scope till system is commissioned and handed over to customer will be the sole responsibility of the Indian representative / associates / agent / liaison office.
8. In case of imported scope of supply, customs clearance & customs duty payment will be to BHEL account after the consignment is received at Indian Airport / Seaport. Bidders must provide all original documents required for completing the customs clearance along with the shipment. Warehousing charges due to incomplete or missing documentation will be recovered from the supplier's bill. All offers for imported scope of supply must be made from any of the gateway ports (within the country) indicated. **(Refer Annexure I)**
9. The offers of the bidders who are on the banned list and also the offers of the bidders, who engage the services of the banned firms, shall be rejected. The list of the banned firms is available on BHEL website: **www.bhel.com.**

10. Business dealings with bidders will be suspended if they are found to have indulged in any malpractices / misconduct which are contrary to business ethics like bribery, corruption, fraud, pilferage, cartel formation, submission of fake/false/forged documents, poor quality, certificates, information to BHEL or if they tamper with tendering procedure affecting the ordering process or fail to execute a contract, or rejection of 3 consecutive supplies or if their firms / works are under strike / lockout for a long period.

B. <u>GUIDELINES FOR PREPARATION OF OFFER:</u>

1. Quotation shall be submitted in Single Part Bid, Two Part Bid or Three Part Bid, as called for in the tender:
   - **SINGLE PART BID**: Technical and Commercial Bid with prices along with price summary & filled in BHEL Standard Commercial terms and conditions in a single sealed envelope.
   - **TWO PART BID**: Unpriced offer i.e. "Techno-commercial Bid" with filled in BHEL Standard Commercial terms and conditions in a sealed envelope **along with the copy of the "Price Bid" without the prices** should be enclosed in one cover and the cover must be super scribed **"Techno-commercial offer** and Priced offer i.e. "Price Bid" containing price summary in a separate sealed envelope and must be super scribed **"Price Bid"**. Both these envelopes shall be enclosed in a single sealed envelope super scribed with enquiry number, due date of tender and any other details as called for in the tender document.
   - **THREE PART BID**: Pre-qualification Bid (Part-I), Techno Commercial Bid with filled in BHEL Standard Commercial terms and conditions (Part-II), and Price Bid (Part-III). All three envelopes shall be enclosed in a single sealed envelope super scribed with enquiry number due date of tender and any other details as called for in the tender document.

   If any of the offers (Part I, Part II or Part III) are not submitted before the due date and time of submission at the venue/place specified or if any part of the offer is incomplete the entire offer of the bidder is liable for rejection.

2. Supplier shall ensure to super scribe each envelope with RFQ number, RFQ Date, RFQ Due date and time, Item Description and Project clearly & boldly. Also mention on the envelope whether it is "Techno Commercial Bid" or "Price Bid" or "Pre-Qualification Bid". Please ensure complete address, department name and purchase executive name is mentioned on the envelope (before dropping in the tender box or handing over) so that the tender is available in time for bid opening.
3. BHEL standard Commercial Terms and Conditions shall be duly filled, signed & stamped and must accompany Technical-Commercial offer without fail and should be submitted in original only. Photocopy will not be accepted. All documents submitted along with the offer shall be signed and stamped in each page by authorized representative of the bidder.
4. Any of the terms and conditions not acceptable to supplier, shall be explicitly mentioned in the Techno-Commercial Bid. If no deviations are brought out in the offer it will be treated as if all terms and conditions of this enquiry are accepted by the supplier without any deviation.
5. Deviation to this specification / item description, if any, shall be brought out clearly indicating "DEVIATION TO BHEL SPECIFICATION" without fail, as a part of Techno-Commercial Bid. If no deviations are brought out in the offer it will be treated as if the entire specification of this enquiry is accepted without deviation.
6. Suppliers shall submit one set of original catalogue, datasheets, bill of materials, dimensional drawings, mounting details and / or any other relevant documents called in purchase specification as part of Technical Bid.
7. "Price Bid" shall be complete in all respects containing price break-up of all components along with all applicable taxes and duties, packing & forwarding charges (if applicable), freight charges (if applicable) etc. Once submitted no modification / addition / deletion will be allowed in the "Price Bid." Bidders are advised to thoroughly check the unit price, total price to avoid any discrepancy.
8. In addition, bidder shall also quote for erection & commissioning charges (I&C charges), documentation charges, service charges, testing charges (type & routine), training charges, service tax, etc. wherever applicable. The price summary must indicate all the elements clearly.
9. Vendors should indicate "lump sum" charges (including To & Fro Fare, Boarding, Lodging, Local Conveyance etc.) for Supervision of Erection, Commissioning and handing over to customer. The quotation shall clearly indicate scope of work, likely duration of commissioning, pre-commissioning checklist and service tax (if any).
10. Wherever bidders require PAC (Project Authority Certificate) for import of raw materials, components required for Mega

Power Projects, Export Projects, MNRE Concession or other similar projects wherein supplies are eligible for customs duty /Excise duty benefits, lists and quantities of such items and their values (CIF) has to be mentioned in the offer. Prices must be quoted taking into account of such benefits.

11. All quotations shall be free from corrections /overwriting. Corrections if any should be authenticated with signature and seal. Any typographical error, totalling mistakes, currency mistake, multiplication mistake, summing mistakes etc. observed in the price bids will be evaluated as per **Annexure VI** "Guidelines for dealing with Discrepancy in Words & Figures – quoted in price bid". BHEL decision will be final.

C. <u>GUIDELINES FOR OFFER SUBMISSION:</u>

1. Offers / Quotations must be dropped in tender box before 13.00 Hrs. on or before due date mentioned in RFQ. The offers are to be dropped in the proper slot of the Tender Box kept in our reception area with caption "CE, SC&PV, DEFENCE." Tenders are opened on 3 days in a week (Monday/Wednesday/Friday). Tender must be deposited in the slot corresponding to the day (Monday - Box no.4/Wednesday - Box no. 6 /Friday - Box no.8) while depositing the offer. **(This clause will not be applicable for e-tenders).**

2. E-Mail / Internet / EDI offers received in time shall be considered only when such offers are complete in all respects. In case of offers received through E-mail, please send the offer to the email IDs within time of submission of tender.
3. In cases where tender documents are bulky, or due to some reasons tender documents are required to be submitted by hand or through posts/couriers, the offers are to be handed over to purchase officers.
4. Tenders will be opened on due date, time and venue as indicated in the RFQ in the presence of bidders at the venue indicated in the RFQ. In case of e-procurement, bidders can see tender results till seven days after due date and time.
5. Vendor will be solely responsible:
   a. For submission of offers before due date and time. Offers submitted after due date and time will be treated as "Late offers" and will be rejected.
   b. For submission of offers in the correct compartment of the tender box based on the day of due date (Monday/Wednesday/Friday). Please check before dropping your offer in the correct tender box.
   c. For depositing offers in proper sealed condition in the tender box. If the bidder drops the tender in the wrong tender box or if the tender document is handed over to the wrong person BHEL will not be responsible for any such delays.
   d. For offers received through email/courier etc., suppliers are fully responsible for lack of secrecy on information and ensuring timely receipt of such offers in the tender box before due date & time.
   e. In case of e-tender, all required documents should be uploaded before due date and time. Availability of power, internet connections, etc. will be the sole responsibility of the vendor. Wherever assistance is needed for submission of e-tenders, help line numbers and executives of service provider of BHEL may be contacted.
   Service provider: e-Procurement Technologies Limited (abc Procure)
   Website address: https://bhel.abcprocure.com
   Helpline no.: +91-79-68136819/809/862/867/823/872/842 (9:30 am to 5:30 pm)
   10:00 AM - 07:00 PM (Monday - Friday)
   10:00 AM-04:00 PM (Saturday)
   Purchase Executive / BHEL will not be responsible for any of the activities relating to submission of offer.

D. <u>PROCESSING OFFERS RECEIVED:</u>

1. Any discount / revised offer submitted by the supplier on its own shall be accepted provided it is received on or before the due date and time of offer submission (i.e. Part-I bid). The discount shall be applied on pro-rata basis to all items unless specified otherwise by the bidder.
2. Changes in offers or Revised offers given after Part-I bid opening shall not be considered as a part of the original offer unless such changes / revisions are requested by BHEL.
3. In case there is no change in the technical scope and / or specifications and / or commercial terms & conditions by BHEL, the supplier will not be allowed to change any of their bids after Technical bids are opened (after the due date and time of tender opening of Part-1 Bid).

4. In case of changes in scope and/ or technical specifications and/ or commercial terms & conditions by BHEL and it accounts for price implications from vendors, all techno-commercially acceptable bidders shall be asked by BHEL (after freezing the scope, technical specifications and commercial terms & conditions) to submit the impact of such changes on their price bid. Impact price will be applicable only for changes in technical specification / commercial conditions by BHEL. The impact price must be submitted on or before the cut-off date specified by BHEL and the original price bid and the price impact bid will be opened together at the time of price bid opening. Impact price means only for those items which have been impacted by addition / deletion / changes in the technical specifications or commercial conditions. The impact may be +/- incremental value of the currency in which originally quoted. The impact price bid to be submitted on the cut-off date, time & venue as specified by BHEL. The impact price bid shall be opened along with original price bid.
5. Un-opened bids (including price bids) will be returned to the respective bidders after release of PO and receipt of order acknowledgement from the successful bidder.
6. After receipt of Purchase Order, supplier should submit required documents like drawings, bill of materials, datasheets, catalogues, quality plan, test procedure, type test report , O & M Manuals and / or any other relevant documents as per Specification / Purchase Order, as and when required by BHEL / Customer.
7. Any deviation to the terms and conditions not mentioned in the quotation by supplier in response to this enquiry will not be considered, if put forth subsequently or after issue of Purchase Order, unless clarification is sought for by BHEL EDN and agreed upon in the Purchase Order.
8. Evaluation shall be on the basis of delivered cost (i.e. "Total Cost to BHEL"). As per RFQ terms.
   "Total Cost to BHEL" shall include total basic cost, packing & forwarding charges, taxes and duties, inspection charges, freight charges, test charges, insurance, service tax for services, any other cost indicated by vendor for execution of the contract and loading factors (for non-compliance to BHEL Standard Commercial Terms & Conditions). Benefits arising out of Nil Import Duty on Mega Projects, Physical Imports or such 100% exemptions & MNRE Exemptions (statutory benefits), customer reimbursements of statutory duties (like Excise Duty, CST, VAT) will also be taken into account at the time of tender evaluation. (Wherever applicable and as indicated in SCC document of tender)
9. For evaluation of offers in foreign currency, the exchange rate (TT selling rate of SBI) shall be taken as under:

Single part bids:	Date of tender opening
Two/three part bids:	Date of Part-I bid opening
Reverse Auction:	Date of Part-I bid opening

   In case of Performance Bank Guarantee (PBG) also, exchange rate will be considered as mentioned above for converting foreign currency to Indian currency and vice versa.

   If the relevant day happens to be a bank holiday, then the exchange rate as on the previous working day of the bank (SBI) shall be taken.
10. Ranking (L-1, L-2 etc.) shall be done only for the techno-commercially acceptable offers and on the basis or evaluation of Total Cost to BHEL.

E. INFORMATION ON PAYMENT TERMS:

1. All payments will be through Electronic Fund transfer (EFT). Vendor has to furnish necessary details as per BHEL standard format **(Refer Annexure IV)** for receiving all payments through NEFT. (Applicable for Indian vendors only)
2. Statutory deductions, if any, will be made and the deduction certificate shall be issued. In case vendor does not provide PAN details, the TDS deduction shall be at the maximum percentage stipulated as per the provisions of Income Tax Act. (Applicable for Indian vendors only).Foreign vendors shall submit relevant details of their bankers like Swift Code, Banker's Name & Address etc.
3. Vendors must submit bills & invoices along with required supporting documents in time. Incomplete documentation / delayed submission of invoice / documents will result in corresponding delay in payment.

F. STANDARD PAYMENT TERMS OF BHEL-EDN

Purchase Orders for indigenous procurement

(a) SUPPLY WITH I&C/SUPERVISION:

Supply:

1) 80% of basic Supply value + 100% of taxes, duties and freight charges will be paid with 45 days credit from the receipt of material at site or 15 days credit from the date of submission of complete set of documentation whichever is later.
2) 10% of basic supply value will be paid on completion of I&C against submission of supplementary invoice along with proof of completion of I&C along with I&C charges (if any).
3) Balance 10% (retention money) against submission of supplementary invoice along with PBG valid for Warranty Period+3 months Claim Period from BHEL Consortium Bank.

I&C/Supervision*:* 100% on completion of I&C/Supervision and certification line item wise on pro-rata basis.

O&M: 100% O&M charges are payable as per RFQ terms against report certified by BHEL.

(b) SUPPLY ONLY:

1) 100% of Basic value with taxes, duties and freight will be paid with 45 days credit from the receipt of material at site or 15 days credit from the date of submission of complete set of documentation whichever is later)+ submission of PBG valid for Warranty Period+ 3 months Claim Period from BHEL Consortium Bank ,if applicable.

Purchase orders for import procurement:

(c) SUPPLY WITH I&C/SUPERVISION:

Supply:

1) 80% of the basic value (excluding I&C charges) will be paid with 45 days credit, against Sight draft, from the date of AWB/BOL on submission of complete set of documents as in PO.
2) 10% of basic supply value will be paid on completion of I&C against submission of supplementary invoice along with proof of completion of I&C along with I&C charges (if any).
3) Balance 10% (retention money) against submission of supplementary invoice along with PBG valid for Warranty Period+3 months Claim Period from BHEL Consortium Bank.

I&C: 100% on completion of I&C/Supervision and certification line item wise on pro-rata basis.

(d) SUPPLY ONLY:

1) 100% of PO value will be paid against Sight draft with 45 days Credit from the date of dispatch or 15 days credit from the date of submission of complete set of documents whichever is later)+ submission of PBG valid for Warranty Period+3 months Claim Period from BHEL Consortium Bank ,if applicable.

Note for (a), (b), (c) and (d): In exceptional cases, if vendor fails to submit PBG after supplies, vendors can also accept for the final 10% payment, payable after the warranty period + 3 months of claim period against supplementary invoice subject to the completion of commissioning (if applicable) as PBG is linked to Warranty period.

G. LOADING FACTORS FOR PAYMENT TERMS & DELAYED DELIVERY:

Loading factors as detailed below will be added to the quoted price (basic) to evaluate the lowest quote for non-compliance of BHEL standard commercial term.

Sl No	Deviation on	Nature of Deviation / Offered Terms	Loading %
1.	**Payment Terms**	**For Purchase within India :-**	
		1) Credit period less than 45 days	15
		*** For Foreign Purchase :-**	
		1) Payment through At Sight Letter of Credit	10
		2)Payment through Letter of Credit with usance credit of 45 days	5
		3) Sight Draft with credit period less than 45 days	5
2.	**Penalty for Delayed Delivery**	1) Non – Acceptance	10
		2) Partial Acceptance (X%)	(10 – X)

*** All bank charges shall be to seller's account. If bank charges of BHEL banker are to BHEL's account then additional loading of 2% on the quoted basic value is applicable.**

Offer/s with payment terms other than the standard payment terms indicated at Clause No. F or Deviated Payment Terms with loading indicated at Clause No. G above are liable for rejection.

NOTES:

1. ADVANCE PAYMENT/LC: Quotations with "Advance payment/Inland LC" shall be rejected.

2. Basic value of Purchase Order mentioned above will include all components of the purchase order and will exclude only taxes, duties, freight and I&C charges (wherever applicable).

3. Wherever the Purchase Order is split into import portion and indigenous portion of supply the retention money will be 10% (as applicable) of both purchase order values put together.

4. Non-Compliance of Warranty terms. Offers not complying with Warranty terms as per RFQ Terms is liable for rejection.

5. SALE IN TRANSIT/ LOCAL VAT: Sale in transit under section 6(2) of CST is allowed if movement of goods is interstate. In case intra state movement of goods, benefit of sale in transit is not available.

6. In case of intrastate movement i.e. supply within same state and VAT is applicable, the vendor shall furnish the respective BHEL's nodal agency TIN no. and address in their invoice. (Refer **Annexure IX**)

H. BANK GUARANTEE (BG) / PERFORMANCE BANK GUARANTEE (PBG):

1. Bank guarantee (BG) / Performance bank guarantee (PBG) will be applicable as called in the tender documents. Such PBG shall be valid for a period of Warranty Period + claim period of 3 months for a value equal to 10 % of the basic value of the purchase order. No deviation for the duration of PBG / BG will be permitted.
    a. PBG shall be from any of the BHEL consortium of bankers **(refer Annexure V)**.
    b. PBGs from nationalized banks are also acceptable.

c. PBG should be sent directly by the bank to the dealing executive mentioned in the purchase order located at the address mentioned in the purchase order. PBG should be in the format indicated. **(Refer Annexure III)**. No deviation to these formats will be allowed.

d. Confirmation from any of the BHEL consortium of banks or any of the Indian Public Sector Banks is essential for the acceptance of PBGs issued by foreign banks (located outside India).

e. Expired BGs / PBGs will be returned only after expiry of the claim period or on completion of the contractual obligation.

f. In case vendor does not accept for submission of PBG, the vendor is liable for rejection on commercial grounds.

I. DOCUMENTS (TRIPLICATE COPIES) REQUIRED AT THE TIME OF DISPATCH FOR PROCESSING OF BILL:

1. FOR INDIGENOUS SCOPE OF SUPPLY:

For Supply: Invoice in Triplicate, Lorry receipt (LR) copy, Packing List, PSI Call Letter Copy, Proof of delivery such as MRC (Material Receipt Certificate)/ original acknowledged LR, Insurance intimation Letter and Warranty Certificate. Note that document pertaining to Proof of delivery shall clearly mention number of boxes/panels etc which shall be in line with the Packing list.

For I&C: Supplementary Invoice in Triplicate with copy of I&C Certificate (Proof of Completion of I&C).

For PBG: Supplementary Invoice in Triplicate with copy of PBG. However, PBG should reach concerned Purchase Officer directly from the Bank.

2. FOR IMPORTED SCOPE OF SUPPLY:

For Supply: Invoice in Triplicate, Air Way Bill/Bill of Lading, Packing List, PSI Call Letter Copy, and Warranty Certificate.

For I&C: Supplementary Invoice in Triplicate with copy of I&C Certificate (Proof of Completion of I&C).

For PBG: Supplementary Invoice in Triplicate with copy of PBG. Both PBG & supplementary invoice should reach concerned Purchase Officer directly from the Bank.

J. PROVISONS APPLICABLE FOR MSE VENDORS (MICRO AND SMALL ENTERPRISES)

Vendors who qualify as MSE vendors are requested to submit applicable certificates (as specified by the Ministry of Micro, Small and Medium Enterprises) at the time of vendor registration. Vendors have to submit any of the following documents along with the tender documents in the Part I / Technical bid cover to avail the applicable benefits.

a. Valid NSIC certificate or

b. Entrepreneur's Memorandum part II (EM II) certificate (deemed valid for 2 years).

c. EM II certificate with CA certificate **(in the prescribed format given in Annexure VIII)** applicable for the year certifying that the investment in plant and machinery of the vendor is within permissible limits as per the MSME Act 2006 for relevant status where the deemed validity is over.

d. Documents submitted for establishing the credentials of MSE vendors must be valid as on the date of part I / technical bid opening for the vendors to be eligible for the benefits applicable for MSE vendors. Documents submitted after the Part I / Technical bid opening date will not be considered for this tender.

PURCHASE PREFERENCE FOR MSE VENDORS:

e. MSE vendors quoting within a price band of L1 + 15% shall be allowed to supply up to 25% of the requirement against this tender provided. Minimum of 3% reservation for women owned MSEs within the above mentioned 25% reservation.

1. The MSE vendor matches the L1 price.
2. L1 price is from a non MSE vendor.
3. L1 price will be offered to the nearest vendor nearest to L1 in terms of price ranking (L2 - nearest to L1). In case of non-acceptance by the MSE vendor (L2) next ranking MSE vendor will be offered who is within the L1 + 15% band (if L3 is also within 15% band).
4. 25% of the 25% (i.e. 6.25% of the total enquired quantity) will be earmarked for SC/ST owned MSE firms provided conditions as mentioned in (1) and (2) are fulfilled.
5. In case no vendor under SC / ST category firms are meeting the conditions mentioned in (1) and (2) or have not participated in the tender, in such cases the 6.25% quantity will be distributed among the other eligible MSE vendors who have participated in the tender.

6. Serial no. 1 to 5 will not be applicable wherever it is not possible to split the tendered quantity / items on account of customer contract requirement, or the items tendered are systems. Such information that tendered quantity will not be split will be indicated in the SCC.

K. INTEGRITY COMMITMENT IN THE TENDER PROCESS, AND EXECUTION OF CONTRACTS:

1. Commitment by BHEL:

BHEL commits to take all measures necessary to prevent corruption in connection with the Tender process and execution of the Contract. BHEL will, during the tender process, treat all bidder / suppliers in a transparent and fair manner, and with equity.

2. Commitment by Bidder(s)/ Contractor(s):

a. The Bidder(s)/ Contractor(s) commit(s) to take all measures to prevent corruption and will not directly or indirectly try to influence any decision or benefit which he is not legally entitled to.
b. The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any undisclosed agreement or understanding or any actions to restrict competition.
c. The Bidder(s)/ Contractor(s) will not commit any offence under the relevant Acts. The Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain or pass on to others, any information or document provided by BHEL as part of business relationship.
d. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract and shall adhere to the relevant guidelines issued from time to time by Government of India/ BHEL.

If the Bidder(s) / Contractor(s), before award or during execution of the Contract commit(s) a transgression of the above or in any other manner such as to put his reliability or credibility in question, BHEL is entitled to disqualify the Bidder(s) / Contractor (s) from the tender process or terminate the contract and/ or take suitable action as deemed fit.

L. FRAUD PREVENTION POLICY:

The bidder along with its associate/collaborators/sub-contractors/sub-vendors/consultants/service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website http://www.bhel.com and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to their notice.
Fraud Prevention policy and List of Nodal Officers shall be hosted on BHEL website, vendor portals of Units/regions intranet.

PURCHASE EXECUTIVE

ಭಾರತ್ ಹೆವಿ ಎಲೆಕ್ಟ್ರಿಕಲ್ಸ್ ಲಿಮಿಟೆಡ್
भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division
PB 2606 , Mysore Road Bangalore , 560026 INDIA

SCPV: BOS: GCC - Rev 03

GENERAL COMMERCIAL CONDITIONS FOR CONTRACT (GCC)

These 'General Commercial Conditions for Contract for Purchase' hereinafter referred to as GCC apply to all enquiries, tenders, requests for quotations, orders, contracts and agreements concerning the supply of goods and the rendering of related services (hereinafter referred to as "deliveries") to Bharat Heavy Electricals Limited and any of its units, regions or divisions (hereinafter referred to as "BHEL" or the Purchaser) or its projects / customers.

Any deviations from or additions to these GCC require BHEL's express written consent. The general terms of business or sale of the vendor shall not apply to BHEL. Acceptance, receipt of shipments or services or effecting payment shall not mean that the general terms of business or sale of the vendor have been accepted.

Orders, agreements and amendments thereto shall be binding if made or confirmed by BHEL in writing. Only the Purchasing department of BHEL is authorized to issue the Purchase Order or any amendment thereof.

Definitions: Throughout these conditions and in the specifications, the following terms shall have the meanings assigned to them, unless the subject matter or the context requires otherwise.

a) 'The Purchaser' means Bharat Heavy Electricals Limited, Electronics division, Mysore road, Bangalore 560 026, a Unit of Bharat Heavy Electricals Limited (A Govt. of India Undertaking) incorporated under the Companies Act having its registered office at BHEL House, Siri Fort, New Delhi-110049, India and shall be deemed to include its successors and assigns. It may also be referred to as BHEL.
b) 'The vendor' means the person, firm, company or organization on whom the Purchase Order is placed and shall be deemed to include the vendor's successors, representative heirs, executors and administrator as the case may be. It may also be referred to as Seller, Contractor or Supplier.
c) 'Contract' shall mean and include the Purchase Order incorporating various agreements, viz. tender/ RFQ, offer, letter of intent / acceptance / award, the General Conditions of Contract and Special Conditions of Contract for Purchase, Specifications, Inspection / Quality Plan, Schedule of Prices and Quantities, Drawings, if any enclosed or to be provided by BHEL or his authorized nominee and the samples or patterns if any to be provided under the provisions of the contract.
d) 'Parties to the Contract' shall mean the 'The Vendor' and the Purchaser as named in the main body of the Purchase Order.
e) "Bidder" shall mean duly established reputed organisation, manufacturer etc. having requisite financial and technical capability and experience of participating in the bid invited by the purchaser for the tender.
f) Bid- The term "bid" or "bidding" can also relate to the documented Offer submitted in response to a request for quotation (RFQ) /Tender.

Interpretation:

In the contract, except where the context requires otherwise:

a) words indicating one gender include all genders;
b) words indicating the singular also include the plural and words indicating the plural also include the singular;
c) provisions including the word "agree", "agreed" or "agreement" require the agreement to be recorded in writing, and
d) "Written" or "in writing" means hand-written, type-written, printed or electronically made, and resulting in a permanent record.

Applicable Conditions:

1. **Price Basis:** All prices shall be firm until the purchase order is executed / completed in all respects. No price variations / escalation shall be permitted unless otherwise such variations / escalations are provided for and agreed by BHEL in writing in the purchase order.

2. **Validity:** The offer will be valid for a period of 90 days from the date of technical bid opening date. Validity beyond 90 days, if required, will be specified in the SCC (special conditions of contract).

3. **Taxes & Duties:** Taxes as mentioned in the Contract Price or Price Schedule shall be paid to the Contractor subject to the Contractor complying with all the statutory requirements and furnishing the relevant documents including error free invoices containing detailed break-up of the taxes. Any duties, levies or taxes not mentioned in Contract Price or Price Schedule but applicable as per any statute(s) shall be deemed to be included in the Contract price and shall be to the account of the Contractor.
   The Contractor shall bear and pay all the costs, liabilities, levies, interest, penalties in respect of non-compliances of any legal requirements as per various statutory provisions. The contractor shall keep the owner indemnified at all times from any tax liability, interest, penalties or assessments that may be imposed by the statutory authorities for non-compliances or non-observation of any statutory requirements by the Contractor.

4. **Ordering and confirmation of Order:** Vendor shall send the order acceptance on their company letter head within two weeks from the date of Purchase Order or such other period as specified / agreed by BHEL. BHEL reserves the right to revoke the order placed if the order confirmation differs from the original order placed. The acceptance of goods/services/supplies by BHEL as well as payments made in this regard shall not imply acceptance of any deviations.
   The purchase order will be deemed to have been accepted if no communication to the contrary is received within two weeks (or the time limit as specified / agreed by BHEL) from the date of the purchase order.

5. **Documentation:** After receipt of Purchase Order, vendor should submit required documents like drawings, bill of materials, datasheets, catalogues, quality plan, test procedure, type test report , O & M Manuals and/or any other relevant documents as per Specification/Purchase Order, as and when required by BHEL/Customer.
   At any stage within the contract period, the vendor shall notify of any error, fault or other defect found in BHEL's documents /specifications or any other items for reference. If and to the extent that (taking account of cost and time) any vendor exercising due care would have discovered the error, fault or other defect when examining the documents/specifications before submitting the tender, the time for completion shall not be extended. However if errors, omissions, ambiguities, inconsistencies, inadequacies or other defects are found in the vendor's documents, they shall be corrected at his cost, notwithstanding any consent or approval.

6. **TERMS OF DELIVERY:**
   FOR IMPORTED PURCHASE:
   Price offered shall be for goods packed and delivered CIF Seaport/ International Airport (FCA) including packing, forwarding, Handling, Ancillary charges like processing of Sight Draft, negotiation charges of bank, Export declaration, Certificate of origin etc.
   Packing shall be Air/Sea worthy, best suitable for trans-shipment and to take care of transit damages. If containerized, no. of containers & size of container shall be mentioned. Packing weight (gross & net) Packing dimensions shall be given prior to shipment to ascertain whether the consignment can be carried on standard cargo in contract or as ODC.
   Wooden packing material for all the foreign consignments should be treated as per ISPM-15 & Fumigation / Phytosanitary certificate to be submitted to the freight forwarders/ BHEL along with the invoice, B/L, packing list etc.
   Vendors shall indicate the name of International Airport/Seaport. The consignment shall be handed over to BHEL approved freight forwarder as mentioned in PO.

FOR INDIGENOUS PURCHASE:

Equipment shall be delivered on "FOR SITE" basis, inclusive of freight, packing, insurance & forwarding charges.

Packing shall be Road / Rail / Air / Sea worthy, best suitable for transhipment and to take care of transit damages. Smaller consignments can be dispatched through Courier services/ RPP with the prior approval of the purchasing Executive.

Deviation for the delivery term is liable for rejection.

7. Penalty:

For delay in delivery: In the event of delay in agreed contractual delivery as per Purchase Order, penalty @ 0.5 % (half percent) per week or part thereof but limited to a max of 10% (ten percent) value of undelivered portion (basic material cost) will be applicable. Delivery will commence from the date of document approval by customer / BHEL or date of issue of manufacturing clearance, whichever is later. The date for which Inspection call is issued by vendor along with test certificates / test reports / Certificate of Conformance / calibration reports, as proof of completion of manufacturing will be treated as date of deemed delivery for penalty calculation. In the absence of furnishing such document indicated above as proof of completion of manufacturing along with inspection call, actual date of inspection will be considered as date of deemed delivery and BHEL will not be responsible for delay in actual date of inspection.

Penalty for delayed delivery, if applicable, shall be deducted at the time of first payment. If penalty is applicable for duration of less than a week, penalty @ 0.5% (half percent) of the basic material value will be deducted.

8. **Contract variations (Increase or decrease in the scope of supply):** BHEL may vary the contracted scope as per requirements at site. If vendor is of the opinion that the variation has an effect on the agreed price or delivery period, BHEL shall be informed of this immediately in writing along with technical details. Where unit rates are available in the Contract, the same shall be applied to such additional work. Vendor shall not perform additional work before BHEL has issued written instructions / amendment to the Purchase Order to that effect. The work which the vendor should have or could have anticipated in terms of delivering the service(s) and functionality (i.e.) as described in this agreement, or which is considered to be the result of an attributable error on the vendor's part, shall not be considered additional work.

9. **Reverse Auction:** BHEL reserves the right to go for Reverse Auction (RA) (Guidelines as available on www.bhel.com) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. Bidders to give their acceptance with the offer for participation in RA. Non-acceptance to participate in RA may result in non- consideration of their bids, in case BHEL decides to go for RA.

Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit 'Process compliance form' (to the designated service provider) as well as 'Online sealed bid' in the Reverse Auction. Non-submission of 'Process compliance form' or 'Online sealed bid' by the agreed bidder(s) will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).

The bidders have to necessarily submit online sealed bid less than or equal to their envelope sealed price bid already submitted to BHEL along with the offer. The envelope sealed price bid of successful L1 bidder in RA, if conducted, shall also be opened after RA and the order will be placed on lower of the two bids (RA closing price & envelope sealed price) thus obtained. The bidder having submitted this offer specifically agrees to this condition and undertakes to execute the contract on thus awarded rates.

If it is found that L1 bidder has quoted higher in online sealed bid in comparison to envelope sealed bid for any item(s), the bidder will be issued a warning letter to this effect. However, if the same bidder again defaults on this count in any subsequent tender in the unit, it will be considered as fraud and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).

10. **Pre Shipment Inspection:** Prior written notice of at least one week shall be given along with internal test certificates / COC and applicable test certificates. Materials will be inspected by BHEL-EDN-QS/CQS or BHEL nominated Third Party Inspection Agency (TPIA) or BHEL authorized Inspection Agency or Customer / Consultant or jointly by BHEL & Customer / consultant. All tests have to be conducted as applicable in line with approved Quality plan or QA Checklist or Purchase specification and original reports shall be furnished to BHEL-EDN, Bangalore for verification / acceptance for issue of dispatch clearance.
    All costs related to inspections & re-inspections shall be borne by vendor. Whether the Contract provides for tests on the premises of the vendor or any of his Sub-contractor/s, vendor shall be responsible to provide such assistance, labour, materials, electricity, fuels, stores, apparatus, instruments as may be required and as may be reasonably demanded to carry out such tests efficiently. Cost of any type test or such other special tests shall be borne by BHEL only if specifically agreed to in the purchase order.

11. **Transit Insurance:** Transit insurance coverage between vendor's works and project site shall be to the account of BHEL, unless specifically agreed otherwise. However, vendor shall send intimation directly to insurance agency through fax/courier/e-mail, immediately on dispatch of goods for covering insurance. A copy of such intimation sent by vendor to insurance agency shall be given to BHEL along with dispatch documents. Dispatch documents will be treated as incomplete without such intimation copy. BHEL shall not be responsible for sending intimations to insurance agency on behalf of the vendor.

12. **Packaging and dispatch:** The Seller shall package the goods safely and carefully and pack them suitably in all respects considering the peculiarity of the material for normal safe transport by Sea / Air / Rail / Road to its destination suitably protected against loss, damage, corrosion in transit and the effect of tropical salt laden atmosphere. The packages shall be provided with fixtures / hooks and sling marks as may be required for easy and safe handling. If any consignment needs special handling instruction, the same shall be clearly marked with standard symbols / instructions. Hazardous material should be notified as such and their packing, transportation and other protection must conform to relevant regulations.
    The packing, shipping, storage and processing of the goods must comply with the prevailing legislation and regulations concerning safety, the environment and working conditions. Any Imported/Physical Exports items packed with raw / solid wood packing material should be treated as per ISPM – 15 (fumigation) and accompanied by Phytosanitory / Fumigation certificate. If safety information sheets (MSDS – Material Safety Data Sheet) exist for an item or the packaging, vendor must provide this information without fail along with the consignment.
    Each package must be marked with Consignee name, Purchase order number, Package number, Gross weight and net weight, dimensions (L x B x H) and Seller's name. Packing list of goods inside each package with PO item number and quantity must also be fixed securely outside the box to indicate the contents of each box. Total number of packages in the consignment must also be indicated.
    Separate packing & identification of items should be as follows.
    1. Main Scope - All items must be tagged with part no. & item description.
    2. Commissioning spares - All items must be tagged with part no. & item description.
    3. Mandatory spares - All items must be tagged with part no. & item description.

13. **Assignment of Rights & Obligations; Subcontracting:** Vendor is not permitted to subcontract the delivery or any part thereof to third party or to assign the rights and obligations resulting from this agreement in whole or in part to third parties without prior written permission from BHEL. Any permission or approval given by the BHEL shall, however, not absolve the vendor of the responsibility of his obligations under the Contract.

14. **Progress report:** Vendor shall render such report as to the progress of work and in such form as may be called for by the concerned purchase officer from time to time. The submission and acceptance of such reports shall not prejudice the rights of BHEL in any manner.

15. **Non-disclosure and Information Obligations: Vendor** shall provide with all necessary information pertaining to the goods as it could be of importance to BHEL. Vendor shall not reveal confidential information that may be divulged by BHEL to Vendor's employees not involved with the tender/ contract & its execution and delivery or to third parties, unless BHEL has agreed to this in writing beforehand. Vendor shall not be entitled to use the BHEL name in advertisements and other commercial publications without prior written permission from BHEL.

16. **Cancellation / Termination of contract:** BHEL shall have the right to completely or partially terminate the agreement by means of written notice to that effect. Termination of the Contract, for whatever reason, shall be without prejudice to the rights of the parties accrued under the Contract up to the time of termination.
    BHEL shall have the right to cancel/foreclose the Order/ Contract, wholly or in part, in case it is constrained to do so, on account of any decline, diminution, curtailment or stoppage of the business.

17. **Risk Purchase Clause:** In case of failure of supplier, BHEL at its discretion may make purchase of the materials / services NOT supplied / rendered in time at the RISK & COST of the supplier. Under such situation, the supplier who fails to supply the goods in time shall be wholly liable to make good to BHEL any loss due to risk purchase.
    In case of items demanding services at site like erection and commissioning, vendor should send his servicemen /representatives within 7 days from the service call. In case a vendor fails to attend to the service call, BHEL at its discretion may also make arrangements to attend such service by other parties at the **RISK & COST** of the supplier. Under such situation the supplier who fails to attend the service shall be wholly liable to make good to BHEL any loss due to risk purchase / service including additional handling charges due to the change.

18. **Shortages:** In the event of shortage on receipt of goods and/or on opening of packages at site, all such shortages shall be made good within a reasonable time that BHEL may allow from such intimation and free of cost.
    Transit Damages: In the event of receipt of goods in damaged condition or having found them so upon opening of packages at site, Supplier shall make good of all such damages within a reasonable time from such intimation by BHEL.

19. **Remedial work:** Notwithstanding any previous test or certification, BHEL may instruct the vendor to remove and replace materials/goods or remove and re-execute works/services which are not in accordance with the purchase order. Similarly BHEL may ask the vendor to supply materials or to execute any services which are urgently required for any safety reasons, whether arising out of or because of an accident, unforeseeable event or otherwise. In such an event, Vendor shall provide such services within a reasonable time as specified by BHEL.

20. **Indemnity Clause:** Vendor shall comply with all applicable safety regulations and take care for the safety of all persons involved. Vendor is fully responsible for the safety of its personnel or that of his subcontractor's men / property, during execution of the Purchase Order and related services. All statutory payments including PF, ESI or other related charges have to be borne by the vendor. Vendor is fully responsible for ensuring that all legal compliances are followed in course of such employment.

21. **Product Information, Drawings and Documents:** Drawings, technical documents or other technical information received by Vendor from BHEL or vice versa shall not, without the consent of the other party, be used for any other purpose than that for which they were provided. They may not, without the consent of the Disclosing party, otherwise be used or copied, reproduced, transmitted or communicated to third parties. All information and data contained in general product documentation, whether in electronic or any other form, are binding only to the extent that they are by reference expressly included in the contract.
    Vendor, as per agreed date/s but not later than the date of delivery, provide free of charge information and drawings which are necessary to permit and enable BHEL to erect, commission, operate and maintain the product. Such information and drawings shall be supplied in as many numbers of copies as may be agreed upon.
    All intellectual properties, including designs, drawings and product information etc. exchanged during the

formation and execution of the Contract shall continue to be the property of the disclosing party.

22. **Intellectual Property Rights, Licenses:** If any Patent, design, Trade mark or any other intellectual property rights apply to the delivery (goods / related service) or accompanying documentation shall be the exclusive property of the Vendor and BHEL shall be entitled to the legal use thereof free of charge by means of a non-exclusive, worldwide, perpetual license. All intellectual property rights that arise during the execution of the Purchase Order/ contract for delivery by vendor and/or by its employees or third parties involved by the vendor for performance of the agreement shall belong to BHEL. Vendor shall perform everything necessary to obtain or establish the above mentioned rights. The Vendor guarantees that the delivery does not infringe on any of the intellectual property rights of third parties. The Vendor shall do everything necessary to obtain or establish the alternate acceptable arrangement pending resolution of any (alleged) claims by third parties. The Vendor shall indemnify BHEL against any (alleged) claims by third parties in this regard and shall reimburse BHEL for any damages suffered as a result thereof.

23. **Force Majeure:** Notwithstanding anything contained in the purchase order or any other document relevant thereto, neither party shall be liable for any failure or delay in performance to the extent said failures or delays are caused by the "Act of God" and occurring without its fault or negligence, provided that, force majeure will apply only if the failure to perform could not be avoided by the exercise of due care and vendor doing everything reasonably possible to resume its performance.
A party affected by an event of force majeure which may include fire, tempest, floods, earthquake, riot, war, damage by aircraft etc., shall give the other party written notice, with full details as soon as possible and in any event not later than seven (7) calendar days of the occurrence of the cause relied upon. If force majeure applies, dates by which performance obligations are scheduled to be met will be extended for a period of time equal to the time lost due to any delay so caused.

    Notwithstanding above provisions, in an event of Force Majeure, BHEL reserves for itself the right to cancel the order/ contract, wholly or partly, in order to meet the overall project schedule and make alternative arrangements for completion of deliveries and other schedules.

24. **Guarantee / Warranty:** Wherever required, and so provided in the specifications / Purchaser Order, the Seller shall guarantee that the stores supplied shall comply with the specifications laid down, for materials, workmanship and performance. The guarantee / warranty period as described shall apply afresh to replaced, repaired or re-executed parts of a delivery. If the vendor fails to take proper corrective action to repair/replace defects satisfactorily within a reasonable period, Purchaser shall be free to take corrective action as may be deemed necessary at vendor's risk and cost after giving notice to the vendor, including arranging supply of goods from elsewhere at the sole risk and cost of the vendor. Unless otherwise specifically provided in the Purchase Order, Vendor's liability shall be co terminus with the expiration of the applicable guarantee / warranty period.

25. **Limitation of Liability:** Vendor's liability towards this contract is limited to a maximum of 100% of the contract value and consequential damages are excluded. However the limits of liability will have no effect in cases of criminal negligence or wilful misconduct.
The total liability of Vendor for all claims arising out of or relating to the performance or breach of the Contract or use of any Products or Services or any order shall not exceed the total Contract price.

26. **Liability during guarantee / warranty:** Vendor shall arrange replacement / repair of all the defective materials / services under its obligation under the guarantee / warranty period. The rejected goods shall be taken away by vendor and replaced / repaired. In the event of the vendor's failure to comply, BHEL may take appropriate action including disposal of rejections and replenishment by any other sources at the cost and risk of the vendor.
In case, defects attributable to vendor are detected during first time commissioning or use, vendor shall be responsible for replacement / repair of the goods as required by BHEL at vendor's cost. In all such cases expiry of guarantee / warranty will not be applicable.

27. **Liability after guarantee / warranty period:** At the end of the guarantee / warranty, the Vendor's liability ceases except for latent defects (latent defects are defects / performance issues notices after the

guarantee / warranty has expired). The Contractor's liability for latent defects warranty for the plant and equipment including spares shall be limited to a period of six months from the end of the guarantee / as specified in RFQ.

28. **Compliance with Laws:** Vendor shall, in performing the contract, comply with all applicable laws. The vendor shall make all remittances, give all notices, pay all taxes, duties and fees, and obtain all permits, licences and approvals, as required by the laws in relation to the execution and completion of the contract and for remedying of any defects; and the Contractor shall indemnify and hold BHEL harmless against and from the consequences of any failure to do so.

29. **Settlement of Disputes:** Except as otherwise specifically provided in the Purchase Order, decision of BHEL shall be binding on the vendor with respect to all questions relating to the interpretation or meaning of the terms and conditions and instructions herein before mentioned and as to the completion of supplies/work/services, other questions, claim, right, matter or things whatsoever in any way arising out of or relating to the contract, instructions, orders or these conditions or otherwise concerning the supply or the execution or failure to execute the order, whether arising during the schedule of supply/work or after the completion or abandonment thereof. Any disputes or differences among the parties shall to the extent possible be settled amicably between the parties thereto, failing which the disputed issues shall be settled through arbitration. Vendor shall continue to perform the contract, pending settlement of dispute(s).

30. **Arbitration Clause:** In case amicable settlement is not reached in the event of any dispute or difference arising out of the execution of the Contract or the respective rights and liabilities of the parties or in relation to interpretation of any provision in any manner touching upon the Contract, such dispute or difference shall (except as to any matters, the decision of which is specifically provided for therein) be referred by either party to the sole arbitration of an Arbitrator appointed by the Executive Director/ General Manager of the purchasing unit/ region/ division of BHEL. Vendor shall have no objection even if the Arbitrator so appointed is an employee of BHEL or has ever dealt/ had to deal with any matter relating to this Contract.
    Subject as aforesaid the provisions of the Arbitration and Conciliation Act, 1996 of India or any statutory modification or re-enactment thereof and the rules made there under and for the time being in force shall apply to the arbitration proceedings under this clause. It is a term of contract that the party initiating arbitration shall specify the dispute or disputes to be referred to arbitration under this clause together with the amount or amounts claimed in respect of each such dispute. The venue for the arbitration shall be Bangalore, India. The award of the arbitrator shall be a speaking award and shall be final, conclusive and binding on all parties to this contract.
    The cost of arbitration shall be borne equally by the parties. Notwithstanding the existence of any dispute or difference or any reference for the arbitration, the vendor shall proceed with and continue without hindrance the performance of the work under the contract with due diligence and expedition in a professional manner.

31. **Applicable Laws and Jurisdiction of Courts:** Prevailing Indian laws both substantive and procedural, including modifications thereto, shall govern the Contract. Subject to the conditions as aforesaid, the competent courts in BANGALORE alone shall have jurisdiction to consider over any matters touching upon this contract.

32. **General Terms:** That any non-exercise, forbearance or omission of any of the powers conferred on BHEL and /or any of its authorities will not in any manner constitute waiver of the conditions hereto contained in these presents.
    That the headings used in this agreement are for convenience of reference only.
    That all notices etc., to be given under the Purchase order shall be in writing, type script or printed and if sent by registered post or by courier service to the address given in this document shall be deemed to have been served on the date when in the ordinary course, they would have been delivered to the addressee.

33. Vendors shall provide their state wise list of GSTIN number as per Govt of India Statute.

34. If the vendor is below the threshold limit, viz Rs.20. lacs as per existing provisions, then a declaration to be provided to that effect along with copy of accounts, failing which the supplier will be treated as an Unregistered dealer (URD) for which tax is payable on reverse charge (RCM) by BHEL.
35. If the vendor is above the threshold limit & is yet not registered, GST is payable by BHEL on reverse charge basis.
36. All supply items are linked to HSN code (Harmonised System Nomenclature). This goods list is mapped with HSN code which is released by Govt of India & available in public domain. All registered suppliers submitting the quote shall mandatorily mention HSN code relevant for the goods quoted.
37. Under GST, Govt of India has linked every service to a service accounting code called SAC. The list of services and the corresponding service accounting code (SAC) is released by Govt of India & available in public domain. All registered suppliers submitting the quote shall mandatorily mention SAC code relevant for the service quoted.
38. The rate of tax applicable for 35 services is also released by Government and rate for any service not falling in the list of 35 services is 18% .
39. Invoice should contain all particulars as per invoice Rules and should include the GST registration number (GSTIN) , service accounting code (SAC) apart from all other details mentioned.
40. Invoice should contain all particulars as per invoice Rules and should include the GST registration number (GSTIN) , HSN code apart from all other details mentioned.
41. In case GST is payable on reverse charge (RCM) invoice should mention that tax is payable on reverse charge
42. For a registered supplier, the supplier uploaded sales data for the month will be available to recipient on 11th of the subsequent month & details can be verified by BHEL. Credit availment can be confirmed based on this verified data
43. If the Supplier is not registered, then tax is payable on Reverse charge & will be to the account of the supplier
44. All services in the course of business or furtherance of business are eligible to credit subject to other compliances listed herein.
45. If service is eligible for credit, then the credit can be availed only if the invoice is as per the prescribed format, the supplier has uploaded the invoice in the GSTN portal, paid the taxes & uploaded the return, and matches with our inward data, failing which any availment of credit attracts interest.
46. Even in case of services where credit is not eligible,

    (i) either the supplier should have registered (if above threshold limit) & comply with all above statutory provisions relating to invoice, tax remittance, return filing etc. This can be verified by BHEL from the GSTN portal OR
    (ii) if not registered BHEL shall be liable to pay applicable taxes on reverse charge

47. For any deficiency in services, where a recovery is made / adjusted in supplier bills, the supplier has to raise a credit note on BHEL & upload in GSTN portal. All above rules applicable for invoice also apply for credit note.
48. All notifications and rules as per central board of excise and customs will be applicable.

ANNEXURE - I

LIST OF INTERNATIONAL GATEWAY AIRPORTS

SCHEDULE NO	COUNTRY	CURRENCY CODE	AIRPORT
D01	UK	GBP	LONDON (HEATHROW)
D02	UK	GBP	NEW CASTLE
D03	UK	GBP	OXFORD. CHETLAM
D04	UK	GBP	BRISTOL. WELLINGBOROUGH
D05	UK	GBP	BIRMINGHAM
DO6	UK	GBP	EAST MIDLANDS
D07	UK	GBP	MANCHESTER
D08	UK	GBP	LEEDS
D09	UK	GBP	GLASGOW
D10	FRANCE	EURO	PARIS (ROISSY) & LYON
D11	SWEDEN	EURO	STOCKHOLM
D12	SWEDEN	EURO	GOTHENBERG & MALMO
D13	ITALY	EURO	ROMA, MILAN
D14	ITALY	EURO	TURIN, BOLOGNA, FLORENCE
D15	NETHERLANDS	EURO	AMSTERDAM, ROTTERDAM
D16	AUSTRIA	EURO	VIENNA, LINZ, GRAZ
D17	BELGIUM	EURO	ANTWERP, BRUSSELS
D18	DENMARK	DKK	COPENHAGEN
D19	JAPAN	JPY	TOKYO, OSAKA
D20	SINGAPORE	SGD	SINGAPORE
D21	CANADA	CAD	TORONTO
D22	CANADA	CAD	MONTREAL
D23	USA	USD	NEW YORK, BOSTON
D24	USA	USD	CHICAGO
D25	USA	USD	SAN FRANCISCO, LOS ANGELES
D26	USA	USD	ALANTA, HOUSTON
D27	GERMANY	EURO	MUNICH, KOLN, DUSSELDORF, HANNOVER, HAMBURG, STUTTGART, DAMSTADT, MANIHIEM, NURUMBERG
D28	GERMANY	EURO	FRANKFURT
D29	GERMANY	EURO	BERLIN
D30	SWITZERLAND	SFR	BASLE, ZURICH, GENEVA
D31	SPAIN	EURO	BARCELONA
D32	AUSTRALIA	AUD	SYDNEY
D33	AUSTRALIA	AUD	MELBOURNE
D34	AUSTRALIA	AUD	PERTH
D35	CZECH	EURO	PRAGUE
D36	HONG KONG	HKD	HONG KONG
D37	NEW ZELAND	NZD	AUCKLAND
D38	RUSSIA	USD	MOSCOW
D39	SOUTH KOREA	USD	KIMPO INTERNATIONAL, INCHEON
D40	FINLAND	EURO	HELSINKI
D41	ROMANIA	EURO	BUCHAREST
D42	NORWAY	EURO	OSLO
D43	IRELAND	EURO	DUBLIN
D44	ISRAEL	USD	TEL AVIV
D45	UAE	USD	DUBAI
D46	OMAN	USD	MUSCAT
D47	EGYPT	USD	CAIRO
D48	TAIWAN	USD	TAIPEI
D49	UKRAINE	USD	KIEV
D50	CHINA	USD	SHANGHAI, SHENZHEN
D51	PHILIPINES	USD	MANILA
D52	MALAYSIA	USD	KUALALUMPUR, PE NANG
D53	CYPRUS	USD	LARNACA
D54	SOUTH AFRICA	USD	JOHANNESBERG, DURBAN
D55	SLOVAKIA	EURO	BARTISLOVA
D56	SAUDI ARABIA	SAR	RIYADH
D57	TURKEY	EURO	ISTANBUL
D58	THAILAND	USD	BANGKOK
D59	BRAZIL	USD	SAO PAULO, RIO DE JANEIRO

ANNEXURE - II

REQUEST FOR C FORM

NAME OF VENDOR :

VENDOR CODE ALLOTED BY BHEL :

E mail id for c form correspondence :

BHEL PO NO	INVOICE NO	INVOICE DATE	INVOICE AMOUNT	SUPPLY FROM - STATE	SUPPLY TO - STATE	CST TIN NUMBER (SUPPLIER)	INVOICE AMOUNT EXCLUDING FREIGHT	C FORM QTR	YEAR	SUPPLY TO BHEL EDN / SITE

Please note that one 'C' form will be issued for a quarter.

Any modification and cancellation of c form is not possible from our end since it is generated online therefore include all invoices pertaining to quarter in your request
Also check the data are correct in all respect

General Instruction:
1. C form request should be given only in this file.
2. Amount should be 100% of Invoice value but should Not include freight, Insurance etc.
3. PO No. should be numeric, starting with 4 and has 10 digits
4. For every quarter separate file to be provided
5. All Invoices pertaining to the relevant quarter to be included.
6. No corrections will be entertained once c-form is issued.

ANNEXURE D

BANK GUARANTEE FOR PERFORMANCE SECURITY

Bank Guarantee No:

Date:

To

NAME

& ADDRESSES OF THE BENEFICIARY

Dear Sirs,

In consideration of Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at _____[1] through its Unit até é é é é é ..(name of the Unit) having awarded to (Name of the Vendor / Contractor / Supplier) with its registered office at_____[2] hereinafter referred to as the ' Vendor / Contractor / Supplier ', which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), a contract Ref Noé é é é é é é dated é é é é é é é é é é é é é .[3] valued at Rsé é é é [4] (Rupees ----------)/FCé é é é é é (in wordsé é é ..) for é é é é é é é é é é [5] (hereinafter called the 'Contract') and the Vendor / Contractor / Supplier having agreed to provide a Contract Performance Bank Guarantee, equivalent to é é % (é . Percent) of the said value of the Contract to the Employer for the faithful performance of the Contract,

we, é é é é é é é , (hereinafter referred to as the Bank), having registered/Head office at é é é é é . and inter alia a branch at é é é é being the Guarantor under this Guarantee, hereby, irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer any sum or sums upto a maximum amount of Rs ---------- [6] (Rupees ----------) without any demur, immediately on first demand from the Employer and without any reservation, protest, and recourse and without the Employer needing to prove or demonstrate reasons for its such demand.

Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Vendor / Contractor / Supplier in any suit or proceeding pending before any Court or Tribunal, Arbitrator or any other authority, our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment thereunder and the Vendor / Contractor / Supplier shall have no claim against us for making such payment.

We the é é é é é é é é bank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract/satisfactory completion of the performance guarantee period as per the terms of the Contract and that it shall continue to be enforceable till

all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied or discharged.

We é é é é é ..BANK further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Vendor / Contractor / Supplier from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Vendor / Contractor / Supplier and to forbear or enforce any of the terms and conditions relating to the said Contract and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Vendor / Contractor / Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Vendor / Contractor / Supplier or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Vendor / Contractor / Supplier and notwithstanding any security or other guarantee that the Employer may have in relation to the Vendor / Contractor / Supplier 's liabilities.

This Guarantee shall remain in force upto and includingé é é é é é é é é é .. [7] and shall be extended from time to time for such period as may be desired by Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Vendor / Contractor / Supplier but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof.

Unless a demand or claim under this guarantee is made on us in writing on or before the é é é é é é é é é é é .[8]we shall be discharged from all liabilities under this guarantee thereafter.

We, é é é é é é BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

a) The liability of the Bank under this Guarantee shall not exceedé é é é é é é é é [6]
b) This Guarantee shall be valid up to é é é é é é [7]
c) Unless the Bank is served a written claim or demand on or before _____[8] all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

For and on behalf of
(Name of the Bank)

Datedé é é é é é .

Place of Issueé é é é é é .

[1] NAME AND ADDRESS OF EMPLOYER I.e Bharat Heavy Electricals Limited

[2] NAME AND ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.

[3] DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE

[4] CONTRACT VALUE

[5] PROJECT/SUPPLY DETAILS
[6] BG AMOUNT IN FIGURES AND WORDS

[7] VALIDITY DATE

[8] DATE OF EXPIRY OF CLAIM PERIOD

Note:

1. Units are advised that expiry of claim period may be kept 3-6 months after validity date. It may be ensured that the same is in line with the agreement/ contract entered with the Vendor.

2. The BG should be on Non-Judicial Stamp paper/e-stamp paper of appropriate value as per Stamp Act prevailing in the State(s) where the BG is submitted or is to be acted upon or the rate prevailing in the State where the BG was executed, whichever is higher. The Stamp Paper/e-stamp paper shall be purchased in the name of Vendor/Contractor/Supplier /Bank issuing the guarantee.

3. In line with the GCC, SCC or contractual terms, Unit may carry out minor modifications in the Standard BG Formats. If required, such modifications may be carried out after taking up appropriately with the Unit/Regionôs Law Deptt.

4. **In Case of Bank Guarantees submitted by Foreign Vendors-**

   a. **From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)** can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.

   b. **From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)**

      b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bankôs (BHELôs Consortium Bank) branch in India. It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.

      b.2 **In case, Foreign Vendors intend to provide BG from** Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.

      b.3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). The BG Format provided to them should clearly specify the same.

ANNEXURE - IV

Electronic Funds Transfer (EFT) OR
Paylink Direct Credit Form

Please Fill up the form in **CAPITAL LETTERS** only.
TYPE OF REQUEST(Tick one): _____ CREATE _____ CHANGE

BHEL Vendor / Supplier Code:
Company Name :
Permanent Account Number(PAN):
Address

City: _____ PINCODE _____ STATE _____

Contact Person(s)
Telephone No:
Fax No:
e-mail id:

1 Bank Name:
2 Bank Address:
3 Bank Telephone No:
4 Bank Account No:
5 Account Type: Savings/Cash Credit
6 9 Digit Code Number of Bank and branch appearing on MICR cheque issued by Bank
7 Bank swift Code(applicable for EFT only)
8 Bank IFSC code(applicable for RTGS)
9 Bank IFSC code(applicable for NEFT)

A I hereby certify that the particulars given above are true, correct and complete and that I, as a representative for the above named Company, hereby authorise BHEL, EDN, Bangalore to electronically deposit payments to the designated bank account.

B If the transaction is delayed or not effected at all for reasons of incomplete or incorrect information, I would not hold BHEL / transfering Bank responsible.

C This authority remains in full force until BHEL, EDN,Bangalore receives written notification requesting a change or cancellation.

D I have read the contents of the covering letter and agree to discharge the resposibility expected of me as a participant under ECS / EFT.

Date:

Authorised Signatory:
Designation: Telephone NO. with STD Code

Company Seal

Bank Certificate

We certify that_____has an Account No_____ with us and we confirm that the bank details given above are correct as per our records.

Date: (……..)
Place: Signature

Please return completed form along with a blank cancelled cheque or photocopy thereof to:
Bharath Heavy Electricals Ltd,
Attn:
Electronics Division, Mysore Road,
BANGALORE - 560 026
In case of any Querry, please call : 080-26998xxx / 2674xxxx or fax no. 080-2674xxxx

ANNEXURE-V

BHEL MEMBER BANKS (LIST OF CONSORTIUM BANKS)

BANK GUARANTEE (BG) SHALL BE ISSUED FROM THE FOLLOWING BANKS ONLY:

	Nationalised Banks		**Nationalised Banks**
1	Allahabad Bank	19	Vijaya Bank
2	Andhra Bank		**Public Sector Banks**
3	Bank of Baroda	20	IDBI
4	Canara Bank		**Foreign Banks**
5	Corporation Bank	21	CITI Bank N.A
6	Central Bank	22	Deutsche Bank AG
7	Indian Bank	23	The Hongkong and Shanghai Banking Corporation Ltd. (HSBC)
8	Indian Overseas Bank	24	Standard Chartered Bank
9	Oriental Bank of Commerce		
10	Punjab National Bank	26	J P Morgan
11	Punjab & Sindh Bank		**Private Banks**
12	State Bank of India	27	Axis Bank
13	State Bank of Hyderabad	28	The Federal Bank Limited
14	Syndicate Bank	29	HDFC Bank
15	State Bank of Travancore	30	Kotak Mahindra Bank Ltd
16	UCO Bank	31	ICICI Bank
17	Union Bank of India	32	IndusInd Bank
18	United Bank of India	33	Yes Bank

Note:

- All BGs must be issued from BHEL consortium banks listed above.
- BHEL may accept BG from other Nationalised Banks also which are not listed above.
- BG will not be accepted from Scheduled Banks and Co-operative Banks.
- In case BG is issued from a bank located outside Indian territory and is issued in foreign currency, the BG must be routed through and confirmed by any one of the above mentioned consortium banks or any of the Indian Public Sector Banks.
- This list is subject to changes. Hence vendors are requested to check this list every time before issuing BGs.

ANNEXURE - VI

DISCREPANCY IN WORDS & FIGURES – QUOTED IN PRICE BID

Following guidelines will be followed in case of discrepancy in words & figures-quoted in price bid:

(a) If, in the price structure quoted for the required goods/services/works, there is discrepancybetween the unit price and the total price (which is obtained by multiplying the unit price by thequantity), the unit price shall prevail and the total price corrected accordingly, unless in theopinion of the purchaser there is an obvious misplacement of the decimal point in the unit price,in which case the total price as quoted shall govern and the unit price corrected accordingly.

(b) If there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and

(c) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a) and (b) above.

(d) If there is such discrepancy in an offer, the same shall be conveyed to the bidder with target date upto which the bidder has to send his acceptance on the above lines and if the bidder does not agree to the decision of the purchaser, the bid is liable to be ignored.

ANNEXURE - VII

BENEFITS FOR MSE SUPPLIERS AS PER MSMED ACT 2006 AND PUBLIC PROCUREMENT POLICY 2012

MSE suppliers can avail the intended benefits only if they submit along with the offer, attested copies of either EM II certificate having deemed validity (five years from the date of issue of Acknowledgement in EM II).

Or

Valid NSIC certificate or EM II certificate along with attested copy of CA certificate (Format enclosed: ANNEXURE VIII) where deemed validity of EM II certificate of five years has expired) applicable for the relevant financial year (latest audited).

Date to be reckoned for determining the deemed validity will be the date of bid opening (Part 1 in case of two part bid).

Non-submission of such documents will lead to consideration of their bid at par with other bidders.

No benefit shall be applicable for this enquiry if any deficiency in the above required documents are not submitted before price bid opening. If the tender is to be submitted through e-procurement portal, then the above required documents are to be uploaded on the portal. Documents should be notarized or attested by a Gazette officer.

ANNEXURE - VIII

CERTIFICATE BY CHARTERED ACCOUNTANT ON LETTER HEAD

This is to certify that M/s …….……
…… ……..(Hereinafter referred to as `Company') having its registered office at …….. is registered under MSMED Act 2006, (Entrepreneur Memorandum No ((Part-II) …… dtd …… Category: …… (Micro/Small). (Copy enclosed).

Further verified from the Books of Accounts that the investment of the company as per the latest audited financial year **…….. as per MSMED Act 2006 is as follows:**
1. For Manufacturing Enterprises: Investment in plant and machinery (i.e., original cost excluding land and building and the items specified by the Ministry of Small Industries vide its notification No.S.O.1722 (E) dated October 5, 2006:
Rs. ……..Lacs.

2. For Service Enterprises: Investment in equipment (original cost excluding land and building and furniture, fittings and other items not directly related to the service rendered or as may be notified under the MSMED Act, 2006:
Rs. ……..Lacs.

The above investment of Rs. …… Lacs in within permissible limit of Rs…… Lacs for……..Micro / Small (Strike off which is not applicable) Category under MSMED Act 2006.

(or)

The company has been graduated from its original category (Micro/Small) (Strike off which is not applicable) and the date of graduation of such enterprise from its original category is ……(dd/mm/yy) which is within the period of 3 years from the date of graduation of such enterprise from its original category as notified vide S.O.No.3322(E) dated 01.11.2013 published in the gazette notification dated 04.11.2013 by Ministry of MSME.

Date:
(Signature)
Name -
Membership Number -

Seal of Chartered Accountant

ANNEXURE - IX

In case of intrastate movement i.e. supply within same state and VAT is applicable, the vendor shall furnish the respective BHEL™s nodal agency TIN no. and address in their invoice.

List of Statewise Nodal Officers with Contact Details

Region	State	Nodal Unit responsible for all other units except those in column 4	Contact Details-Landline No.	E-mail	TIN No.	CST No.
1	2	3		7	8	9
Norther States	Jammu & Kashmir	PSNR	0120-2510488/2416452	rahulb@bhelpsnr.co.in / a.chadha@bhelpsnr.co.in	01291101313	
	Himachal Pradesh	PSNR			02011000622	
	Punjab	PSNR			03451148722	
	Haryana	PSNR			06962606884	
	Rajasthan	PSNR			08232903345	
	Uttar Pradesh	PSNR	0120-2416536	rahulb@bhelpsnr.co.in / smittal@bhelpsnr.co.in	09365800914	
	Uttarakhand	Hardwar	01334-285449	alok@bhelhwr.co.in	05001757277 Dated 30th Sep 2005	5000030 Dated 13/03/1965
	Delhi	TBG	0120-6748429	skjindal@bhel.in	07472001760	07472001760
Western States	Madhya Pradesh	Bhopal	0755-2503231	meeta@bhelbpl.co.in	23573600001 (HEL/05/01/0001/S dated 15/11/1979 under MPCT)	HEL/05/01/0004/C dated 15/11/1979
	Chattisgarh	PSWR	0712-3048609	mgupta@bhelpswr.co.in	22173202974	
	Gujarat	PSWR	0265-2370321	bhavin@bhelpswr.co.in	24190101571	
	Maharashtra	ROD Mumbai	022-22126061/22187850	mahajani@bhel.in	27060300130V	27060300130C
	Daman & Diu	EDN	080-26998724 / 26998830	theerthagiri@bheledn.co.in	25000009902	
Southern States	Orissa	PSSR	044-28286773	sparida@bhelpssr.co.in , lakshmi@bhelpssr.co.in	21031301916	
	Tamil Nadu	Trichy	0431-2577757/ 2577229	msrao@bheltry.co.in /bharaths@bheltry.co.in	33243560005	239383 dt.11.6.91
	Kerala	PSSR	044-28286773	lakshmi@bhelpssr.co.in	32072043622	
	Karnataka	EDN	080-26998724 / 26998830	theerthagiri@bheledn.co.in	29180069268	00850081
	Telangana	HPEP RC, Puram	040-23185406/ 040-23182238	chand@bhelhyd.co.in sbsv@bhelhyd.co.in	36360151179	
	Andhra Pradesh	HPVP, Vizag	0891-6681298	sarmaass@bhpvl.com	37418632431	
	Puducherry	PSSR				
Eastern States	West Bengal	PSER	033-23216130-3238	amitavac@bhelpser.co.in	19200936019	19200936213
	Bihar	PSER	0612-2231275	rakesh@bhelpser.co.in	10010994046	10010994046
	Jharkhand	PSER	06549-266351(Sh. Parmanand Swaroop)/06534-292179 (Sh. K.K. Ajeet)	pswaroop@bhelpser.co.in (Bokaro) kk.ajit@bhelpser.co.in (Koderma/Abhijeet/North Karanpura) manishk.jain@bhelpser.co.in (Chandrapura)/kpsubbu@bhelpser.co.in kpsubbu@bhelpser.co.in	20352205642 (Bokaro) 20082005255 (Maithon) 20512405410 (Koderma) 20122200394 (Chandrapura) 20620905730(Adhunik) 20650507026(Abhijeet) 20452110016 (North Karanpura)	TG-729(C)
	Mizoram	PSER	033-23216130-3249	anindya@bhelpser.co.in	15501465017	
	Arunachal Pradesh	PSER	033-23216130-3249	anindya@bhelpser.co.in	12020122182	Not Applied
	Assam	PSER	033-23216130-3249	anindya@bhelpser.co.in	18790101415	18179903204
	Tripura	PSER	03821-265209	mkmahato@bhelpser.co.in	16060947071	16060947273
	Sikkim	PSER				
	Meghalaya	PSER				
	Manipur	PSER				
	Nagaland	PSER				

Public Procurement (Preference to Make in India)

"For this procurement, Public Procurement (Preference to Make in India),Order 2017 dated 15.06.2017 & 28.05.2018 and subsequent orders issued by the respective Nodal Ministry shall be applicable even if issued after issue of this NIT but before finalization of contract/PO/WO against this NIT.

In the event of any Nodal Ministry prescribing higher or lower percentage of purchase preference and /or local content in respect of this procurement, same shall be applicable."

Arbitration Clause in case of Contract with contractors/vendors /consultants other than Public Sector Enterprise (PSE) or a Government Department:

ARBITRATION & CONCILIATION

The parties shall attempt to settle any disputes or difference arising out of the formation, breach, termination, validity or execution of the Contract; or, the respective rights and liabilities of the parties; or, in relation to interpretation of any provision of the Contract; or, in any manner touching upon the Contract, or in connection with this contract through friendly discussions. In case no amicable settlement can be reached between the parties through such discussions, in respect of any dispute; then, either Party may, by a notice in writing to the other Party refer such dispute or difference to the sole arbitration of an arbitrator appointed by Head of the BHEL – EDN. Such Sole Arbitrator appointed, shall conduct the arbitration in English language.

The Arbitrator shall pass a reasoned award and the award of the Arbitration shall be final and binding upon the Parties.

Subject as aforesaid, the provisions of Arbitration and Conciliation Act 1996 (India) or statutory modifications or re-enactments thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceedings under this clause. The seat of arbitration shall be Bangalore.

The cost of arbitration shall be borne as decided by the Arbitrator upon him entering the reference.

Subject to the Arbitration Clause as above, the Courts at Bangalore alone shall have exclusive jurisdiction over any matter arising out of or in connection with this Contract.

Notwithstanding the existence or any dispute or differences and/or reference for the arbitration, the parties shall proceed with and continue without hindrance the performance of its obligations under this Contract with due diligence and efficiency in a professional manner except where the Contract has been terminated by either Party in terms of this Contract.

Arbitration Clause in case of Contract with contractors/vendors /consultants when they are a Public Sector Enterprise (PSE) or a Government Department:

In the event of any dispute or difference relating to the interpretation and application of the provisions of the Contract, such dispute or difference shall be referred by either party for Arbitration to the Sole Arbitrator in the Department of Public Enterprises to be nominated by the Secretary to the Government of India in-charge of the Department of Public Enterprises. The Arbitration and Conciliation Act, 1996 shall not be applicable to arbitration under this clause. The award of the Arbitrator shall be binding upon the parties to the dispute, provided, however, any Party aggrieved by such Award may make further reference for setting aside or revision of the Award to the Law Secretary, Department of Legal Affairs, Ministry of Law and Justice, Government of India. Upon such reference the dispute shall be decided by the Law Secretary or the Special Secretary or Additional Secretary when so authorized by the Law Secretary, whose decision shall bind the Parties hereto finally and conclusively. The Parties to the dispute will share equally the cost of arbitration as intimated by the Arbitrator.''

INTEGRITY PACT

Between

Bharat Heavy Electricals Ltd. (BHEL), a company registered under the Companies Act 1956 and having its registered office at "BHEL House", Siri Fort, New Delhi – 110049 (India) hereinafter referred to as "The Principal", which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the ONE PART

and

_____, (description of the party along with address), hereinafter referred to as "The Bidder/ Contractor" which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the OTHER PART

Preamble

The Principal intends to award, under laid-down organizational procedures, contract/s for _____

_____

_____. The Principal values full compliance with all relevant laws of the land, rules and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ Contractor(s).

In order to achieve these goals, the Principal will appoint Independent External Monitor(s), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1 – Commitments of the Principal

1.1 The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles:-

1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

1.1.2 The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.

1.1.3 The Principal will exclude from the process all known prejudiced persons.

1.2 If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Indian Penal Code 1860 and Prevention of Corruption Act 1988 or any other statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions.

Section 2 – Commitments of the Bidder(s)/ Contractor(s)

2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.

2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he / she is not legally entitled to, in

order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

2.1.2 The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.

2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant IPC/ PC Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

2.1.4 The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

2.2 The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

Section 3 – Disqualification from tender process and exclusion from future contracts

If the Bidder(s)/ Contractor(s), before award or during execution has committed a transgression through a violation of Section 2 above, or acts in any other manner such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidders(s)/ Contractor(s) from the tender process or take action as per the separate “Guidelines for Suspension of Business Dealings with Suppliers/ Contractors” framed by the Principal.

Section 4 – Compensation for Damages

4.1 If the Principal has disqualified the Bidder(s) from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Earnest Money Deposit/ Bid Security.

4.2 If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to section 3, the Principal shall be entitled to demand and recover from the Contractor liquidated damages equivalent to 5% of the contract value or the amount equivalent to Security Deposit/Performance Bank Guarantee, whichever is higher.

Section 5 – Previous Transgression

5.1 The Bidder declares that no previous transgressions occurred in the last 3 years with any other company in any country conforming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.

5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Section 6 – Equal treatment of all Bidders/ Contractors/ Sub-contractors

6.1 The Bidder(s)/ Contractor(s) undertake(s) to demand from his sub-contractors a commitment consistent with this Integrity Pact. This commitment shall be taken only from those sub-contractors whose contract value is more than 20% of Bidder's/ Contractor's contract value with the Principal.

6.2 The Principal will enter into agreements with identical conditions as this one with all Bidders and Contractors.

6.3 The Principal will disqualify from the tender process all bidders who do not sign this pact or violate its provisions.

Section 7 – Criminal Charges against violating Bidders/ Contractors /Sub-contractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section 8 –Independent External Monitor(s)

8.1 The Principal appoints competent and credible Independent External Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.

8.2 The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.

8.3 The Bidder(s)/ Contractor(s) accepts that the Monitor has the right to access without restriction to all contract documentation of the Principal including that provided by the Bidder(s)/ Contractor(s). The Bidder(s)/ Contractor(s) will grant the monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his contract documentation. The same is applicable to Sub-contractor(s). The Monitor is under contractual obligation to treat the information and documents of the Bidder(s)/ Contractor(s) / Sub-contractor(s) with confidentiality.

8.4 The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.

8.5 As soon as the Monitor notices, or believes to notice, a violation of this agreement, he will so inform the Management of the Principal and request the Management to discontinue or

take corrective action, or heal the situation, or to take other relevant action. The Monitor can in this regard submit non-binding recommendations. Beyond this, the Monitor has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action.

8.6 The Monitor will submit a written report to the CMD, BHEL within 8 to 10 weeks from the date of reference or intimation to him by the Principal and, should the occasion arise, submit proposals for correcting problematic situations.

8.7 The CMD, BHEL shall decide the compensation to be paid to the Monitor and its terms and conditions.

8.8 If the Monitor has reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant IPC / PC Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

8.9 The number of Independent External Monitor(s) shall be decided by the CMD, BHEL.

8.10 The word ‘Monitor’ would include both singular and plural.

Section 9 – Pact Duration

9.1 This Pact begins when both parties have legally signed it. It expires for the Contractor 12 months after the last payment under the respective contract and for all other Bidders 6 months after the contract has been awarded.

9.2 If any claim is made / lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified as above, unless it is discharged/ determined by the CMD, BHEL.

Section 10 – Other Provisions

10.1 This agreement is subject to Indian Laws and jurisdiction shall be registered office of the Principal, i.e. New Delhi.

10.2 Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.

10.3 If the Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.

10.4 Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

10.5 Only those bidders/ contractors who have entered into this agreement with the Principal would be competent to participate in the bidding. In other words, entering into this agreement would be a preliminary qualification.

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For & On behalf of the Principal	For & On behalf of the Bidder/ Contractor
(Office Seal)	(Office Seal)

Place----------

Date----------

Witness: _____	Witness: _____
(Name & Address) _____	(Name & Address)_____
_____	_____

Certificate by statutory auditor or cost auditor of the company (in the case of companies)

or

from a practicing cost account or the practicing charted accountant (in respect of supplies other than companies) on their letter head

In line with Government Public Procurement Order No. P-45021/2/2017-BE-II dt. 15.06.2017 & P-45021/2/2017-PP (BE-II) dated 28.05.2018, we hereby certify that

……

(supplier name) are local supplier meeting requirement of minimum local content (50%) defined in as above orders for the material against Enquiry No.

SPKSCPV031 dtd. 24.05.2019 for supply, I&C and O&M for BOS and Transmission line of for 10 MW SPV Project, STPP, Pegadapally, SCCL Telangana.

Details of location at which local value addition will be made is as follows:

……

……

……

We also understand, false declarations will be in breach of the Code of Integrity under Rule 175(1)(i)(h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151 (iii) of the General Financial Rules along with such other actions as may be permissible under law.

Seal and Signature of Authorized signatory with date

No. P-45021/2/2017-PP (BE-II)
Government of India
Ministry of Commerce and Industry
Department of Industrial Policy and Promotion
(Public Procurement Section)
****

Dated 28th May, 2018
Udyog Bhawan, New Delhi

To
All Central Ministries/Departments/CPSUs/All concerned

ORDER

Subject: Public Procurement (Preference to Make in India), Order 2017 – Revision; regarding.

Department of Industrial Policy and Promotion, in partial modification of Order No.P-45021/2/2017-B.E.-II dated 15.6.2017, hereby issues the revised 'Public Procurement (Preference to Make in India), Order 2017" with immediate effect:-

Whereas it is the policy of the Government of India to encourage 'Make in India' and promote manufacturing and production of goods and services in India with a view to enhancing income and employment, and

Whereas procurement by the Government is substantial in amount and can contribute towards this policy objective, and

Whereas local content can be increased through partnerships, cooperation with local companies, establishing production units in India or Joint Ventures (JV) with Indian suppliers, increasing the participation of local employees in services and training them,

Now therefore the following Order is issued :

1. This Order is issued pursuant to Rule 153 (iii) of the General Financial Rules 2017.
2. **Definitions**: For the purposes of this Order:

   'Local content' means the amount of value added in India which shall, unless otherwise prescribed by the Nodal Ministry, be the total value of the item procured (excluding net domestic indirect taxes) minus the value of imported content in the item (including all customs duties) as a proportion of the total value, in percent.

   'Local supplier' means a supplier or service provider whose product or service offered for procurement meets the minimum local content as prescribed under this Order or by the competent Ministries / Departments in pursuance of this order.

   'L1' means the lowest tender or lowest bid or the lowest quotation received in a tender, bidding process or other procurement solicitation as adjudged in the evaluation process as per the tender or other procurement solicitation.

   'margin of purchase preference' means the maximum extent to which the price quoted by a local supplier may be above the L1 for the purpose of purchase preference.

.....Contd. p/2

'Nodal Ministry' means the Ministry or Department identified pursuant to this order in respect of a particular item of goods or services or works.

'Procuring entity' means a Ministry or department or attached or subordinate office of, or autonomous body controlled by, the Government of India and includes Government companies as defined in the Companies Act.

'Works' means all works as per Rule 130 of GFR- 2017, and will also include *'turnkey works'.*

3. **Requirement of Purchase Preference :** Subject to the provisions of this Order and to any specific instructions issued by the Nodal Ministry or in pursuance of this Order, purchase preference shall be given to local suppliers in all procurements undertaken by procuring entities in the manner specified hereunder"

a. "In procurement of goods, services or works in respect of which the Nodal Ministry has communicated that there is sufficient local capacity and local competition, and where the estimated value of procurement is Rs. 50 lakhs or less, only local suppliers shall be eligible. If the estimated value of procurement of such goods or services or works is more than Rs. 50 lakhs, the provisions of sub-paragraph b or c, as the case may be, shall apply";

b. "In the procurements of goods or works which are not covered by paragraph 3a and which are divisible in nature, the following procedure shall be followed";

   i. Among all qualified bids, the lowest bid will be termed as L1. If L1 is from a local supplier, the contract for full quantity will be awarded to L1.

   ii. If L1 bid is not from a local supplier, 50% of the order quantity shall be awarded to L1. Thereafter, the lowest bidder among the local suppliers, will be invited to match the L1 price for the remaining 50% quantity subject to the local supplier's quoted price falling within the margin of purchase preference, and contract for that quantity shall be awarded to such local supplier subject to matching the L1 price. In case such lowest eligible local supplier fails to match the L1 price or accepts less than the offered quantity, the next higher local supplier within the margin of purchase preference shall be invited to match the L1 price for remaining quantity and so on, and contract shall be awarded accordingly. In case some quantity is still left uncovered on local suppliers, then such balance quantity may also be ordered on the L1 bidder.

c. "In procurements of goods or works not covered by sub-paragraph 3a and which are not divisible, and in procurement of services where the bid is evaluated on price alone, the following procedure shall be followed":-

   i. Among all qualified bids, the lowest bid will be termed as L1. If L1 is from a local supplier, the contract will be awarded to L1.

.....Contd. p/3

ii. If L1 is not from a local supplier, the lowest bidder among the local suppliers, will be invited to match the L1 price subject to local supplier's quoted price falling within the margin of purchase preference, and the contract shall be awarded to such local supplier subject to matching the L1 price.

iii. In case such lowest eligible local supplier fails to match the L1 price, the local supplier with the next higher bid within the margin of purchase preference shall be invited to match the L1 price and so on and contract shall be awarded accordingly. In case none of the local suppliers within the margin of purchase preference matches the L1 price, then the contract may be awarded to the L1 bidder.

4. **Exemption of small purchases**: Notwithstanding anything contained in paragraph 3, procurements where the estimated value to be procured is less than Rs. 5 lakhs shall be exempt from this Order. However, it shall be ensured by procuring entities that procurement is not split for the purpose of avoiding the provisions of this Order.

5. **Minimum local content**: The minimum local content shall ordinarily be 50%. The Nodal Ministry may prescribe a higher or lower percentage in respect of any particular item and may also prescribe the manner of calculation of local content.

6. **Margin of Purchase Preference**: The margin of purchase preference shall be 20% .

7. **Requirement for specification in advance**: The minimum local content, the margin of purchase preference and the procedure for preference to Make in India shall be specified in the notice inviting tenders or other form of procurement solicitation and shall not be varied during a particular procurement transaction.

8. **Government E-marketplace**: In respect of procurement through the Government E-marketplace (GeM) shall, as far as possible, specifically mark the items which meet the minimum local content while registering the item for display, and shall, wherever feasible, make provision for automated comparison with purchase preference and without purchase preference and for obtaining consent of the local supplier in those cases where purchase preference is to be exercised.

9. **Verification of local content**:

   a. The local supplier at the time of tender, bidding or solicitation shall be required to provide self-certification that the item offered meets the minimum local content and shall give details of the location(s) at which the local value addition is made.

   b. In cases of procurement for a value in excess of Rs. 10 crores, the local supplier shall be required to provide a certificate from the statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content.

   c. Decisions on complaints relating to implementation of this Order shall be taken by the competent authority which is empowered to look into procurement-related complaints relating to the procuring entity.

.....Contd. p/4

d. Nodal Ministries may constitute committees with internal and external experts for independent verification of self-declarations and auditor's/ accountant's certificates on random basis and in the case of complaints.

e. Nodal Ministries and procuring entities may prescribe fees for such complaints.

f. False declarations will be in breach of the Code of Integrity under Rule 175(1)(i)(h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151 (iii) of the General Financial Rules along with such other actions as may be permissible under law.

g. A supplier who has been debarred by any procuring entity for violation of this Order shall not be eligible for preference under this Order for procurement by any other procuring entity for the duration of the debarment. The debarment for such other procuring entities shall take effect prospectively from the date on which it comes to the notice of other procurement entities, in the manner prescribed under paragraph 9h below.

h. The Department of Expenditure shall issue suitable instructions for the effective and smooth operation of this process, so that:

   i. The fact and duration of debarment for violation of this Order by any procuring entity are promptly brought to the notice of the Member-Convenor of the Standing Committee and the Department of Expenditure through the concerned Ministry /Department or in some other manner;

   ii. on a periodical basis such cases are consolidated and a centralized list or decentralized lists of such suppliers with the period of debarment is maintained and displayed on website(s);

   iii. in respect of procuring entities other than the one which has carried out the debarment, the debarment takes effect prospectively from the date of uploading on the website(s) in the such a manner that ongoing procurements are not disrupted.

10. **Specifications in Tenders and other procurement solicitations**:

a. Every procuring entity shall ensure that the eligibility conditions in respect of previous experience fixed in any tender or solicitation do not require proof of supply in other countries or proof of exports.

b. Procuring entities shall endeavour to see that eligibility conditions, including on matters like turnover, production capability and financial strength do not result in unreasonable exclusion of local suppliers who would otherwise be eligible, beyond what is essential for ensuring quality or creditworthiness of the supplier.

c. Procuring entities shall, within 2 months of the issue of this Order review all existing eligibility norms and conditions with reference to sub-paragraphs 'a' and 'b' above.

d. If a Nodal Ministry is satisfied that Indian suppliers of an item are not allowed to participate and/ or compete in procurement by any foreign government, it may, if it deems appropriate, restrict or exclude bidders from that country from eligibility for procurement of that item and/ or other items relating to that Nodal Ministry. A copy of every instruction or decision taken in this regard shall be sent to the Chairman of the Standing Committee.

.....Contd. p/5

e. For the purpose of sub-paragraph 10 d above, a supplier or bidder shall be considered to be from a country if (i) the entity is incorporated in that country, or ii) a majority of its shareholding or effective control of the entity is exercised from that country; or (iii) more that 50% of the value of the item being supplied has been added in that country. Indian suppliers shall mean those entities which meet any of these tests with respect to India."

11. **Assessment of supply base by Nodal Ministries**: The Nodal Ministry shall keep in view the domestic manufacturing / supply base and assess the available capacity and the extent of local competition while identifying items and prescribing minimum local content or the manner of its calculation, with a view to avoiding cost increase from the operation of this Order.

12. **Increase in minimum local content**: The Nodal Ministry may annually review the local content requirements with a view to increasing them, subject to availability of sufficient local competition with adequate quality.

13. **Manufacture under license/ technology collaboration agreements with phased indigenization**: While notifying the minimum local content, Nodal Ministries may make special provisions for exempting suppliers from meeting the stipulated local content if the product is being manufactured in India under a license from a foreign manufacturer who holds intellectual property rights and where there is a technology collaboration agreement / transfer of technology agreement for indigenous manufacture of a product developed abroad with clear phasing of increase in local content.

14. **Powers to grant exemption and to reduce minimum local content**: Ministries /Departments of Government of India and the Boards of Directors of Government companies or autonomous bodies may, by written order,

    a. reduce the minimum local content below the prescribed level;

    b. reduce the margin of purchase preference below 20% ;

    c. exempt any particular item or procuring or supplying entities or class or classes of items or procuring or supplying entities from the operation of this Order or any part of the Order.

    A copy of every such order shall be marked to the Member-Convenor of the Standing Committee constituted under this Order.

15. **Directions to Government companies**: In respect of Government companies and other procuring entities not governed by the General Financial Rules, the administrative Ministry or Department shall issue policy directions requiring compliance with this Order.

16. **Standing Committee**: A standing committee is hereby constituted with the following membership:

    Secretary, Department of Industrial Policy and Promotion—Chairman
    Secretary, Commerce—Member
    Secretary, Ministry of Electronics and Information Technology—Member
    Joint Secretary (Public Procurement), Department of Expenditure—Member
    Joint Secretary (DIPP)—Member-Convenor

.....Contd. p/6

The Secretary of the Department concerned with a particular item shall be a member in respect of issues relating to such item. The Chairman of the Committee may co-opt technical experts as relevant to any issue or class of issues under its consideration.

17. **Functions of the Standing Committee**: The Standing Committee shall meet as often as necessary but not less than once in six months. The Committee

    a. shall oversee the implementation of this order and issues arising therefrom, and make recommendations to Nodal Ministries and procuring entities.

    b. shall annually assess and periodically monitor compliance with this Order

    c. shall identify Nodal Ministries and the allocation of items among them for issue of notifications on minimum local content

    d. may require furnishing of details or returns regarding compliance with this Order and related matters

    e. may, during the annual review or otherwise, assess issues, if any, where it is felt that the manner of implementation of the order results in any restrictive practices, cartelization or increase in public expenditure and suggest remedial measures

    f. may examine cases covered by paragraph 13 above relating to manufacture under license/ technology transfer agreements with a view to satisfying itself that adequate mechanisms exist for enforcement of such agreements and for attaining the underlying objective of progressive indigenization

    g. may consider any other issue relating to this Order which may arise.

18. **Removal of difficulties**: Ministries /Departments and the Boards of Directors of Government companies may issue such clarifications and instructions as may be necessary for the removal of any difficulties arising in the implementation of this Order.

19. **Ministries having existing policies**: Where any Ministry or Department has its own policy for preference to local content approved by the Cabinet after 1st January 2015, such policies will prevail over the provisions of this Order. All other existing orders on preference to local content shall be reviewed by the Nodal Ministries and revised as needed to conform to this Order, within two months of the issue of this Order.

20. **Transitional provision**: This Order shall not apply to any tender or procurement for which notice inviting tender or other form of procurement solicitation has been issued before the issue of this Order.

(B. S. Nayak)
Under Secretary to Government of India
Ph. 23061257

Guidelines for Reverse Auction - 2016

Issued on 26.09.2016

(Applicable for all NITs issued on or after 26.11.2016)

(AA:SSP:RA:03)

Sourcing Strategy & Policy

Corporate Operations Management

BHEL, New Delhi

(Note: Abridged version for the information of the bidders)

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1.0 Scope

This document describes the guidelines to be followed by each Unit/ Division/ Region for conducting reverse auction for procurement of material/ services/ works. These guidelines will be applicable for all purchases/ contracts to be awarded under extant policy and the Reverse Auction shall follow the philosophy of English Reverse (No ties).

English Reverse (No ties) is a type of auction where the starting price and bid decrement are announced before start of online reverse auction. The interested bidders can thereupon start bidding in an iterative process wherein the lowest bidder at any given moment can be displaced by an even lower bid of a competing bidder, within a given time frame. The bidding is with reference to the current lowest bid in the reverse auction. All bidders will see the current lowest quoted price and their rank. The term 'No ties' is used since more than one bidder cannot give an identical price, at a given instant, during the reverse auction. In other words, there shall never be a tie in the bids.

2.0 Intent of Reverse Auction (RA)

To derive maximum benefit in cost savings through competitive bidding.

3.0 Terms in NIT

Wherever it is felt that procurement may be done through Reverse Auction, the bids shall be invited in two parts/ three parts or single part bid (Price Bid) where Techno-Commercial MoU already exists. Wherever, the evaluation is done for individual line item, separate envelope sealed price bid for each line item shall be taken.

Decision to go for RA would be taken after evaluation of techno-commercial bids. The NIT would contain following **clause**:

"*BHEL reserves the right to go for Reverse Auction (RA) (Guidelines as available on www.bhel.com) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. Bidders to give their acceptance with the offer for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case BHEL decides to go for RA.*

Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit 'Process compliance form' (to the designated service provider) as well as 'Online sealed bid' in the Reverse Auction. Non-submission of 'Process compliance form' or 'Online sealed bid' by the agreed bidder(s) will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).

The bidders have to necessarily submit online sealed bid less than or equal to their envelope sealed price bid already submitted to BHEL along with the offer. ***The envelope sealed price bid of successful L1 bidder in RA, if conducted,***

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shall also be opened after RA and the order will be placed on lower of the two bids (RA closing price envelope sealed price) thus obtained. The bidder having submitted this offer specifically agrees to this condition and undertakes to execute the contract on thus awarded rates.

If it is found that L1 bidder has quoted higher in online sealed bid in comparison to envelope sealed bid for any item(s), the bidder will be issued a warning letter to this effect. However, if the same bidder again defaults on this count in any subsequent tender in the unit, it will be considered as fraud and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com)."

As a reminder to the bidders, system will flash following message (in RED Color) during the course of 'online sealed bid':

"Bidders to submit online sealed bid less than or equal to their envelope sealed bid already submitted to BHEL"

6.0 Business rules for RA

Business rules (annexure-I) are attached.

7.0 Role of Service Provider

- Acknowledge the receipt of mandate from BHEL.
- Contact the bidders, provide business rules and train them, as required.
- Get the process compliance form signed by all the participating bidders before RA event.
- Conduct the event as per the contract and business rules.
- Submit the login reports, results, history sheet and authorized final bid from the bidders.
- To obtain price breakup including that of line items (wherever required) from successful bidder and submit the same to BHEL.

8.0 Receipt of Techno-Commercial Bids & Evaluation

Suppliers are required to submit their best price bid in a separate sealed cover along with techno-commercial bid. After evaluation of Techno-Commercial Bids:

a) In case BHEL decides not to conduct RA, the envelope sealed price bids of all techno-commercially qualified bidders, along with price impact, if any, should be opened and processed as per extant Policy.

b) In case BHEL decides to conduct RA, business rules of RA will be sent to service provider.

12.0 Reverse Auction Process

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12.1 Reverse auction process is deemed to have been started upon receipt of 'Online Sealed Bids' from the bidders within the prescribed time frame as per Business Rules. After receipt of 'online sealed bids', start price & bid decrement will be decided by BHEL and the same shall be communicated to the service provider, to start the bidding process. Only those bidders who have submitted the 'online sealed bid' within the scheduled time shall be eligible to participate further in RA process. However, the H1 bidder (whose quote is highest in online sealed bid) will not be allowed to participate in further RA process provided minimum three bidders are left after removal of H1 bidder.

In case of tie for H1 bid (identical online sealed bids), 15 minutes additional time shall be provided and all the participating bidders shall be informed by mail/ message on bidding screen to enable bidders submit revised online sealed bids so as to break the tie.

12.2 All bidders who had given online sealed bid will see their rank and L1 price and their ranking L1, L2 etc. would be based on their last quoted price irrespective of quote received in RA or online sealed bid.

13.0 Failure of RA

RA shall be treated as failed in the following scenarios:

a) In case no bidder accepts the start price.

b) In cases where the number of online sealed bids are less than four before removal of highest bidder.

c) In cases of tie among H1 bidders, even after extension of submission of online sealed bids once by 15 minutes.

Wherever, the evaluation is done for individual line items, RA shall be treated as failed only for those line item(s) for which any of the above a), b) or c) satisfies.

14.0 Treatment of RA failed scenarios:

In cases of failure of RA, sealed envelope price bids (of item(s) for which RA has failed) of all the techno-commercially qualified bidders shall be opened and the tender shall be processed accordingly. However, the envelope sealed bid(s) of techno-commercially acceptable bidder(s) who had agreed to participate in the RA and had failed to submit the online sealed bid shall not be opened.

15.0 Processing of case after RA

15.1 After declaring L1 upon completion of RA, the envelope sealed price bid of L1 bidder shall also be opened for placement of order on lower of the two bids (RA closing price & envelope sealed price) and file is to be processed as per extant policy provisions. Action as per NIT terms is to be taken if online sealed bid is higher than the envelope sealed bid.

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15.2 Relative position of bidders (for usage in cases of predefined splitting the quantities) shall also include bidders who have given 'online sealed bids' but have not given further bids in auction. In case of splitting requirement, H1 bidder may also be considered for counter offer if the pre-stated (NIT) numbers of suppliers do not accept the counter offer.

15.3 In case H1 bidder happen to be MSE and was removed from further bidding but is within L1 + 15% band, then this bid shall also be considered and to be processed in line with 'Public Procurement Policy for Micro & Small Enterprises (MSEs) order, 2012'.

15.4 For providing preference to Domestically manufactured Electronic Products, in accordance with Department of Electronics and Information Technology (DeitY) Gazette Notification No. 33(3)/2013-IPHW dated 23.12.2013 and its related notifications issued from time to time, H1 bidder removed from further bidding may be considered for counter offer to meet domestic bidder requirement for the item(s) under procurement.

17.0 Processing of cases where RA is not done

In case BHEL decides not to go for Reverse Auction for the tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL's standard practice.

18.0 Others

18.2 In case of enquiry through e-Procurement, the sealed electronic price bid (e-bid) is to be treated as sealed envelope price bid.

18.3 BHEL will inform bidders the details of service provider who will provide business rules, all necessary training and assistance before commencement of online bidding on internet.

18.4 Bidders are advised to read the 'Business Rules' indicating details of RA event carefully, provided by the Service provider, before reverse auction event.

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Annexure – I

Business Rules for Reverse Auction

This has reference to tender no **{tender number….date…}**. BHEL shall finalise the Rates for the supply of {item name} through Reverse Auction mode. BHEL has made arrangement with M/s. {Service provider}, who shall be BHEL's authorized service provider for the same. Bidders should go through the instructions given below and submit acceptance of the same.

The technical & commercial terms are as per (a) BHEL Tender Enq. No. {...} dated {...}, (b) Bidders' technical & commercial bid (in case of two part bid) and (c) subsequent correspondences between BHEL and the bidders, if any.

1. Procedure of Reverse Auctioning

i. **Online Sealed Bid:** This duration of online sealed bid will be {…} minutes. All bidders to submit their online sealed bids during this period.

ii. Online Reverse Auction: The 'opening price' i.e. start price for RA and 'bid decrement' will be decided by BHEL.

iii. If BHEL decides the lowest online sealed bid as the starting price, then the lowest bidder in online sealed bid shall be shown as current L1 automatically by the system and no acceptance of that price is required. System shall have the provision to indicate this bid as current L1.

iv. Bidders by offering a minimum bid decrement or the multiples thereof can displace a standing lowest bid and become "L1" and this continues as an iterative process.

v. After the completion of the online reverse auction, the Closing Price (CP) shall be available for further processing.

2. Schedule for Reverse Auction: The Reverse Auction is tentatively scheduled on {date}: and the duration of online sealed bid will be {…} minutes. All bidders to submit their online sealed bids during this period.

- Online Sealed Bid:-

• *{Start Time:*

• *Close Time: }*

- Online Reverse Auction:-

• *{Start Time:*

• *Close Time:}*

3. Auction extension time: If a bidder places a bid in the last {…} minutes of closing of the Reverse Auction and if that bid gets accepted, then the auction's duration shall get extended automatically for another {…} minutes, for the entire auction (i.e. for all the items in the auction), from the time that bid comes in. Please note

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that the auto-extension will take place only if a bid comes in those last {…} minutes and if that bid gets accepted as the lowest bid. If the bid does not get accepted as the lowest bid, the auto-extension will not take place even if that bid might have come in the last {…} minutes. In case, there is no bid in the last {…} minutes of closing of Reverse Auction, the auction shall get closed automatically without any extension. However, bidders are advised not to wait till the last minute or last few seconds to enter their bid during the auto-extension period to avoid complications related with internet connectivity, network problems, system crash down, power failure, etc.

The above process will continue till completion of Reverse Auction. Complaints/ Grievances, if any, regarding denial of service or any related issue should be given in writing thru e-mail/ fax to M/s. {Service provider} with a copy to BHEL within 15 minutes prior to initial closing time of Online Reverse Auction.

4. **Bid price:** The Bidder has to quote the {……} Price inclusive of Packing & Forwarding charges, all the routine & type tests as per tender scope, ED + cess, CST against C-form, Freight (bidder to provide original Freight paid receipt), insurance charges, etc. including loading (if indicated by BHEL due to deviations in technical/ commercial terms) for the Items specified. Details are as shown in Excel Sheet for calculation of total cost to BHEL (To be specified by Unit as per NIT conditions).

5. **Bidding currency and unit of measurement:** Bidding will be conducted in *Indian Rupees per Unit* of the material as per the specifications {...} In case of foreign currency bids, exchange rate (TT selling rate of State Bank of India) as on scheduled date of tender opening (Part-I bid) shall be considered for conversion in Indian Rupees. If the relevant day happens to be a Bank holiday, then the forex rate as on the previous bank (SBI) working day shall be taken.

6. **Validity of bids:** Price shall be valid for {… *days*} from the date of reverse auction. These shall not be subjected to any change whatsoever.

7. **Lowest bid of a bidder:** In case the bidder submits more than one bid, the lowest bid at the end of Online Reverse Auction will be considered as the bidder's final offer to execute the work.

8. Bidders shall be assigned a **Unique User Name** & **Password** by M/s. *{Service provider}*. Bidders are advised to change the Password and edit the information in the Registration Page after the receipt of initial Password from M/s. *{Service provider}* to ensure confidentiality. All bids made from the Login ID given to the bidders will be deemed to have been made by the bidders/ bidders' company.

9. **Post auction procedure:** BHEL will proceed with the Lowest Bid in the Reverse Auction for further processing.

10. Any commercial/ technical loading shall be intimated to bidders prior to RA. The excel sheet provided in this regard shall cover all these aspects. Commercial/ technical loading if any, shall be added by the respective bidder in its price during online sealed bid & Online Reverse Auction. Modalities of loading & de-loading

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shall be separately intimated to the bidders. The responsibility for correctness of total cost to BHEL shall lie with the bidders.

11. Computerized reverse auction shall be conducted by BHEL (through M/s. *{Service Provider}*), on pre-specified date, while the bidders shall be quoting from their own offices/ place of their choice. Internet connectivity shall have to be ensured by bidders themselves.

During the RA process if a bidder is not able to bid and requests for extension of time by FAX/ email/ phone then time extension of additional 15 minutes will be given by the service provider provided such requests come before 5 minutes of auction closing time. However, only one such request per bidder can be entertained.

Despite this extension if bidder fails to upload his prices due to extreme case of failure of Internet connectivity, (due to any reason whatsoever may be) it is the bidders' responsibility/ decision to send fax communication immediately to M/s. *{Service provider}*, furnishing the price the bidder wants to bid online with a request to the service provider to upload the faxed price online so that the service provider will upload that price online on behalf of the Bidder. It shall be noted clearly that the concerned bidder communicating this price to service provider has to solely ensure that the fax message is received by the service provider in a readable/ legible form and also the Bidder should simultaneously check up with service provider about the clear receipt of the price faxed. It shall also be clearly understood that the bidder shall be at liberty to send such fax communications of prices to be uploaded by the service provider only within the closure of Bid time and under no circumstance it shall be allowed beyond the closure of Bid time /reverse auction. It shall also be noted that the service provider should be given a reasonable required time by the bidders, to upload such prices online and if such required time is not available at the disposal of the Service provider at the time of receipt of the fax message from the bidders, the service provider will not be uploading the prices and either BHEL or the service provider are not responsible for this unforeseen circumstances. In order to ward-off such contingent situation bidders are requested to make all the necessary arrangements/ alternatives whatever required so that they are able to circumvent such situation and still be able to participate in the reverse auction successfully. Failure of power or loss of connectivity at the premises of bidders during the Reverse auction cannot be the cause for not participating in the reverse auction. On account of this, the time for the auction cannot be extended and neither BHEL nor M/s. *{Service provider}* is responsible for such eventualities.

12. Proxy bids: Proxy bidding feature is a pro-bidder feature to safeguard the bidder's interest of any internet failure or to avoid last minute rush. The proxy feature allows bidders to place an automated bid in the system directly in an auction and bid without having to enter a new amount each time a competing bidder submits a new offer. The bid amount that a bidder enters is the minimum that the bidder is willing to offer. Here the software bids on behalf of the bidder. This obviates the need for the bidder participating in the bidding process until the proxy bid amount

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is decrementally reached by other bidders. When proxy bid amount is reached, the bidder (who has submitted the proxy bid) has an option to start participating in the bidding process. The proxy amount is the minimum amount that the bidder is willing to offer. During the course of bidding, the bidder cannot delete or change the amount of a proxy bid. Bids are submitted in decrements (decreasing bid amounts). The application automates proxy bidding by processing proxy bids automatically, according to the decrement that then auction originator originally established when creating the auction, submitting offers to the next bid decrement each time a competing bidder bids, regardless of the fact whether the competing bids are submitted as proxy or standard bids. However, it may please be noted that if a manual bid and proxy bid are submitted at the same instant manual bid will be recognized as the L1 at that instant. In case of more than one proxy bid, the system shall bid till it crosses the threshold value of 'each lowest proxy bid' and thereafter allow the competition to decide the final L1 price. Proxy bids are fed into the system directly by the respective bidders. As such this information is privy only to the respective bidder(s).

13. Bidders are advised to get fully trained and clear all their doubts such as refreshing of screen, quantity being auctioned, tender value being auctioned etc from M/s. *{Service provider}*.

14. M/s. *{Service provider}*, shall arrange to demonstrate/ train the bidder or bidder's nominated person(s), without any cost to bidders. M/s. *{Service provider}*, shall also explain the bidders, all the business rules related to the Reverse Auction. Bidders are required to submit their acceptance to the terms/ conditions/ modalities before participating in the Reverse Auction in the process compliance form as enclosed. Without this, the bidder will not be eligible to participate in the event.

15. Successful bidder shall be required to submit the final prices (L1) in prescribed format (Annexure-VI) for price breakup including that of line items, if required, quoted during the Online Reverse Auction, duly signed and stamped as token of acceptance without any new condition (other than those already agreed to before start of auction), after the completion of auction to M/s. *{Service provider}* besides BHEL within two working days of Auction without fail.

16. Any variation between the final bid value and that in the confirmatory signed price breakup document will be considered as tampering the tender process and will invite action by BHEL as per extant guidelines for suspension of business dealings (as available on www.bhel.com).

17. Bidders' bid will be taken as an offer to execute the work/ supplies of the item as per enquiry no. {…} dt. {…}. Bids once made by the bidder, cannot be cancelled/ withdrawn and bidder shall be bound to execute the work as mentioned above at bidder's final bid price. Should bidder back out and not execute the contract as per the rates quoted, BHEL shall take action as per extant guidelines for suspension of business dealings (as available on www.bhel.com).

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18. Bidders shall be able to view the following on their screen along with the necessary fields during Online Reverse Auction:

a. Leading (Running Lowest) Bid in the Auction (only total price of package).
b. Bid Placed by the bidder.
c. Start Price.
d. Decrement value.
e. Rank of their own bid during bidding as well as at the close of auction.

19. BHEL's decision on award of contract shall be final and binding on all the Bidders.

20. BHEL reserves the right to extend, reschedule or cancel the Reverse Auction process at any time, before ordering, without assigning any reason, with intimation to bidders.

21. BHEL shall not have any liability to bidders for any interruption or delay in access to the site irrespective of the cause. In such cases, the decision of BHEL shall be binding on the bidders.

22. Other terms and conditions shall be as per bidder's techno-commercial offers and other correspondences, if any, till date.

23. If there is any clash between this business document and the FAQ available, if any, in the website of M/s. *{Service provider}*, the terms & conditions given in this business document will supercede the information contained in the FAQs. Any changes made by BHEL/ service provider (due to unforeseen contingencies) after the first posting shall be deemed to have been accepted if the bidder continues to access the portal after that time.

24. Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating with other bidders, action as per extant BHEL guidelines for suspension of business dealings (as available on www.bhel.com), shall be initiated by BHEL.

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