

Bharat Heavy Electricals Ltd
Electronics Division
Mysore Road, Bangalore – 560026

Tender Document for SUPPLY, I&C & O&M OF BOS- NLC Site RFQ REF: HBSBOS025

Technical Bid Opening Date: 3rd December, 2014

This Tender Document Contains:

General Terms and Conditions, Technical Specification, Unpriced Bid Formats & Price
Bid Formats

Note: Part – I: To be submitted in a separate sealed cover

Part – II: To be submitted in a separate sealed cover.

And Part-I & Part-II sealed covers should be put in outer envelope and super scribing the Name of work and Name & Address of the tenderer. Tender document should be dropped in Tender drop box super scribed “SC&PV-MM, Wednesday” kept in reception

area of BHEL – EDN, Bangalore.

Contact Person at BHEL:

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REQUEST FOR QUOTATION

	BHARAT HEAVY ELECTRICALS LIMITED Electronics Division PB No. 2606, Mysore Road Bangalore - 560026 INDIA	RFQ NUMBER: HBSBOS025 RFQ DATE : 12.NOV.2014	Due Date 03.DEC.2014 Time: 13:00 HRS VENUE : NEW ENGG. BLDG
MMI:PU:RF:003			
		(for all correspondence) Purchase Executive : SRINIVAS H B Phone : 26998452 Fax : 00918026989217 E-mail: srinivasahb@bheledn.co.in	
Please submit your lowest quotation subject to our terms and conditions attached for the material mentioned below. The quotation must be enclosed in a sealed envelope / Fax superscribed with RFQ no.and due date, should reach us on or before the due date by 13.00 hours IST and will be opened on the same day at 13.30 hours at the venue mentioned above. PLEASE DROP THE OFFER IN THE BOX PROVIDED AT RECEPTION.			
RFQ TERMS & CONDITIONS: 1.Offer shall be submitted in two part : Part 1 : Techno-Commercial Bid Part 2 : Price Bid 2. This RFQ document comprises of : (1) Request For Quotation (2) Technical Specifications : PS- 439-9245 (3) Enclosures B,B1&B2 : Commercial Terms & Conditions, Unpriced Bid Format and Price Bid Format (4) General Terms and Conditions (Doc Ref : SCPV/BOS/01-Rev 01)			
Please note that the tender will be opened in the presence of the bidders or his authorised representatives (maximum two per organisation) who choose to be present with authorisation letters. Refer annexure for the terms and conditions. Please specify Terms of delivery, Excise duty, sales tax, Ex-BHEL, Ex-works surcharge, Insurance,P&F, Freight and other taxes very clearly . For evaluation,exchange rate(TT selling rate of SBI) as on scheduled date of tender opening (Part-I bid incase of two part bid) shall be considered. The offers of the bidders who are on the banned list as also the offer of the bidders, who engage the services of the banned firms, shall be rejected.The list of banned firms is available on BHEL web site www.bhel.com			
i). This is only RFQ not an order. ii). In all correspondence quote RFQ No. & due date. iii). In Quotation BHEL material code / RFQ Sl. No. should be mentioned clearly. iv). Quotation Envelope / Fax not superscribed with RFQ No.and due date is liable for rejection. v). Quotation should remain valid for a minimum peiod of 90 days from due date. vi). In case of non-receipt of Quotation or regret letter for 3 consecutive RFQs you are liable to be removed from our vendors list. vii). All Prices should be written in words and numbers. viii). Excise Chapter Heading should be mentioned for all items where VAT is applicable .			

For and On behalf of BHEL.

	PURCHASE SPECIFICATION; GROUP: PHOTOVOLTAICS SUPPLY OF BOS ITEMS, E&C, O&M FOR 10MW (AC) SPV POWER PLANT AT NLC, NEYVELI, CUDDALORE DIST., TAMIL NADU	PS-439-925
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Technical Specification for
Supply of Balance of System items, Erection and commissioning,
Operations & Maintenance
For 10 MW (AC) Solar PV grid connected power plant
at NLC, Neyveli, Cuddalore Dist., Tamil Nadu

Revision details : R 00	Prepared:	Approved:	Date: 10.11.2014
	NVR	SLR	

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1.0 Introduction

Bharat Heavy Electricals Limited (BHEL), Electronics Division, Bangalore is setting up an 11.5 MWp (10MW AC) Grid Connected SPV Power Plant at NLC Neyveli, Cuddalore district, T.N.

The overall area of the plant is approx. 54 acres. The plant will have a solar array field with seasonal tilted type of structures. PV modules (240Wp) of mono-crystalline type will be deployed. Electrically, the plant will have five equal segments, each generating DC power of 2.3 MWp, which is then fed to 2 MW (AC) Power Collection Sub Station (PCSS)/Inverter Station in which DC power gets inverted by grid-connected power conditioning units (PCU) of 500kVA/1000kVA rating. At the AC output level, PCUs are fed to a three/two winding dry type resin cast transformer of 33 kV and 1.25MVA rating. Each 1.25 MVA transformer shall be fed to a 33kV Ring Main Unit (RMU) which houses a vacuum circuit breaker and two load break switches. In total, there shall be 10 Nos of 1.25 MVA transformers and 10 Nos of RMUs out of which 6 RMUs shall form in to a ring main circuit and remaining 4 MW RMUs shall form in to another ring main circuit and these two ring main circuits shall be combined in a combined 33kV HT switchgear panel which consists of 4 Nos (2 for 6 MW circuit and 2 for 4 MW circuit) of 33kV Incoming VCB feeders, one No of 33kV spare Incoming VCB feeder, 1 No of 33kV Outgoing VCB feeder and one No of Bus PT panel. From the outgoing VCB feeder, 10 MW AC power shall be fed to 33kV grid which is around 2 km away from solar plant through 33kV HT power cable.

To summarize, PCSS is a containerized solution and each 2 MW PCSS shall consists of 4 Nos of 500kVA/2 Nos of 1000kVA PCUs, 2 Nos of 1.25 MVA 33kV Dry type Transformers, 2 Nos of 1.25 MVA RMUs, Bus Duct in LV side, LT Bus Panel, ACDB, Battery and Battery Charger, Fire detection system, illumination system etc. PCSS container will have two compartments, One compartment shall be air conditioned which consists of PCUs, LT Bus panel, battery & battery charger and other electronics for communication and control. In other compartment, 33kV RMU and 33kV 1.25 MVA encapsulated resin cast dry type transformer shall be housed with insulated bus duct connection between the compartments for connecting AC bus panel to transformer LV side. 33kV power from transformer to load break switch/VCB shall be through HT cabling. The transformer compartment shall be well ventilated by exhaust fan. All these 5 PCSS shall be distributed over the array yard and the AC power from all PCSS shall be fed to 33kV HT switch gear panel located in Power Export Sub Station (PESS) building which also houses plant SCADA, 33kV Control and Metering Panel, Auxiliary ACDB, DCDB, Battery and Battery Charger. 125kVA, 415V/415V, Delta/Star Auxiliary Transformer shall take the NLC provided 3 phase 3 wire auxiliary power and converts in to star and shall feed to ACDB for necessary auxiliary power distribution.

The solar array will have 130 or 140 Nos of 16 Input combiner boxes with String monitoring system (SMCB) that collect the solar PV generated DC power and provide inputs to the PCUs housed within PCSS. Each SMCB shall consists of string fuses, reverse blocking diodes, string monitoring card, SPD, copper bus bars and DC Isolating MCCB.

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The plant will have SCADA integration and PC based monitoring desk to gather DC, AC parameters from SMCBs, PCUs, weather monitoring equipment, transformers, LT / HT breakers, RMUs etc.

This technical specification provides requirements of BHEL for supply, installation, commissioning of balance of system items and operation and maintenance of power plant for a period of 4 years which includes one year of performance guarantee (PG) test. BHEL scope of supply is mentioned under clause 3.2.

1.1 Pre-Qualification criteria:

- 1) The bidder shall have executed electrical works including power and signal/communication cable laying and associated civil works for any power project/industry in last 2 years from RFQ date. Bidder shall furnish the details of project executed such as a) Project location & details b) Customer details c) Satisfactory performance certificate of the installed plant issued by customer.
- 2) The bidder should have achieved average annual financial turnover of Rs. 900 lakhs in the last three years ending 31st March of the previous financial year. The bidder shall submit Audited balance sheets for last three years.

Bidder also should refer notes given at Clause 11 regarding opening of Part 2 of successful Bidders. Documents containing details as per 1.1.1 and 1.1.2 shall be submitted with bid.

1.2 Inspection of site:

Vendor shall visit the site to assess all the technical and operational requirements and familiarize with the site conditions before placing the bid. Vendor shall assess and satisfy himself as to the adequacy of the local conditions such as approach roads to the site, water and power supply, accommodations required during the contract, climatic conditions, availability of labour, construction materials, details of taxes, duties and levies as applicable and any other information required. The cost of visiting the site shall be at the vendor's own expenses.

1.3 Packing and Marking– Vendor Compliance (Yes/No):

Vendor shall be responsible for securely packing the equipment in vendor's scope as per prescribed standards in force to withstand the journey and ensuring safety of materials and also arrival of materials at destination in original condition and good for contemplated use. Packing case size and weight shall take into consideration the remoteness of the goods final destination and absence of heavy material handling facilities at all points in transit.

Packing lists of materials shall be provided in each package to facilitate checking up of the contents at the destination. In order to import any items, associated with the Solar PV Power Project, from abroad or from any other state in India, vendor shall have to arrange any clearance, permission, if required at his own risk, from any Government (Government of Tamil Nadu and

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Government of India) or any Government controlled organization for transportation of materials from manufacturing shop to delivery at site.

All packing material will be the property of BHEL/NLC and shall be immediately deposited by the vendor to BHEL/NLC's store at project site.

1.4 Standards– Vendor Compliance (Yes/No):

The work shall be executed in conformity with the relevant standard of Bureau of Indian Specification (or equivalent International Standard), Indian Electricity Rules, 1956 (as amended up to date), Indian Electricity Act, BARC/DAE rules, Explosive Act 1948, Petroleum Act 1934, National Building Code and relevant Rules in vogue at the time of execution including operation & maintenance period.

Vendor shall comply with all applicable laws or ordinances, codes, approved standards, rules, and regulations and shall procure all necessary Panchayat/Municipal and Government permits & licenses etc at his own cost. Vendor shall leave NLC and the Project site harmless as a result of any infractions thereof. If required, the vendor shall renew the permits & licenses in case such situation warrants.

Vendor shall be technically conversant about planning and execution of works in a sequential manner so that the project schedule shall not be affected. Vendor shall dovetail the supply and the works to be carried out at site. Vendor shall furnish an activity chart which depicts both supply and works as per this tender specs.

1.5 Responsibility of the Contractor– Vendor Compliance (Yes/No):

Vendor shall be entirely responsible for the execution of the contract in accordance with the specification and annexures. He shall be responsible for the quality and workmanship of all materials and completed works, correct designs and drawings, correct delivery of material, erection, testing and commissioning including operation & maintenance.

1.6 Safety– Vendor Compliance (Yes/No):

Vendor shall provide technically suitable tools and tackles for installation & erection of Plant and Machineries conforming to relevant BIS safety and technical standards for proper execution of work under vendor's scope. BHEL/NLC, in no way, shall be responsible for supply of any tools and tackles for implementation of the vendor's scope of work and also to carry out operation & maintenance activities.

Vendor shall have to provide necessary and adequate safety measures including supply of required personal protective equipment and precautions to avoid any accident, which may cause damage to any equipment/material or injury to workmen. BHEL/NLC shall not be responsible for any such accidents.

Any hazardous material used during construction or used as part of the plant has to be taken back by the supplier for recycling or dumping purpose after its operating/working life, so that it may not affect the environment or any living being. Vendor shall comply with Tamil Nadu Pollution Control Board (TNPCB) regulations.

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1.7 Rejection of Defective Parts– Vendor Compliance (Yes/No):

If any supplied item/completed work which is in vendor's scope, be found to be defective, or fails to fulfill the requirements of the contract, the Project Manager of BHEL/NLC shall issue a notice to the vendor stating the particulars of such defects or failure. Vendor shall start the rectification with immediate effect to make good the defect, or alter the same to make it comply with the requirements of the contract. If the vendor fails to do so within a reasonable time, BHEL/NLC may reject and replace, at the risk and cost of the vendor, the whole, or any portion of the vendor's scope of work/supplied item, as per requirement of the contract.

Such replacement shall be carried out by BHEL/NLC within a reasonable time to the same specifications. In cases if such replacement is taken up by BHEL/NLC, the extra cost, if any, of such replacement, shall be realized from vendor from any money due or which becomes due to the vendor under this Contract or any other contract that are being executed elsewhere with BHEL.

In the event of such rejection, BHEL/NLC shall be entitled to the use of the plant/ part of the plant in responsible and proper manner, till such time, which is reasonably sufficient to enable the contractor to obtain other replacement plant/ part of the plant.

1.8 Site Conditions– Vendor Compliance (Yes/No):

Following site conditions may be followed for the site by the vendor while designing/planning for any work/supply:

- Mean annual rainfall of 1300mm and intensity as 250mm/hr.
- Maximum wind speed 160 km per hour
- Seismic condition of site defined in IS: 1893 as being in Zone –II
- Ambient temperature 50 degree C for outdoor, 45 degree C for indoor
- Relative humidity 100% maximum
- Wind loads for outdoor structures shall be as per IS 802-1977. (Basic wind speed and diagonal wind loads as applicable need to be considered in the design of outdoor structures)
- Barometric pressure 1006 mbar

2.0 Documents enclosed with this specification– Vendor Compliance (Yes/No)

1	Format of performance certificate from end user/customer for getting NLC approval for various items	Annexure 1
2	AC Single line diagram of SPV plant	Annexure 2
3	DC Single line diagram of SPV plant	Annexure 3
4	Site layout with locations of solar array, PCSS and PESS locations	Annexure 4

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5	PESS Layout	Annexure 5
6	List of EDEC ineligible items	Annexure 6
7	SPV module Drawing	Annexure 7

Note: Above provided drawings are tentative and for tendering purpose only. Final drawings may differ from provided drawings based on the project requirements.

3.0 Scope of work

3.1 Vendor scope of work– Vendor Compliance (Yes/No)

The table below indicates the vendor's scope of supply, installation and O&M for 4 years including O&M during one year PG test, as briefly outlined. Vendor shall submit the offer (in two part bids) as per this list and quantity.

#	Scope of work (as briefly outlined)	Qty
1	Supply of MC4 connectors, crimping tools, cable ties, PVC conduits, Hard PVC cable conduits, HDPE DWC conduits, cable lugs, cable glands, hardware, cable trays etc. as per clauses 5.5 to 5.10 and 5.14 to 5.20.	1 set
2	Supply of LT Auxiliary power cables, control cables, data & communication cables, Optical fiber cables, 33kV termination kits and straight through joint kits etc. as per clauses 5.16, 5.19, 5.20, 5.25, 5.26 and 5.27.	1 set
3	Supply of Earthing System for Solar array structures, String monitoring combiner boxes, electrical panels in PCSS and PESS, PESS electrical room wiring circuits, Transformers in PCSS, lightning arresters, weather monitoring station equipment, compound fencing angles and all other panels/equipment/metallic structures as applicable as per clause 5.21 & 5.26.	1 set
4	Supply and Installation of Lightning protection system (Lightning arrestors) to protect the equipment of SPV power plant from lightning as per clause 5.22.	1 set
5	Supply of Weather Monitoring Station as per clause 5.23.	1 set
6	Supply of Exterior lighting including illumination of periphery path, approach roads/pathways, watch towers, main gate, PCSS & PESS building external areas as per clause 5.24 & 5.26.	1 set
7	Supply of miscellaneous items such as cable tags/markers, danger boards, cable route markers, hoarding board, sign boards, display boards, electrical insulation mats, chequered trench cover plates, air conditioners, office furniture etc. as per clauses 5.31 to 5.37 and 5.39 & 5.41.	1 set
8	Supply of Fire detection, protection and firefighting system as per clause 5.26 & 5.40:	1 set

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9	Supply of auxiliary ACDB, Battery Bank, Battery Charger and DCDB for auxiliary power requirements of plant as per clause 5.30.	1 set
10	Supply of Surveillance CCTV system along with supply, laying and termination of associated cable laying as per clause 5.28.	1 set
11	Supply of solar PV module charged, battery operated portable jet washer units with water tank, high pressure pump, hose and jet nozzles, providing 3 phase, four wire, 415 V AC power supply points in the array field for energizing pumps, as per Clause 5.29. Required PV modules and the associated BoS such as Support structures, junction boxes and cables shall be supplied by BHEL.	3 Nos
12	Supply of Tools and Tackles as per clause 5.38 and 5.43.2.	1 set
13	Supply of Mandatory Spares as per clause 5.43.1.	1 Set
14	Supply of Auxiliary Transformer 125 kVA, 415 V/415 V Delta/Star, ONAN along with earthing material, fencing material and gate for auxiliary transformer as per statutory requirement, firefighting equipment etc. as per Clause 5.26	1 Set
15	E&C: Temporary site office, storage yard, unloading and movement of consignments, arrangement for electrical power and water etc. as per clauses 5.1 to 5.4	1 AU
16	E&C: Interconnection of SPV modules, cabling from strings to SMCBs, installation of SMCBs including cable terminations and inspection thereof as per clauses 5.5 to 5.10.	1 AU
17	E&C: Formation of cable trenches and laying of DC power cables from SMCBs to respective PCSS, per PCSS basis, as per clause 5.11, 5.12 and 5.14 (1 AU = 2.3 MW)	5 AU
18	E&C: Erection of PESS panels such as HT switchgear panels, Control and Metering Panel, ACDB, SCADA panels, Battery Charger, Battery bank, DCDB, Fire alarm panels, etc. including grouting, erection of cable trays and cable supports, routing and terminations of DC and AC cables as per clauses 5.17 and 5.18.	1 AU
19	E&C: Erection of PCSS on the civil platform as per clauses 5.13.	5 AU
20	E&C: Cable trenches, cable laying, cable terminations for 33KV cables among PCSS rooms and also from PCSS rooms to HT switch gear panel and also from HT switchgear panel to 33kV grid (substation) as per clauses 5.15, 5.16 and 5.25.	1 AU
21	E&C: Cable trenches, cable laying, cable terminations for control, OFC and communication cables related to SMCBs, PCSS equipment, HT Panels, Control and Metering Panel and SCADA as per clauses 5.19 and 5.20.	1 AU
22	E&C of Earthing System for Solar array structures, String monitoring combiner boxes, electrical panels in PCSS and PESS, PESS electrical room wiring circuits, Transformers in PCSS, lightning arresters, weather monitoring station	1 AU

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	equipment, compound fencing angles and all other panels/equipment/metallic structures as applicable as per clauses 5.21 & 5.26.	
23	E&C of Exterior lighting including illumination of periphery path, approach roads/pathways, watch towers, main gate, PCSS and PESS building external areas as per clause 5.24.	1 AU
24	E&C of miscellaneous and safety items such as cable tags, danger boards, cable markers, hoarding board, sign boards, display boards, electrical insulation mat, chequered plates, air conditioners, office furniture, fire extinguishers, fire alarm system etc as per clauses 5.31 to 5.37 and 5.39 to 5.41.	1 AU
25	E&C of weather monitoring equipment including cable laying as per clause 5.23.	1 AU
26	E&C of CCTV surveillance system as per clause 5.28	1 AU
27	E&C of 33kV HT power cable in cable trench from outgoing feeder of HT switchgear panel located in PESS building of solar power plant to 33kV NLC substation as per clause 5.25.	1 AU
28	E&C of Auxiliary Transformer with necessary civil foundation, fencing for auxiliary transformer yard, associated earthing, jelly spreading etc. as per Clause 5.26	1 AU
29	E&C: Pre-commissioning inspections / checks / tests, MRT tests and coordination with state and central departments such as Tamil Nadu SEBs/CEIG/SECI etc. for necessary approvals/ clearances for commissioning, synchronization with grid and post-commissioning operation of the plant as per clause 5.42.	1 AU
30	Operation and Maintenance of PV plant for One year (12 Months) during performance guarantee (PG) test from the date of commissioning/ declaration of O&M as per clause 8.0.	12 Months
31	Operation and Maintenance of PV plant for Three years (36 Months) from the date of completion of PG test as per clause 8.0.	36 Months

Note: The terminal point under the scope of this specification shall be laying and terminating 33KV 10 MW evacuation cable to the identified bay of 33kV NLC substation which is located around 2 km from PESS of solar plant.

3.2 BHEL scope of work:

For the sake of clarity to the vendor, the items that are within the scope of BHEL supply are listed below. The receipt, unloading, safe storage, handling, erection and commissioning of these items except PV Modules & module mounting structures are within the scope of vendor. However, insurance for these items are within BHEL scope.

1	Solar PV Modules: BHEL make, 240Wp (Type L20220)	48000 Nos
2	Solar array structures with modules mounted on seasonal tilted type	11.5 MWp

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	structures (MMS), with each having 24 Nos. of 240Wp modules	
3	Cable, 1Cx 6 sq-mm (for connection of PV modules to string monitoring boxes)	approx. 165km
4	Cable, 1C x 120sq-mm (for connection from SMCB's up to PCUs in PCSS)	approx. 55 km
5	3 core 33kV 300 sq mm (UE) Aluminum conductor, XLPE insulated, Armored Cable	approx. 4400 m
6	16 Input Combiner Boxes with String Monitoring System (SMCB) with mounting fixtures	130 Nos or 140 Nos
7	2 MW Power Collection Sub Station (PCSS)/Inverter Station containing 500 kW/1000kW PCUs, 1.25 MVA Transformers, RMUs, Bus Duct, LT Bus Panel, Battery Charger, Battery Bank, Fire detection system etc.	5 Nos
8	33kV HT Switchgear Panel consists of 4 Nos of 33kV VCB Incoming feeders, 1 No of spare 33kV VCB incoming feeder, 1 No of 33kV VCB outgoing feeder and 1 No of Bus PT panel	1 No
9	33kV Control and Metering Panel for metering, relaying and protection of 33kV feeder circuits and Transformers	1 No
10	SCADA system with PC, accessories and software	1 set
11	Module water washing system – permanent arrangement includes water storage sump, pump, motor and buried ring main system of heavy duty rigid PVC pipe network with manual isolating valves (415 V, 3 phase, four wire AC power supply cabling (armoured, underground) and plug points at points on PV array field for energizing pumps on mobile pumping systems	1 set
12	Civil Platforms for PCSS, Construction of PESS building, Watch Towers and Security cabin	1 set
13	Peripheral Chain link Fencing and Live Fencing, Grading & Leveling, Approach roads, peripheral roads, internal pathways, and drainage system within the solar plant.	1 set

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4.0 Instructions to vendors on bid submission– Vendor Compliance (Yes/No)

4.1	Offer shall be submitted in two-parts (Two part-bid). Both parts shall be in separate sealed envelopes as per instructions in tender. The individual envelopes shall be enclosed in a common bigger envelope with markings (address, etc) on the envelope as per instructions provided in tender.
4.2	First-part shall be techno-commercial bid. Following details shall be furnished: 1. Technical offer with covering letter. 2. Filled-up enclosures as per BHEL formats (meant for first-part) provided in tender. 3. Clause-wise compliance shall be filled-up in the column provided in this specification, with signature and seal on every page. 4. Company brochure. 5. Project implementation time schedule. 6. Stage-wise manpower schedule. 7. Any other necessary documents (other than above) as mentioned in this specification for submission during bid shall also be furnished.
4.3	Second-part shall be price bid with filled up enclosures as per BHEL formats provided in tender.
4.4	In addition to the above instructions, tender document provides detailed instructions for bid submission. Vendor shall submit the bid based on instructions in tender document.
4.5	If the vendor's acceptance is 'NO' against any of the clauses mentioned in the specification, the offer is liable for rejection on technical grounds. In case of any deviations, vendor to record the same in the column meant for vendor compliance.

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5.0 Technical specification for supply, installation and commissioning

Vendor shall indicate clause-wise compliance (Yes/No) in the column provided as below. In case of non-compliance or deviation, vendor shall record their comment.

#	BHEL specification	Vendor's compliance (Yes / No) In case of non-compliance or deviation, vendor shall record their comments:
5.1	Setting up of temporary site office (1) Vendor shall set up a temporary site office using porta cabin of about 200 sq. ft within one week to ten days from the date of purchase order to enable speedy commencement of site activities. (2) Cabin shall be retained at the site until completion of all civil & electrical works or up to 3 months from commissioning whichever is later. (3) Cabins shall be furnished with essential amenities such as two work tables, six chairs and necessary number of power points, lamps and fans.	
5.2	Electrical power and water for construction and O&M period (1) NLC shall provide a separate 415V, 3 phase 3 wire power supply of about 100kW maximum from their distribution network to meet the entire solar plant auxiliary power requirements. (2) 415V, 3 phase power supply shall be provided by NLC at one point in the site near PESS for construction purposes and also during O&M period at free of charge. (3) All distribution and controls inside the power plant area shall be made by the vendor at his own cost. (4) Vendor shall provide a separate suitable distribution network with an auxiliary transformer of 125kVA rated, 415V/415V, Delta/Star configuration from PESS to all PCSS, security room, watch towers and road/peripheral lighting on 24 x 7 basis, with necessary metering of total power consumption. (5) Vendor shall supply, install and commission the auxiliary transformer next to PESS building with necessary civil platform, fencing, earthing and jelly spreading of yard etc. (6) Vendor shall also supply and install necessary firefighting equipment in auxiliary transformer yard. (7) Vendor shall supply, install and terminate the necessary cable from auxiliary transformer to ACDB which is located in PESS building. (8) Power as required to provide essential and peripheral loads of PCSS shall be met with necessary ACDB, internal wiring and control switches. (9) Auxiliary power consumption details of BHEL supplied equipment shall be provided during detailed engineering.	

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	(10) Proposed auxiliary power (AC & DC) distribution scheme with necessary design calculations, drawings and description shall be submitted by vendor to BHEL/NLC for approval. (11) NLC shall provide water with one 1.5 inch diameter water supply line from NLC's water supply network at one location in the power plant area free of charge. (12) Water will be provided to vendor free of charge by NLC during construction and also during O&M period including one year PG test period. (13) All distribution and controls inside the power plant area shall be made by the vendor at his own cost for distribution of water. Vendor shall arrange for storage sumps, pumps, distribution piping to various locations of power plant (for the works of vendor's scope) at his own cost. (14) Vendor shall arrange drinking water for the site engineers of BHEL/NLC and the staff/employees of vendor.	
5.3	Construction of temporary yards for safe storage of all BHEL as well as vendor supplied items (1) Vendor shall, at suitable locations at the site, as decided based on discussions with BHEL site engineer, construct temporary storage yard for safe storage of BHEL as well as vendor supplied items except for PV modules and module mounting structures. This includes storage of all items such as electrical panels (PCSS, HT panels, Control and Metering Panel, SCADA, Battery banks, Battery chargers, Distribution boards etc.), cables, SMCBs, spares, tools, instruments etc. (2) Area of each storage yard shall be decided mutually with BHEL based on site conditions. (3) An adequate area of storage yard area shall be provided with suitable roof and side covers (asbestos, FRP, steel sheet etc.,) in order to ensure that there will not be any water spillage which may damage equipment requiring dry storage. This covered store should be supported by steel poles that shall be grouted using suitable concrete foundations. Height should be appropriately decided to ensure safe operation of hydra for loading/unloading etc., (4) Necessary raised / covered arrangements shall be provided to the individual panels / equipment to ensure that these items are not affected by water at the ground level during time of rain storm, flood etc. (5) Yard shall be fenced all around with barbed wire and provided with a steel gate of width of 4 m. Height of barbed wire fence and gate shall be 2.5m minimum above the ground level. (6) Gate shall be suitably secured to the fencing poles and shall be provided with lock and key. (7) Watch and ward security personnel shall be provided for the yard on round-the-clock basis.	

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5.4	Receipt, unloading, safe storage and movement of BHEL and vendor supplied items except PV Modules and MMS: (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 received at the site and subsequent movement to the storage yard. Loading, shifting and unloading of the materials from storage yard to the point of construction/installation is in the scope of the vendor. (2) Vendor shall maintain proper documentation / compilation of all the records related to shipping (invoices, delivery challans etc) and shall take verification and approval from BHEL site engineer for every consignment. The documents shall be suitably preserved for further handing over to BHEL. (3) Safeguarding the items from pilferage etc is responsibility of vendor. For this purpose, vendor shall post adequate watch and ward for the yard on round-the-clock basis. (4) Registers shall be maintained for the yard to keep track of incoming / outgoing items. (5) Vendor shall arrange for necessary insurance for the stored items of vendor supply up to the time of commissioning. (6) BHEL will ensure insurance for all the BHEL supplied items.	
5.5	Interconnection of SPV modules to form strings. Supply of SPV modules is in BHEL scope. 48000 Nos. of BHEL make PV module of L20220P type, 240 Wp shall be supplied. Erection of module mounting structures and mounting of the SPV modules on the structures are in BHEL scope. Vendor shall interconnect the modules as follows: (a) Each module is fitted integrally with a junction box having positive and negative polarity cables (4 sq.mm) with MC4 connectors – male & female type fitted. (b) Module Interconnections shall be done with 1C 6 sq mm DC cables through hard PVC conduit. (c) Positive cable of one module shall be connected to the negative cable of adjacent module through 1C 6 sq mm (BHEL supply) cable of 0.15 meter	



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	length with male & female MC4 connectors. Hence, for module interconnection of 2000 strings, approximately 7.5 km of 1C 6 sq mm DC cable shall be required and the same will be provided by BHEL to vendor during installation at site. Vendor has to cut the 1C 6 sq mm cables in 0.15m lengths and shall use for module interconnection and accordingly vendor shall maintain the required tools & tackles at site. Supply and termination of MC4 connectors for module interconnection is in the scope of vendor. (d) All the module interconnections shall be through hard PVC conduit with required elbows/bends. PVC conduit shall be firmly fitted to PV modules/module mounting structures with cable ties with required accessories. Make of PVC conduit, bends/elbows shall be as per the approval of BHEL/NLC. (e) This way, 24 modules shall be connected in series for L20220 type to form a series string. Thus, 2000 strings shall be formed. (f) MC4 connectors shall have rating of 1000V DC (IEC), rated current of 30A, Type approved by TUV Rheinland for product safety. (g) Total quantity of MC4 connector sets required for module interconnection= 46000 sets (each set having a male and a female part). Vendor shall ensure that the type, model & make of MC4 connectors shall be of same type of connectors that are fitted to PV modules. (h) Vendor shall submit the proposed module interconnection drawing to BHEL/NLC as explained in this specification for approval. Up on approval only, vendor shall take up for implementation. (i) PVC conduits for interconnected cables shall be neatly routed and dressed using UV resistant nylon cable ties of appropriate dimension. (j) These cable ties shall be in vendor scope of supply. Make shall be as per the approval of BHEL/NLC. Specs: Nylon cable ties, polyamide 6.6 UV stabilized black, UL94 flammability rating V2, meant for outdoor use. Operating temperature up to 85 deg C. Width of cable tie shall be minimum 4.5 mm.	
5.6	Installation of 16 Input combiner boxes with string monitoring system (SMCB): (1) Supply of SMCBs, 130 or 140 sets and 10 set spare, is in BHEL scope. These are 16-in and 1-out type. The construction of each SMCB may be in two separate enclosures or one enclosure as per disposition of fuses, blocking diodes, string monitoring cards and bus bars respectively. In case of two separate enclosures, together the boxes shall be called as a single SMCB. (2) Vendor shall install the SMCBs in the solar array field as indicated in array layout. (3) All fixtures (Mounting bracket) and necessary hardware required for installation of SMCBs is in BHEL scope of supply. (4) Drawings and details of SMCBs and the fixtures will be provided to the	

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	vendor after placement of purchase order. (5) SMCBs shall be fixed on the structures using the hardware that are supplied by BHEL as part of SMCB assembly kit. (6) All tools necessary for mounting shall be in vendor scope.	
5.7	Interconnection of SPV module cable to 6 sq-mm cable: (1) Each SPV module string shall be connected to SMCB using 1Cx 6 sq-mm cable supplied by BHEL. (2) SPV module is provided with positive and negative cables (4 sq-mm) having male and female parts of MC4 type connectors. (3) Vendor shall supply plug connectors of MC4 type, each set having a pair of male and female parts, to join the 6 sq-mm cable with SPV module string. (k) MC4 connectors shall have rating of 1000VDC (IEC), rated current of 30A, Type approved by TUV Rheinland for product safety. Vendor shall ensure that the type, model & make of MC4 connectors shall be of same type of connectors that are fitted to PV modules. (4) Quantity of MC4 connector sets required = 2000 sets (each set having a male and a female part). So, total quantity of MC4 connectors required including the quantity for module interconnection = 48000 sets (each set having a male and female part). (5) Extra quantity shall also be procured considering possibilities of damages during the installation. Vendor shall ensure that there shall not be any shortage during execution time. (6) In addition to the above safety margin, vendor shall supply 1000 sets extra as spares for contingency use during post-commissioning period. (7) Two sets of tool kits (with plastic box enclosure) shall be supplied and stored at the site as O&M tools. 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 6-sqmm (of both pliers). Vendor should make available extra MC4 tool kits of at least 20 nos., during execution for simultaneous working on the array. Note: For any other equivalent make of plug connectors and tool sets, BHEL approval shall be obtained.	
5.8	Routing of 1Cx 6 sq-mm cable: (1) 6 sq-mm cables connecting the SPV module strings to SMCBs shall be neatly routed along the module mounting structures using cable ties.	

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	(2) 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. Make shall be as per the approval of BHEL/NLC. Width of the cable ties shall be a minimum of 4.5 mm. BHEL approval shall be obtained for the selected brand and length of cable tie. (3) Cables shall not be loosely hanging.	
5.9	Underground laying of 6 sq-mm cables between the rows (1) Where 6 sq-mm cables run between two rows of structure, HDPE double walled corrugated (DWC) pipe shall be used to guide the cables underground from one row to the other in trenches. (2) HDPE DWC pipe shall be within scope of vendor supply. (3) Specification of HDPE DWC pipe: As per IEC 61386 part 1-4; Inner Diameter (ID) shall be selected to accommodate the number of 6 sq-mm cables to be guided. However, Inner diameter shall be limited to a minimum of 63mm. (4) Make, part number, sizes / dimensions shall be submitted to BHEL for approval. (5) Details of cable trench (tentative): (a) Trench depth = 600 mm minimum. (b) Trench width = 200 mm minimum. (c) Bottom layer shall be sand of IS: 383 with 100mm thick. (d) HDPE conduit shall be laid over the sand layer. (e) Another layer of sand of 100 mm thick. (f) Brick layer with bricks of class-2. (g) Trench shall, then, be filled with refill soil and compacted. (6) Actual trench details, trench layout and cross sectional drawings shall be submitted by vendor for the approval of BHEL/NLC during detailed engineering. Work shall be done at site as per the approved drawing only. (7) Vendor to procure necessary quantity of HDPE pipes based on the actual requirement and ensure no shortfall in supply during the time of installation.	
5.10	Connecting the 6 sq-mm cables on input side of SMCBs (1) 6 sq-mm cables of positive and negative polarities originating from SPV module strings shall be terminated at the input side of SMCBs. (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 terminal block (connector) within the SMCB. Cables shall enter the SMCB through the cable glands that are part of the SMCBs supplied by BHEL. (3) Cable lug shall be in vendor scope of supply. Type of lug (pin type etc.) shall be in accordance with the termination arrangement within the SMCB. (4) In case, SMCB contains two separate boxes, one for housing diodes and second one for housing string monitoring cards, combining bus bars and DC MCCB, then the required cabling & termination between two boxes with	

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	6 sq mm DC cable shall be done by vendor. Supply of 6 sq mm DC cable is not in the scope of vendor. For termination, supply of necessary lugs and other hardware is in the scope of vendor. (5) Any other hardware, if necessary for fulfilling the connection, such as bolts, nuts, screws, washers etc. shall be in vendor scope of supply. In such a case, all hardware shall be of SS304. (6) All necessary tools such as pliers, strippers, crimping tool etc. shall be within vendor scope.	
5.11	Connecting the 120 sq-mm cables on output side of SMCBs (1) Cables of 1Cx120 sq-mm (Copper, armored) cables of positive and negative polarities shall be terminated at the output side of SMCBs. Supply of this cable is not in vendor's 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 bus bar within the SMCB. Cables shall enter the SMCB through the cable glands that are supplied by BHEL along with SMCBs. (3) Cable lug shall be in vendor scope of supply. Lug shall be of copper of appropriate duty and size. (4) Hardware such as bolts, nuts, plain washers and spring washers shall be in vendor scope of supply. The size and type of these shall be in accordance with termination arrangement on the bus bar of SMCB. Hardware should be SS304. Spring washers should be Zn coated. (5) All necessary tools such as pliers, strippers, crimping tool etc shall be within vendor scope.	
5.12	Cable trenches for laying power cables from SMCB to PCSS: (1) 1Cx 120 sq-mm (Copper, Armored) cables of positive and negative polarities are routed from SMCB box to power conditioning units (PCUs) located at the respective PCSS. (2) These cables shall be laid underground from the point near SMCB to PCSS. (3) Two cables (+, -) from each of the 130 or 140 SMCBs have to be routed to respective PCSS. Each PCSS shall have 26 or 28 SMCBs respectively. (4) Tentative Array layout with location of SMCBs and PCSS is enclosed for vendor's reference and for estimation purpose. Exact solar array layout will be provided by BHEL after placing purchase order. Vendor shall estimate the length of cable trench. Generally these power cables will be packed in 500 m/1000 m drums. Vendor has to carefully plan laying of farther cables first to ensure cut lengths can be used for shorter cables. Any shortage of cable occurring because of vendor's works will be in the scope of the vendor. (5) Vendor shall construct the underground trench as per the below mentioned tentative details: (a) Trench depth = 750 mm minimum. (b) Trench width shall vary en route to PCSS, based on the number of cables. As the cables join from SMCBs en route, bunching takes place	

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	and the width of trench shall increase. (c) Sand as per IS: 383 of 100 mm layer thickness shall be laid at the bottom most level of trench. (d) Over the sand layer, cables shall be laid one adjacent to the other. Cables shall not be laid one over the other. In other words, only one layer of cables shall be allowed. (e) Over the layer of cables, one more layer of sand of 100mm shall be laid. (f) Then, a single layer of class-2 brick of 75 mm thickness shall be laid. (g) Trench shall then be filled up with refill soil. (h) Subsequently, land over the cable trench shall be leveled and compacted suitably. (6) Actual trench details, trench layout and cross sectional drawings shall be submitted by vendor for the approval of BHEL/NLC during detailed engineering. Work shall be done at site as per the approved drawing only. (7) Signal cable and power cable shall not be laid in the same cable trench.	
5.13	Installation of PCSS containers on civil platform: 1. Vendor shall organize necessary resources such as labour, cranes, hydra, forklifts, transportation trucks / trolleys and other accessories for movements, positioning and installation of PCSS containers on civil platforms. Construction of civil platforms for PCSS is in the scope of the BHEL. 2. PCSS containers shall be placed over the civil platforms, in the exact sequence and locations as shown in BHEL drawings that will be provided to vendor at an appropriate time during the period of execution. 3. Placement of PCSS shall be carried out in such a manner that this activity shall not hinder other works being carried out in the site. All the works shall be carried out in a coordinated manner.	
5.14	Power cable terminations on DC side of PCUs in PCSS (1) On DC side, for each 500kW / 1000kW PCU, vendor shall carry out the necessary number of cable terminations for 7 or 13 positive and 7 or 13 negative inputs connections respectively – un-sleeving, crimping and connecting. (2) BHEL shall supply the cables (1Cx120 sq-mm Copper, armored). (3) All cable glands, cable lugs, bolts, nuts and washers shall be supplied by the vendor. (4) All tools and accessories required to carry out the termination shall be within scope of vendor.	
5.15	Cable trench and laying of 33kV HT power cables Vendor shall construct underground cable trench for laying 33kV cables among PCSS containers and from PCSS containers to HT switch gear panel in PESS. As shown in SLD, 3 PCSS containers shall form to a ring main circuit and remaining 2 PCSS containers shall form to another ring main circuit. 1. 33kV HT cable trenches and power cables shall be laid	

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	(a) From Incomer -1 of 33kV HT switch gear panel to PCSS-1, from PCSS-1 to PCSS-2, from PCSS-2 to PCSS-3 and from PCSS-3 to Incomer-2 of HT switchgear panel in PESS. (b) From Incomer-3 of 33kV HT switchgear panel to PCSS-4 and from PCSS-4 to PCSS-5 and from PCSS-5 to Incomer-4 of 33kV HT switchgear panel in PESS building. 2. However, as per the actual arrangement of PCSS containers, above said arrangement may vary based on their proximity to PESS building. Hence, work shall happen at site as per the approved drawing only. Supply of HT power cables is not in the scope of Vendor. 3. Vendor shall make the measurements between the equipment and cut the cables to the required lengths and lay accordingly. 4. Vendor shall lay these cables layer wise providing adequate separation as per the relevant IS standards. Vendor shall indicate the IS standards employed. Trench layout and trench cross sectional drawings shall be submitted to BHEL/NLC for approval.	
5.16	Power cable terminations on AC (HT) side for RMUs and for HT switchgear Panel: (1) Vendor shall carry out HT power cable terminations on HV side (33kV) of 33kV RMUs located in PCSS containers and at HT switchgear Panel located in PESS building. Cable lugs, HT termination kits and all necessary hardware, all of which shall be within vendor scope of supply. (2) There are 10 RMUs in the plant. 6 RMUs shall form in to a ring main circuit and remaining 4 RMUs shall form in to another ring main circuit. In PCSS wise, 3 PCSS containers shall form a ring main circuit and remaining 2 PCSS containers shall form in to another ring main circuit. (Please refer to plant SLD attached) (3) Cable laying and termination among two RMUs in each PCSS is also in the scope of the vendor. Vendor shall also make the cable termination at outgoing feeder of 33kV HT switch gear panel located in PESS building. (4) Vendor shall make suitable size cut-outs using hole-saw cutters in the gland plates of RMUs for entry and exit of cables. (5) HT termination kits shall be of 33kV kV, 3-core, indoor type. Make: Raychem, 3M or reputed equivalent as shall be approved by BHEL. (6) Qty of HT termination kits – 25 nos. (approx.) and HT straight through joint kits – As required for 3C 33kV grade UE cable. Extra spare quantities shall be provided (2 Nos). Vendor shall ensure procurement of additional quantity of termination and jointing kits, if required at no additional cost to BHEL to tide over any contingencies during installation. (7) All tools, Cable lugs, Cable glands and accessories required to carry out the termination shall be within the scope of vendor. (8) In case, 33kV HT cables have to be terminated to RMUs through screened separable connectors instead of heat shrinkable termination kits, supply	

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	and works of necessary materials for cable termination is in the scope of vendor.	
5.17	Installation (indoor) of HT Switchgear Panel, SCADA Panels, CCTV surveillance control panel and screens, Battery Charger panels, Battery Banks, Auxiliary ACDB, DCDB, Control and Metering Panel in PESS building with cable trays in cable trench: (1) Vendor shall organize necessary resources such as labour, cranes, hydra, forklifts, transportation trucks / trolleys and other accessories for movements and positioning of the items as below within the PESS: (a) 33kV HT switch gear Panel – 5 Incomers + 1 Outgoer + 1 Bus PT (~1500 Kg per panel – In total ~ 10500 Kg) (b) Battery bank (110V, 100 AH): 2 sets (each ~600 Kg) (c) Battery charger panel: 2 sets (each ~800 Kg) (d) ACDB panel: 1 set (~400 Kg) (e) SCADA panels: 1 set (~500 Kg). (f) Control and Metering Panel – 1 No. (g) DCDB panel: 1 No. (May be an integral part of Battery Charger) (h) CCTV surveillance control panel and display screen -1 Set (2) Panels shall be placed over the cable trenches in PESS building, in the exact sequence and locations as shown in BHEL drawings that will be provided to vendor at an appropriate time during the period of execution. (3) Panels shall be suitably grouted using welding / bolting methods as appropriate. BHEL approval shall be obtained for the grouting arrangement. All necessary hardware for the same shall be within vendor scope of supply. (4) Vendor shall supply and install cable trays of required length and corner bends as required within PESS building for laying DC, AC, and control & communication cables over the trays. Vendor shall supply cable trays as follows: (a) Ladder type (for AC&DC) & Perforated type (for control and communication) GI cable trays (b) Hot dip galvanized (c) Thickness of sheet employed = 3 mm (d) Depth of tray = 40 mm (e) Width = 750 mm. Width may vary as per the requirement (5) Vendor shall fix the cable trays on the projecting steel sections in cable trench of PESS building. Supply and works related to the appropriate	

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	placement of these steel sections will be in the vendor's scope. (6) Suitable cut outs shall be made in the cable trays to provide path for the cable to reach the lower level trays. (7) Adjacent cable trays shall be interconnected using suitable hardware items that shall be in vendor scope of supply. (8) Cables shall be laid over the cable trays and neatly dressed using appropriate cable ties etc. (9) For 33kV HT power cables, cable support structure within PESS near 33kV HT switchgear panel (close to the entry and exit points) shall be provided to avoid sagging strain on the cables. Supports shall be made using suitable ISA MS angles (75x6 minimum) suitably painted with red oxide and BHEL approved black paint. BHEL approval shall be taken for the support arrangement. (10) These cable support structures at the entry and exit are to ensure that cable enters the control room/inverter rooms at an elevated level than the ground level. This will be useful to avoid any sort of water ingress into the cable trench in the control room/inverter rooms. (11) Necessary cable entry openings shall be made to PESS building for HT cables and Auxiliary transformer cable feeding ACDB. (12) All PESS cable entry openings shall be closed using a suitable sheet made of steel / aluminum / fiber etc. to arrest entry of rodents. (13) Necessary design and drawings related to cable tray arrangement in PESS shall be submitted by vendor for the approval of BHEL/NLC.	
5.18	Laying and termination of Auxiliary Power AC and DC cables at ACDB, DCDB, Battery Bank, Battery Charger, HT panels, Control and Metering panel, SCADA panels, CCTV Surveillance system, Fire alarm control panel etc: (1) All AC & DC auxiliary power cables together with cable trays, cable conduits, cable glands, cable lugs, bolts, nuts, washers etc shall be in vendor scope of supply including the cable from auxiliary transformer to ACDB. Make shall be as per approved vendor list. It is the responsibility of the vendor to assess the actual length requirements of various types of cables. (2) Vendor shall submit the details of make, GTP particulars, Bill of materials including the associated cable accessories such as glands, lugs, cable trays, cable conduits, bolts, nuts, washers etc for BHEL/NLC approval, during detailed engineering. (3) LT AC / DC power supply cables, for auxiliary power consumption from various panels in PESS and at various locations in the plant: Vendor shall appropriately select the cable type / size / rating etc and design calculations shall be submitted for BHEL/NLC approval. Quantity shall be appropriately assessed by the vendor. (4) Vendor shall make the measurements between the equipment, cut the cables to the required lengths, fix them with glands, unsleeve them at the ends, properly crimp them with suitable lugs & sockets etc., and terminate	

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	them at the respective bus bar provisions within the panels / equipment. (5) Cable terminations shall be passed through brass compression type cable glands at the entry and exit point of cubicles. The panel bottoms should be properly sealed to prevent entry of snakes and lizards etc. inside the panel. (6) All cable/wires shall be marked with good quality letter and number ferrules of proper sizes so that the cables can be identified easily. (7) All tools and accessories required to carry out the termination shall be within the scope of vendor.	
5.19	Supply, Laying and termination of Control Cables from PCSS & 33kV HT switchgear panel to Control and Metering Panel: (1) Control cables shall be laid from each PCSS and also from HT switchgear panels to Control and Metering (C&M) Panel and C&M panel shall perform following functions: (a) Remote control, metering and alarm annunciation of 33kV breakers in PCC and 33kV HT switchgear panel equipment. (b) Protections: • Inverse time over current • Instantaneous over current with adjustable time setting • Inverse time earth fault • Instantaneous earth fault with adjustable time setting • PT fuse failure • Transformer differential • Restricted earth fault • Standby earth fault • Under voltage relay with time delay • Over voltage relay with time delay • Transformer over fluxing • Trip circuit supervision • Auxiliary relay for transformer faults – winding temperature alarm and trip • High speed tripping relay. The above mentioned protection functions shall be covered with one or multiple numerical relays which has provision to communicate with plant SCADA. (c) Metering – Ammeter with selector switch, Voltmeter with selector switch and Electronic power meter/load manager (d) Annunciation – Shall annunciate during following abnormal functions: • Circuit breaker auto trip • Operation of each type of protective relay • PT fuse failure • Fault in DC control power supply equipment • Winding temperature – alarm	



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	• Winding temperature – trip (e) Control: Electrical closing of all isolators and circuit breakers. However, earth switches of isolators will be operated manually. Controls shall have suitable interlock to facilitate safe operation. (f) Indication: Using LED type indication lamps, following indications shall be provided. • Circuit breaker – open, close, fault trip, trip circuit healthy and spring charged status • Isolator and Earth switch – Open and Close status (2) Supply of C&M Panel is not in the scope of vendor. C&M panel shall have following devices and components: • Protective relays • Auxiliary relays • Instruments and meters – 2 Nos of microprocessor based, TOD, ABT compliant energy meters • Semaphore indicators • Alarm annunciation • Control and selector switches • Indicating lamps • Push buttons • Mimic diagram (3) As per the above mentioned requirements/functions, vendor shall appropriately select the type / size / rating etc of control cables and design calculations shall be submitted for BHEL/NLC approval. Quantity shall be appropriately assessed by the vendor. (4) Supply of control cables together with cable trays, cable conduits, cable glands, cable lugs, bolts, nuts, washers etc shall be in vendor scope of supply. Make shall be as per approved vendor list. It is the responsibility of the vendor to assess the actual length requirements of various types of cables. (5) Specification of control cables shall be so as to suit the system configuration adopted in this project and the cabling & accessories for the same shall be as per relevant IEC/IS codes and practices. (6) Vendor shall submit the details of make, GTP particulars, Bill of materials including the associated cable accessories such as glands, lugs, cable trays, cable conduits, bolts, nuts, washers etc. for BHEL/NLC approval, during detailed engineering. (7) Vendor shall make the measurements between the equipment, cut the cables to the required lengths, fix them with glands, unsleeve them at the ends, properly crimp them with suitable lugs & sockets etc., and terminate them at the respective bus bar provisions within the panels / equipment. (8) Cable terminations shall be passed through brass compression type	
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	cable glands at the entry and exit point of cubicles. The panel bottoms should be properly sealed to prevent entry of snakes and lizards etc. inside the panel. (9) All cable/wires shall be marked with good quality letter and number ferrules of proper sizes so that the cables can be identified easily. (10) All tools and accessories required to carry out the termination shall be within the scope of vendor. (11) BHEL shall furnish drawings/details of PCSS, C&M panel and 33kV HT switch gear panel to vendor during detailed engineering for providing necessary inputs.	
5.20	SCADA integration for the power plant along with supply of necessary data and communication cables, cable laying through trenches and cable termination: (1) SCADA of power plant comprises of data station panel and PC based control desk with software to collect, store, process and report the data parameters of power plant as follows: (a) String monitoring combiner boxes (SMCBs) in solar array field: string current, voltage, box temperature, module temperature, status of SPD and DC MCCB in SMCBs (b) Weather monitoring equipment: solar irradiation, ambient temperature, PV module back surface temperature, wind velocity, rain fall measurement and PESS room temperature. (c) PCSS data: PCU data, LT Breakers, Transformer data, RMU data, Fire alarm system data etc. (d) HT switchgear Panel and Control & Metering Panel data: Status of breakers, relay data, status of protection, metering parameters etc. (e) ACDB, DCDB, Battery, Battery Charger, Fire alarm system- Status of LT breakers, metering parameters, Battery status, Battery Charger status etc. (2) Supply of SCADA panels is not in the scope of vendor. However supply of all data and communication cables related to SCADA is in vendor's scope. Data and communication cabling shall be designed to suit the system configuration adopted in the project. The cabling and accessories for the same shall confirm to relevant IEC/IS codes and practices. (3) Vendor shall appropriately select the cable type / size / rating etc. and design calculations and data sheets of data and communication cables shall be submitted for BHEL/NLC approval. Quantity shall be appropriately assessed by the vendor as per the site requirements. BHEL shall furnish SCADA drawings and cable schedule to vendor at an appropriate time during detailed engineering. (4) Vendor shall perform following activities: (a) Formation of underground cable trenches and cable laying and termination for data communication cables from SMCBs to PCSS – SCADA panel.	

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	(b) Formation of underground cable trench and cable laying and termination for OFC cables from individual PCSS SCADA panels to main SCADA panel in PESS building. (c) Cable laying of control, signal, Ethernet, OFC and termination from HT switchgear panel and Control & Metering panel to SCADA through cable trays fitted to cable trenches in PESS. (d) Cable laying and termination from weather monitoring station to SCADA in PESS. (e) Cable laying and termination from ACDB, DCDB, Battery Bank, Battery Charger, Fire alarm system panel to SCADA panel in PESS through cable trays fitted to cable trenches in PESS. (f) Cable layout routing and trench drawings for SCADA cables shall be submitted by vendor to BHEL/NLC for approval. (5) Details regarding specification and supply of data communication cables from SMCBs to PCSS SCADA panels: (a) Cable specification: Cable, 1.1kV grade, 1 pair x 0.5 sq-mm, annealed tinned copper conductor, stranded, PVC type-A insulation, twisted pair, overall shielded with aluminum backed polyester film / Mylar sheet, inner sheath of extruded PVC type ST1, Galvanized steel strip / round wire armored as per IS, outer sheath of extruded FRLS PVC type ST1 conforming to IS: 1554 / part-1 with latest amendments up to date. Cable supply in required quantity is in the scope of the vendor. However, after considering the relevant standards, vendor shall submit the data sheet with guaranteed technical particulars for approval to BHEL/NLC. (b) This cable is meant for RS485 Modbus interfacing. The RS485 output of SMCBs shall be daisy-chain looped using this cable. (c) These data cables shall be laid underground using separate cable trench. In other words, these cables shall not be laid along with power cables. A minimum distance of 500mm shall be maintained between the data cable trench and power cable trench to avoid EMI interference. (d) Underground laying shall be ensured even within the daisy-chain looping between adjacent SMCBs. (e) Cable trench details may be as follows. However, vendor shall submit the detailed cable trench layout and cross sectional drawings as per relevant standards for approval of NLC/BHEL: • Trench depth = 600mm minimum • Trench width shall be 200mm minimum • Bottom layer shall be sand as per IS: 383 with 100mm layer thickness. • Communication – RS 485 cable shall be laid over the sand. • Another layer of sand, 100 mm thick, shall be laid. • A single layer of brick, class-2, 75mm thick, shall be laid over the	
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	sand. - Trench, then, shall be filled up with refill soil and compacted. (6) OFC cables from PCSS SCADA panels to Main SCADA panel in PESS - Armored, single mode type OFC shall be supplied and accordingly data sheet with guaranteed technical particulars shall be submitted to BHEL/NLC for approval. Required quantity as per the site condition shall be considered by vendor for supply. OFC cables shall be laid from PCSS SCADA panels to main SCADA panel located in PESS. OFC Cables shall be laid underground by way of direct burying using appropriate layers of sand, appropriate protective covering, refill soil etc to appropriate excavation depth below the ground level as per relevant Indian standards (IS:1255), Indian Electricity rule, CEIG/CBIP norms etc related to cable installation practices and procedures. OFC cable termination to SCADA panels is in the scope of the vendor. Vendor shall submit the detailed cable trench layout and cross sectional drawings as per relevant standards for approval of NLC/BHEL. (7) Supply, laying and termination of necessary data and auxiliary power cabling from weather monitoring station to SCADA is also in the scope of vendor. (8) Supply, laying and termination of necessary appropriate data and communication cabling to SCADA panels from PESS equipment such as ACDB, DCDB, HT switchgear Panel, Control and metering panel, Battery, Battery Charger, Fire alarm system etc. is in the scope of vendor. (9) Cable terminations shall be made with suitable cable lugs & sockets etc. crimped properly and passed through brass compression type cable glands at the entry & exit point of the cubicles. The panel bottoms should be properly sealed to prevent entry of snakes/lizard etc. inside the panel. (10) All cable/wires shall be marked with good quality letter and number ferrules of proper sizes so that the cables can be identified easily. (11) Cable and wiring design, data sheets, detailed cable sizing calculations and detailed explanations along with drawings shall be approved by BHEL/NLC.	
5.21	Supply and Installation works of Earthing System for Solar array structures, String monitoring combiner boxes, electrical panels in PCSS and PESS, PESS electrical room wiring circuits, Transformers in PCSS, lightning arresters, weather monitoring station equipment, compound fencing angles and all other panels/equipment/metallic structures as applicable: (1) The earthing for array and LT power system shall be made with GI pipe, 4.5 m long 40 mm diameter including accessories, and providing masonry enclosure with cast iron cover plate having locking arrangement, watering pipe using charcoal or coke and salt as required as per provisions of IS: 3043. Resistivity value of the soil is max 715 ohms-m at 3 meters depth. Necessary provision shall be made for bolted isolating joints of each	

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	earthing pit for periodic checking of earth resistance. (2) Each Array structure of the Solar PV Yard shall be grounded properly. The array structures are to be connected to earth pits as per IS standards. (3) The earthing for the power plant equipment and PCSS & PESS equipment shall be made as per provisions of IS. Necessary provision shall be made for bolted isolating joints of each earthing pit for periodic checking of earth resistance. (4) The complete earthing system shall be mechanically and electrically connected to provide independent return to earth. All equipment shall have two distinct earth connections. For each earth pit, necessary Test Point shall be provided. (5) In compliance to Rule 33 and 61 of Indian Electricity Rules, (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. (6) Vendor shall ensure adequate earthing system protection to provide an acceptable degree of protection as per IS 3043 for the array yard, PESS equipment and for PCSS. If necessary, more numbers of earth pit and conductors may be provided. Theoretical design calculations and detailed explanations along with necessary drawings shall be provided and got approved from BHEL/NLC. Earth resistance of the earth pits shall be tested in the presence of the representative of BHEL/NLC. Earth pits shall have painted name plates with identification number, date of earth resistance testing and tested value written on same. The name plate shall be of painted GI sheet clamped with steel angle/rod post erected in soil. (7) Vendor to ensure that every earthed structure is provided with two alternate paths to earth. Accordingly, vendor shall provide suitable number of earth pits and ensure that the earth resistance of all earthed structures is less than 1ohm. (8) Supply of earthing material, earthing chamber, GI/copper strips and all hardware (nuts, bolts, washers of SS304) shall be in vendor scope of supply. (9) Vendor shall submit, earthing layout, design calculations and data sheets of earthing material for approval to BHEL/NLC.	
5.22	Supply and Installation of Lightning protection system (Lightning arrestors) to protect the equipment of SPV power plant from lightning: (1) The Solar PV Power plant should be provided with Lightning and over voltage protection. The lightning protection system must be completed prior to start-up of commissioning activities of the project. The main aim of over voltage protection is to reduce the over voltage to a tolerable level before it reaches the PV Modules or other sub-system components. The source of over voltage can be lightning or other atmospheric disturbance. (2) The lightning conductors shall be designed as per Indian Standards in order to protect the entire Array Yard from lightning stroke. Vendor shall	

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	design a protection system and submit the ACAD as plotted on the PV array layout, drawings of components & system along with bill of materials for BHEL/NLC approval, during detailed engineering stage. Supply and installation of the lightning protection system together with all necessary accessories and hardware as below shall be in scope of vendor. (3) Necessary concrete foundation for holding the lightning conductor in position is to be made after giving due consideration to its shadow on adjoining solar PV modules, maximum wind speed and maintenance requirement at site in future. (4) The lightning conductor shall be earthed through flats and connected to the earth mats as per applicable Indian Standards with earth pits. Each lightning conductor shall be fitted with individual earth pit as per standards including accessories, and providing masonry enclosure with cast iron cover plate having locking arrangement, watering funnel using charcoal or coke and salt as required as per provisions of IS. (5) The Bidder shall ensure adequate lightning protection to provide an acceptable degree of protection as per IS for the entire area of SPV power plant. If necessary more numbers of lightning conductors may be provided. Theoretical design calculations and detailed explanations along with drawings shall be provided and got approved from BHEL/NLC.	
5.23	Supply, Installation and Commissioning of Weather Monitoring Station: (1) Vendor shall supply, install and commission the weather monitoring station with instruments viz., Pyranometer, Anemometer, Rain Gauge and Temperature sensors for ambient, module back surface and PESS room temperatures on the roof top of PESS building which is ~20 m away from SCADA room. Necessary pedestal footing for erection of these equipment shall also be in vendor scope. Regarding module back surface temperature sensor, it shall be fitted to any of the module which shall be nearer to weather monitoring station. (2) All necessary fixtures and accessories (poles, arms, plates, stand, hardware etc) required for mounting and erection of these shall also be in scope of vendor supply, in addition to pedestal footings. (3) All cables with necessary length required for connecting weather monitoring equipment to the data station panel (data logger / PLC) in SCADA room shall be within scope of vendor supply. (4) Data sheets, Inspection reports/Test certificates/Test reports with calibration reports, GA of weather monitoring station, Bill of Materials and other necessary drawings shall be submitted during detailed engineering for the approval of BHEL/NLC. (5) Periodical calibration of Pyranometers not exceeding three (3) months duration shall be carried out and records have to be maintained by the vendor for total contract period. (6) Details of weather monitoring equipment required are as follows. Vendor shall provide the following measuring instruments with all	



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	necessary software & hardware required to make it compatible with SCADA. - Pyranometers – 2 Nos - Anemometer – 1 No - Temperature sensor for ambient temperature – 2 Nos - Temperature sensor for PV module back surface temperature – 1 No - Temperature sensor for PESS room temperature – 1 No - Rain Gauge – 1 No (7) Typical specification of Pyranometer shall be as follows: - Spectral Response- 0.31 to 2.8 microns - Sensitivity-7 – 14 microvolt/ w/Sq.m - Time response(95%): Max 15 s - Non linearity: $\pm 0.5\%$ - Temperature Response: $\pm 2\%$ - Temperature Response: Max $\pm 2\%$ - Tilt error: $\pm 0.5\%$. - Zero offset thermal radiation: ± 7 w/m² - Zero offset temperature change ± 2 w/m² - Operating temperature range: - 40 deg.C to +80 deg.C - Uncertainty(95% confidence Level): Hourly- Max: -3% - Daily- Max: -2% - Non stability: Max $\pm 0.8\%$ - Resolution: Min + / - 1 W/m² - Input Power for Instrument & Peripherals: 230 VAC (If required) - Output Signal: Analogue form which is compatible with the data. Each instrument shall be supplied with necessary cables. Calibration certificate with calibration traceability to World Radiation Reference (WRR) or World Radiation Centre (WRC) shall be furnished along with the equipment. Periodical calibration of Pyranometers not exceeding three (3) months duration shall be carried out and records have to be maintained by the contractor for total contract period. The signal cable length shall not exceed 20m. Vendor shall provide Instrument manual in hard and soft form. Vendor shall mention the make and model of WMS components considered in their offer (8) Typical details of Ambient Thermometer/Temperature sensor: Vendor shall supply two RTD type ambient temperature measuring instruments at suitable places in PV array. Instruments shall have a range of 10 deg C to 80 deg C.	
5.24	Supply, Installation and Commissioning of Exterior lighting including illumination of periphery path, approach roads/pathways, watch towers,	



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	main gate, PCSS & PESS building external areas: (1) Vendor shall supply, install and commission adequate exterior lighting including erection of poles, fixtures, junction boxes, conduits, fittings and accessories and cables as per standards, keeping the general security in mind using auxiliary power supply system and proposed watch towers around the plant boundary. Providing watch towers is not in the scope of vendor. (2) A minimum illumination level of 50 lux shall be maintained in the internal roads/pathways. It is preferable to adopt low height bollard type road/path way illuminators to avoid shadow on adjoining solar PV modules wherever required. (3) Outdoor lighting theoretical design, calculations, cable data sheets, luminaire and lamp catalogs, Bill of Materials and detailed explanations along with drawing shall be provided and approved by BHEL/NLC. (4) Adequate spacing between the lighting poles shall be provided to ensure the minimum lux requirement. (5) Underground armored cables shall be laid for power supply. Supply, laying and termination of these cables in adequate quantity are in the scope of the vendor. (6) Supply of necessary hardware such as nuts, bolts, washers (SS304) for the work completion is in the scope of vendor. (7) Vendor to ensure the lighting arrangement does not cast shadows on the PV panels. (8) All necessary tools and tackles shall be in the scope of vendor. (9) Vendor shall construct the underground trench for laying the cables for array yard/road/pathway lights. However, vendor shall submit the trench cross sectional details and routing drawings/layouts during detailed engineering for the approval of BHEL/NLC and the work at site shall be as per approved drawings. ▪ Trench depth = 600 mm minimum ▪ Trench width = 200 mm minimum ▪ Sand as per IS: 383 of 100 mm layer thickness shall be laid at the bottom most level of trench. ▪ Over the sand layer, cables shall be laid one adjacent to the other. Cables shall not be laid one over the other. In other words, only one layer of cables shall be allowed. ▪ Over the layer of cables, one more layer of sand of 100mm shall be laid. ▪ Then, a single layer of class-2 brick of 75 mm thickness shall be laid. ▪ Trench shall then be filled up with refill soil.	
5.25	Laying and termination of 10 MW (AC) evacuation cable: (1) 33kV HT (UE) XLPE cable shall be laid from Outgoing VCB feeder of HT	

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	switchgear panel in PESS building to 33kV evacuation substation which is around 2 km from PESS building. (2) 33kV HT Cables shall be laid in underground cable trench all along the road side (near PESS) of NLC township and no road crossings are required as the SPV plant and 33kV substation are lying on the same side of the road. (3) 33kV HT Cables shall be laid underground by way of direct burying using appropriate layers of sand, appropriate protective covering, refill soil etc. to appropriate excavation depth below ground level as per relevant Indian Standards, IEC, CEIG/CBIP norms etc related to cable installation practices and procedures. Vendor shall indicate the relevant standards employed. (4) Vendor shall make the measurements and cut the cables to the required lengths and lay accordingly. (5) Supply and termination of adequate number of 33kV cable end termination kits (outdoor type) and 33kV straight through joint kits is in the scope of vendor. (6) Vendor shall submit the cable routing, cable trench layout & cross sectional details/drawings to BHEL/NLC for approval during detailed engineering and work shall happen at site as per the approved drawings. (7) Necessary tools, tackles, hardware and other miscellaneous equipment required for cable laying and termination is in the scope of vendor.	
5.26	Supply, Installation and Commissioning of Auxiliary Transformer including civil foundation, earthing, fencing, jelly spreading and providing firefighting equipment for auxiliary transformer yard: (1) Vendor shall supply an auxiliary transformer of 125kVA, 415V/415V, Delta/Star rating, ONAN, Outdoor type. NLC shall provide auxiliary power of maximum 100kW in 3 wire 415V 3 phase system. Auxiliary Transformer shall convert delta to star and shall feed the power to ACDB. (2) Transformer shall be designed and manufactured as per IS 2026-1977 and shall be supplied with first filling of oil to IS 335 of 1993. Technical particulars of Auxiliary Transformer shall be as follows: - Quantity: One - Rated kVA: 125 - Service: Outdoor - Mounting: Civil plinth/platform - Wound: Double (One for primary and one for secondary) - Winding material: Copper - Type of cooling: ONAN - Temp. rise in oil: 50 deg C - Temp. rise by resistance: 55 deg C - Vector Group: Dyn11 - Primary Connection: Delta - Primary volts: 415	

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	m) Primary phases: 3 n) Primary wires: 3 o) Secondary Connection: Star p) Secondary volts: 415 q) Secondary phases: 3 r) Secondary wires: 4 s) Taps on primary winding for primary voltage variation: +5% to - 5% in steps of 2.5% t) Terminal Arrangement: HV – Cable Box and LV – Cable Box u) % Impedance – 4% (Tolerance as per IS) (3) Vendor shall provide below mentioned fittings and accessories mandatorily and in addition to that, during the document approval by BHEL/NLC, some more fittings and accessories may be added to the list and hence vendor shall consider accordingly without any additional cost to BHEL/NLC. a. Rating and Terminal marking plate – 1 No. b. Earthing terminals – 2 Nos. c. Lifting lugs – 2 Nos. (minimum) d. Off circuit tap switch – 1 No. e. Conservator with drain plug – 1 No. f. Oil filling hole with cap – 1 No. g. Oil level indicator – 1 No. h. Dehydrating silica gel breather – 1 No. i. Air release device – 1 No. j. Thermometer Pocket – 1 No. k. Drain cum filter valve with blanking plate – 1 No. l. Filter valve with blanking plate – 1No. m. Explosion vent with diaphragm – 1 No. n. Radiators (Attachable) – Adequate o. Separate Neutral terminal – 1 No. (4) Cable glands, sockets, cable termination kits and accessories, bolts etc. are also in the scope of vendor. (5) Vendor shall submit the data sheet, detailed drawings, BoM, MQP and other relevant design parameters to BHEL/NLC for approval. (6) Data sheet shall be submitted for approval of BHEL/NLC before procurement. (7) Inspection shall be as per relevant standards and approved MQP. (8) Make of Auxiliary Transformer shall be as per the approval of BHEL/NLC. (9) Vendor shall construct the necessary civil foundation for mounting auxiliary transformer and accordingly vendor shall submit the design calculations and drawings of civil foundation to BHEL/NLC for approval. (10) Vendor shall install the transformer adjacent to the PESS	
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	building as per the relevant standards/practice and commission the transformer after performing the pre commissioning checks/tests and the test results shall be submitted to BHEL/NLC for approval. Vendor shall submit the plan and elevation drawings of auxiliary transformer yard for the approval of BHEL/NLC. (11) Vendor shall construct the fencing with wicket gate for auxiliary transformer yard and accordingly shall submit the detailed drawing, design and BoQ for fencing shall be submitted along with make list to BHEL/NLC for approval before commencement of procurement/work activities. Fencing and wicket gate shall be earthed at two separate points. (12) Vendor shall do the required earthing, gravel/jelly spreading and other activities to the auxiliary transformer yard as per the statutory requirements. Accordingly, the supply of the required material is in the scope of vendor. (13) Vendor shall provide the required firefighting equipment in auxiliary transformer yard as per the statutory requirements. (14) Vendor shall supply, lay and terminate the necessary cable required from Auxiliary transformer star side to ACDB. (15) Vendor shall provide necessary lighting to auxiliary transformer yard as per the requirements detailed in the relevant clauses of this specification. (16) Vendor shall supply, install and terminate the necessary control and auxiliary power cables from auxiliary transformer to respective 33kV VCB feeder of 33kV HT switchgear Panel and ACDB/DCDB respectively.	
5.27	Supply of LT Auxiliary power AC and DC cables: Vendor shall supply required quantity of LT auxiliary AC and DC cables including the cable from auxiliary transformer to ACDB as per the project requirements and as per vendor's scope and the cables shall be as per the below specification: (1) LV Power cables: - All LV power cables used in the work shall be armored cables unless otherwise stated and of 1100 V Grade. All cables shall be of XLPE insulated and flat steel or steel wire armored cables manufactured to IS: 7098 1988 part I and PVC insulated and PVC sheathed Armored cable in conformity with IS: 1554 of 1988 part I. The cables shall be identified as XLPE/SWA or SFA/PVC for XLPE cables and PVC/SWA/PVC for PVC insulated cables. - The cable used in the work shall be as far as possible of one manufacturer only. The cables shall be delivered to the site as complete coiled drums/coils with wrapping seals intact. The contractor shall provide manufacturer's test certificate and date of manufacture at the time of delivering the cables to the site. All	



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	multi-core cable drums shall be from manufacturer and unwound cables delivered to site shall not be approved for installation. c. The cable conductor shall be of electrolytic pure grade Aluminum conforming to IS 8130 of 1984. d. All cables shall be fitted with suitable compression or packing ring to protect the same from ingress of water and moisture. All glands shall be provided with locking nut, earth tag and PVC cable shoe/shroud. PVC insulated earth continuity conductors of appropriate size in conformity with Indian Electricity Rules shall connect all earth tags to the main earth bars at terminations of cables. The earth tags shall be individually connected to the Earth Terminals and Looping of conductors through more than one tap is not permitted. e. The compression type cable lugs shall be used for terminations. The Crimping termination of the cables shall be carried out with the help of correct compression type crimping tool with proper size dies. The compression tools and terminations materials shall be from a single manufacturer and care shall be taken to adhere to manufacturer's recommendations. PVC shoe/ shroud shall be fitted to cable terminations to prevent dust and moisture entry into terminations. f. Only terminal cable joints shall be accepted. No cable joint to join two cable ends shall be accepted unless in the case of cables exceeding the standard drum length. g. All LV cables shall be tested for insulation resistance and continuity test at two stages. • Insulation and continuity test before after laying but before backfilling. • Insulation and continuity test after backfilling. In addition, Insulation resistance test shall be conducted to measure the insulation resistance between phase conductors and between each phase conductors and earth. The resistance shall be measured with the help of megger by applying 1000 volts for duration as specified by relevant standards. Earth continuity tests to confirm that the cable armoring has been properly bonded to earth shall be carried out. Phase rotation test shall be conducted to prove that the cables have been properly connected. h. Cable shall be laid in suitable cable tray in trenches inside PESS and shall be buried in the yard with suitable protection. The type and specification of the cable tray used and cable burying scheme shall be got approved by BHEL/NLC before commencement of work.	
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	(2) LV wiring cables (If applicable): a. The low voltage wiring cables shall be PVC insulated single core, color coded, stranded Copper conductor rated for 1100 V and conforming to IS 694 and IEC 227 or the corresponding latest IEC. Conductor strand diameter and resistance of the conductor shall be in conformity with IS: 8130 of 1984. The insulation used in manufacturing the cable/wires shall be of flame retardant and low smoke generating material. b. The stranded conductor shall be made of thin strands of electrolytic copper not less than 0.25mm. The number of strands shall be suitable for the size of the cable. However the minimum number of strands shall be as follows: <table> <tr> <th>Size of the wire</th><th>Thickness of the conductor</th><th>No. of Strands.</th></tr> <tr> <td>1.5 Sq. mm</td><td>0.25 or 0.3 mm</td><td>32 or 22</td></tr> <tr> <td>2.5 Sq. mm</td><td>0.25 or 0.3 mm</td><td>50 or 36</td></tr> <tr> <td>4.0 Sq. mm</td><td>0.3 mm</td><td>56</td></tr> <tr> <td>6.0 Sq. mm</td><td>0.3 mm</td><td>84</td></tr> </table> c. All wiring for connecting various fittings shall be through steel conduits of approved make. All Tees, Bends etc. shall be of standard make. Approval for materials should be obtained from BHEL/NLC.	Size of the wire	Thickness of the conductor	No. of Strands.	1.5 Sq. mm	0.25 or 0.3 mm	32 or 22	2.5 Sq. mm	0.25 or 0.3 mm	50 or 36	4.0 Sq. mm	0.3 mm	56	6.0 Sq. mm	0.3 mm	84	
Size of the wire	Thickness of the conductor	No. of Strands.															
1.5 Sq. mm	0.25 or 0.3 mm	32 or 22															
2.5 Sq. mm	0.25 or 0.3 mm	50 or 36															
4.0 Sq. mm	0.3 mm	56															
6.0 Sq. mm	0.3 mm	84															
5.28	Supply and Installation of Surveillance CCTV system along with supply, laying and termination of associated cable laying: (1) Surveillance CCTV system is required to ensure effective surveillance of solar power plant area (array yard, PCSS rooms, PESS building etc.) as well as create a tamperproof record for post event analysis. The System shall provide an online display of video images on Large LCD/LED monitors as per Industry standard of not less than 40" size shall be located in SCADA room in PESS as well as at any of the office terminals through internet. (2) System should facilitate viewing of live and recorded images and controlling of all cameras by the authorized users present in the LAN. System should provide interoperability of hardware, OS, software, networking, printing, database connectivity, reporting, and communication protocols. System expansion should be possible through off-the-shelf available hardware. Equipment with better specifications shall be accepted. (3) All CCTV Cameras provided shall be day/night vision type and should have low lux so that the same can operate in minimum illumination also. Cameras should be IP cameras and should have remote swivel arrangement and should have both auto/manual focus mode and control should also be both manual/auto. As a minimum, 18 numbers of cameras shall be provided covering the entire area. (4) The system should be based on Stand Alone Integrated NVR (Network Video Recording). Specifications of Stand Alone Integrated NVR: I. Ability to connect Cameras as per requirement,																



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	II. Facility to store 90 days of Video, III. Capability to set the frame rate, contrast, brightness of each individual camera, IV. Should have facility to view live video (with audio) images in a monitor, in a PC and web browser. V. Remote Administration: Should be fully administrable/programmable remotely through client software and web browser. VI. Recording rate per channel – NTSC/30 fps per channel, PAL/25 per channel. VII. Configurable/adjustable recording rate. VIII. Full recording and playback facilities on remote machine. IX. Smart monitoring (Motion Detection). X. Adjustable motion detection (motion detection sensitivity should be adjustable). XI. Ability to convert H.264 video into AVI files. XII. Date and time stamping of video files. XIII. Viewing for all cameras. XIV. Should support backup devices like USB drive, DVD writer NVR Software must be able to take backup in DVD writer, USB drive etc. Remote controller shall be available for operating the NVR. XV. Should have live display, playback, and record facilities. XVI. Should have minimum 1 USB port. (5) System should have the capability of increasing the storage capacity as and when required. (6) It should have low maintenance cost and should be upgradeable to inputs for more cameras, as and when required, with minimum cost. (7) It should be compatible with alarm system. (8) IP Cameras are to be provided with suitable LAN and the Cameras should be C-mount type. (9) The firm installing the system should have adequate infrastructure for providing after sales/installation service. (10) IP Cameras of CCTV system of minimum 18 numbers should be provided so as to cover the following areas: - Power Collection Sub Station Control Room (Inside) – 5 nos. IR (Night Vision) camera. - Array Yard watch towers – 10 nos. Dome camera. - Main Entrance gate – 1 no. Dome camera. - Power Export Sub Station (PESS) Control Room – 2 nos. Box camera. The above quantities, type and location are tentative, subject to minimum of 18 cameras and shall be finalized during detailed engineering. (11) Technical Specifications of Cameras - Box Camera - 1/3" CCD colour camera with C mount Auto iris lens	
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	i. 6mm Lens with Auto Iris Lens ii. Minimum 480 TVL or above horizontal resolution iii. 0.5 Lux at F 1.2 minimum illumination iv. 270 deg swivel arrangement with remote operation. b. Dome Camera – 1/3” CCD Colour Camera i. 4mm Fixed focal lens ii. Minimum 480 TVL or above horizontal resolution iii. 0.4 Lux at F 1.2 minimum illumination c. Camera – Infra Red (Night Vision) i. 1/3” CCD Color ii. 3.6/4 mm lens with Infra-Red iii. Selectable mode for Day and Night iv. C/CS mount v. Fixed Board Lens vi. 0.0 lux minimum illumination (12) Video Cable: Video cable suitable for NVR shall be provided by the Contractor. (13) Power Cable with heavy Gauge (14) Other technical requirements: a. The NVR system should have CE certification with certificates b. All Cameras must be provided with suitable mounts/housings Wall, Dome etc. c. All cameras must be connected with NVR system with suitable cables (with heavy gauge PVC conduits) and Contractor must perform the necessary cabling to connect NVR with cameras. d. The NVR system offered must be an integrated NVR system and should not be a NVR system assembled using third party Personal Computers and NVR cards. (15) Training Aspect - At the time of installation of equipment, the vendor shall offer free training specific to CCTV system. (16) Warranty of CCTV - The CCTV system shall be warranted for 5 years from the date of commissioning of entire SPV plant and trial run completion. (17) All necessary cabling, conduits, termination hardware, necessary tools & tackles, cable laying etc. to complete the task in all aspects as per relevant standards are in the scope of vendor. (18) Circuit diagram with necessary data sheet, drawings, layouts and detailed description of the Surveillance & vigilance CCTV system should be submitted for approval to BHEL/NLC.	
5.29	Supply of 3 Nos of Portable Jet Washer Units for PV Module cleaning: (1) Three numbers solar PV module charged, battery operated portable jet washer units with water tank, high pressure pump, hose and jet nozzle shall be provided for washing the Solar PV modules at regular intervals. (2) Detailed drawings, data sheets, design documents for the same shall be	

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	submitted to BHEL/NLC during detailed engineering for approval. (3) However, providing permanent arrangement for module washing system in the solar PV plant is in BHEL scope. This permanent arrangement for module washing system shall include construction of water storage sump, pump, motor and laying buried ring main system of heavy duty rigid PVC pipe (suitable for pressurized water circulation) network covering all areas of solar PV arrays. Tap off points from the PVC supply pipe network with manual isolating valves shall be provided at number of locations for filling up portable washing machine tank. (4) Suitable solar powered Battery charging stations (2 units including standby) shall be separately supplied and installed at PESS for carrying out charging of mobile battery banks of portable jet washing vehicles units. The battery chargers shall have option to charge from grid supply in case of insufficient sunshine and solar input.	
5.30	Supply of Auxiliary ACDB, DCDB, Battery Bank and Battery Charger: (1) Auxiliary AC Distribution Board (ACDB) and plant auxiliary power distribution network requirements: - Vendor shall consider all the auxiliary AC power requirements of SPV plant while designing ACDB and this shall be placed in PESS building. - Auxiliary power supply for the Solar PV Power Plant is proposed to be met from NLC's existing power distribution network. L.T power at 415 V will be made available by NLC for about 100 kW maximum at one point near PESS. - Vendor shall provide a separate LT distribution network with an 125kVA, 415V/415V, Delta/Star Auxiliary Transformer from PESS to all PCSS and road/peripheral lighting on 24 x 7 basis with necessary internal metering of total consumption. - Power as required to provide essential and peripheral loads of PESS shall be met with necessary ACDB, internal wiring and control switches. - ACDB shall also meet the power requirements of exterior lighting, PCSS rooms, security room, PESS panels/equipment, weather monitoring station, CCTV surveillance, watch towers etc. - Proposed scheme with necessary design calculations, data sheets, layouts, drawings and description shall be submitted for approval by BHEL/NLC during detailed engineering. (2) Station DC Control Power System comprising of Battery, Battery Charger and DCDB: - Adequate capacity, 110V DC battery Bank should be provided for emergency control supply of control / protection system in 33kV HT switchgear panel, Control and Metering Panel in PESS building and for emergency lighting. A Battery charger of appropriate capacity with relevant IS/IEC standards & protection and automatic change	



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over system should be provided to charge the battery bank along with relay circuit, fuses, annunciations etc. A DC power supply Distribution panel/board should be supplied along with the Charger as per relevant IS standards. Each PCSS is equipped with Battery, Battery Charger and DCDB for its internal auxiliary power requirements. Supply of Battery, Battery Charger and DCDB that are located in each PCSS is in the scope of BHEL. However, cable supply, cable laying, termination and providing AC auxiliary power supply from ACDB to each PCSS is in the scope of vendor. The basic design data for battery, battery charger and DCDB shall be as follows:

b) Battery:

- i. Type of cell: Valve regulated lead acid type (VRLA) only
- ii. Nominal DC voltage : 110V DC
- iii. Load: To meet the requirements of relays, breakers, indication lamps, hooters, mimics etc. in 33kV HT switchgear panel and Control and Metering Panel, emergency lighting, UPS, FAS, etc.
- iv. Battery capacity : Ah to suit based on 10 hour rate of discharge
- v. Duty : Sub Station duty
- vi. End cell voltage : 1.85 Volts
- vii. Ampere hour efficiency : Better than 90%
- viii. Watt hour efficiency : Better than 80%
- ix. Self-discharge: Not to exceed 1% per week.
- x. Accessories : Battery rack made of acid resistant paint coated steel sheet
Set of lead coated heavy duty copper strips with bolts and nuts as inter cell and inter row connectors
Cell testing voltmeter
Thermometer with temperature correction chart

c) Battery Charger:

- i. The battery charger shall be designed for charging the battery in float as well as boost modes and simultaneously supplying the continuous load current indicated in the duty cycle. The charger shall be designed to operate with input voltage as 415V +10%, 3 phase, 50 Hz +5%/-3% with an output voltage shall be 110VDC +1%.
- ii. The charger shall consist of input switchgear, two winding transformer, SCRs and diodes, regulator, filter circuit, output switchgear, metering and protective devices for under voltage, over voltage and earth fault, alarm indicator circuit and integral DC distribution board. All necessary indications and meters like AC voltmeter, DC voltmeter, DC ammeter etc. shall be provided. Indication for DC battery connected to

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	load shall also be provided. iii. Both float and boost chargers shall have control device to vary the voltage to achieve the desired output. iv. The output voltage of bridge for float charger shall be 120V DC max. The output voltage of the bridge for boost charger shall be 145V DC max. v. The charger shall be provided with auto-changeover circuitry from float to boost and vice versa in addition to manual changeover switch. The float circuit shall be designed for supplying the continuous load current as well as charge the battery. The boost circuit shall be suitable for delivering charging current suitable for 110V, battery. RMS ripple factor in input voltage of the charger shall not be more than 3%. d) DC Distribution Board (DCDB): i. The DCDB shall form an integral part of main battery charger. It shall be compartmentalized; dust & vermin proof and shall be equipped with main incoming switch fuse unit and required number of double pole MCBs and switch fuse units. ii. The utilization category of the DC switching devices shall be based on the individual loads as recommended in IS 13947. e) DC Battery, charger and DC power distribution system theoretical design, calculations and detailed explanations along with drawings, data sheets, layouts and Bill of Materials shall be provided vendor which will be approved by BHEL/NLC.	
5.31	Identification markings using paint and cable tags, as applicable to the individual cases and as approved by BHEL, shall be provided: (1) String monitoring combiner boxes: Identification marking by way of painting on nearby module structure. (2) All PESS equipment such as Control and Metering panel, ACDB, DCDB, Battery Charger shall be provided with suitable identification markings using painting, with inscriptions as approved by BHEL. (3) Identification markings for all the earth chambers (using painting) with inscriptions as approved by BHEL. (4) Cable tags using aluminum plate of 1-2 mm thickness with suitable inscriptions as approved by BHEL for all the power cables of the electrical panels such as HT switchgear panel, Control and metering panel, Batteries, Battery chargers, DCDB, ACDB panel etc. (5) Identification markings on all MMS and Lightning arrestors with inscriptions as approved by BHEL.	
5.32	Cable markers (1) Steel cable markers with suitable labels (DC cable, LT cable, HT cable, Data cable etc.) and arrow marks (pointing to the cable destination) shall be supplied and installed along the cable trenches for following	

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	cases: - For DC power cables from SMCBs to respective PCSS containers. - For data communication cables from SMCBs to PCSS and among SMCBs. - For cables of yard lights of solar array field, periphery road etc. - For HT cables among PCSS and from PCSS to PESS - Cable markers shall be suitably grouted with concrete foundation depth of minimum 300 mm below the ground level. Cross section of foundation shall be minimum 200mm diameter. - Cable markers shall have a minimum height of 300 mm above the ground level. - Cable markers shall be suitably painted.	
5.33	Hoarding/Sign board for the solar power plant. - Aesthetically designed sign board shall be provided at the entrance of approach road to Solar PV Power Plant from NLC town ship road. - The sign board shall contain brief description of the Power Plant. - The Signboard will be made of stainless steel tubular frame with steel plate of not less than 3 mm. - Necessary steel tubular support column with concrete foundation shall be provided. - Letters on board shall be designed with proper colour scheme and glowing paint system / arrangement. - The design & size of the signboard shall have to be befitting the Power Plant Office cum Power Export Sub Station. - The sign board design and drawing shall be submitted to BHEL/NLC for approval before commencing the manufacture.	



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5.34	Display boards and sign boards <table border="1"> <tr> <td>1</td><td>Board displaying instruction chart for restoration of person from Electric Shock</td><td>2 Nos</td></tr> <tr> <td>2</td><td>Board displaying instruction chart for artificial respiration</td><td>2 Nos</td></tr> <tr> <td>3</td><td>Board displaying dos and don'ts.</td><td>2 No</td></tr> <tr> <td>4</td><td>Board displaying fire extinguishers details and operations</td><td>2 Nos</td></tr> <tr> <td>5</td><td>"No smoking" board</td><td>5 Nos</td></tr> <tr> <td>6</td><td>Board showing list of O&M staff with name, qualification and work responsibility</td><td>2 No</td></tr> <tr> <td>7</td><td>Board showing list of contact details of NLC, BHEL, O&M team, O&M security, police station, fire service, hospital, medical store etc. with names, address, mobile numbers etc.</td><td>2 Nos</td></tr> <tr> <td>8</td><td>Danger boards with details such as value of voltage etc. for SMCBs, HT switchgear panels, LT panels etc.</td><td>Qty as required</td></tr> <tr> <td>9</td><td>Identification boards, of suitable sizes, within PESS building such as SCADA room, store room (AC & non AC), battery room, security room, gents / ladies toilets, pantry etc. shall be supplied by vendor. BHEL will provide the list during detailed engineering.</td><td>~20 Nos</td></tr> </table> (a) 5mm thick sun board with LG make vinyl sticker (computerized cutting and pasting) shall be used for SI Nos 4, 5, 8 and 9. (b) For others, flex banner with design & printing shall be used.	1	Board displaying instruction chart for restoration of person from Electric Shock	2 Nos	2	Board displaying instruction chart for artificial respiration	2 Nos	3	Board displaying dos and don'ts.	2 No	4	Board displaying fire extinguishers details and operations	2 Nos	5	"No smoking" board	5 Nos	6	Board showing list of O&M staff with name, qualification and work responsibility	2 No	7	Board showing list of contact details of NLC, BHEL, O&M team, O&M security, police station, fire service, hospital, medical store etc. with names, address, mobile numbers etc.	2 Nos	8	Danger boards with details such as value of voltage etc. for SMCBs, HT switchgear panels, LT panels etc.	Qty as required	9	Identification boards, of suitable sizes, within PESS building such as SCADA room, store room (AC & non AC), battery room, security room, gents / ladies toilets, pantry etc. shall be supplied by vendor. BHEL will provide the list during detailed engineering.	~20 Nos	
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5.35	Electrical insulation mats (1) Vendor shall supply -70Nos approx of electrical insulating mat as follows: (a) Make shall be as per the approval of BHEL/NLC. (b) As per IS: 15652:2006 (c) Class B (d) Thickness 2.5 mm minimum (e) Size = 2m x 1m minimum (f) Colour: Black. (g) Max use voltage = 33 kV (h) Marking of IS standard on the mat (2) Test certificate shall be provided by vendor. (expiry date to be verified before supplies for quality and longevity of service life) (3) Vendor shall lay the mats in front of electrical panels (PCUs, RMUs, LT, HT, Battery Charger, ACDB panels) in PCSS rooms and PESS building.																												
5.36	Chequered plate for closing the cable trenches in PESS building (1) Plate shall have a suitable handle (welded to the plate) to facilitate ease of lifting and movements. (2) Plate thickness = 6mm																												



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	(3) Width = 1000 mm max, total length required: 120m approximately (4) These width and length dimensions are indicative. Actual dimensions shall be based on site conditions. (5) Plate shall be red oxide coated followed by black painting. (6) BHEL/NLC approval shall be obtained for overall arrangement of checkered plate.																																																																			
5.37	Air conditioner Split air conditioner of 2T (approx.) capacity with stabilizer (1 set) each shall be supplied and installed in SCADA room, AC store room and Office room. Air conditioner shall be of appropriate energy efficient (5 star as per BEE standards) and the final rating of Air conditioner shall be so as to design the system to maintain 20 +/- 2 deg C in SCADA room and 25 +/- deg C in AC stores and office rooms. Make shall be as per the approved vendor list of NLC. Data sheet shall be submitted for the approval of BHEL/NLC.																																																																			
5.38	Tools and Tackles: Vendor shall provide complete, new and unused sets of all special tools and tackles which will be required for normal operation and maintenance. The list of tools and appliances included in the scope shall be as specified in below table. <table border="1"> <thead> <tr> <th>Sl.No.</th><th>Item Description</th><th>Quantity</th></tr> </thead> <tbody> <tr><td>1</td><td>Insulation tester 500V (Megger)</td><td>1 No</td></tr> <tr><td>2</td><td>Insulation tester 5000V (Megger)</td><td>1 No</td></tr> <tr><td>3</td><td>Earth tester</td><td>1 No</td></tr> <tr><td>4</td><td>Digital Tong tester</td><td>1 No</td></tr> <tr><td>5</td><td>Digital Multi-meter with Graphic display</td><td>1 No</td></tr> <tr><td>6</td><td>Tool box</td><td>1 No</td></tr> <tr><td>7</td><td>Crimping tool (2.5 to 240sq mm)</td><td>1 No</td></tr> <tr><td>8</td><td>Insulation stripper</td><td>1 No</td></tr> <tr><td>9</td><td>Analog multi meter</td><td>1 No</td></tr> <tr><td>10</td><td>Analog tong tester (AC/DC)</td><td>1 No</td></tr> <tr><td>11</td><td>Electronic Relay Testing Kit</td><td>1 No</td></tr> <tr><td>12</td><td>Torque Wrench</td><td>2 Nos</td></tr> <tr><td>13</td><td>Breaker lifting / handling truck of each type</td><td>1 No</td></tr> <tr><td>14</td><td>Fuse pullers of each type</td><td>5 Nos</td></tr> <tr><td>15</td><td>PV Array Tester</td><td>1 No</td></tr> <tr><td>16</td><td>IR Hand-held Temperature Scanner</td><td>1 No</td></tr> <tr><td>17</td><td>Temperature Indicator</td><td>1 No</td></tr> <tr><td>18</td><td>Solar Module Portable Cleaning Kit</td><td>1 No</td></tr> <tr><td>19</td><td>Rheostat</td><td>1 No</td></tr> <tr><td>20</td><td>C.R.O</td><td>1 No</td></tr> <tr><td>21</td><td>Function Generator</td><td>1 No</td></tr> </tbody> </table>	Sl.No.	Item Description	Quantity	1	Insulation tester 500V (Megger)	1 No	2	Insulation tester 5000V (Megger)	1 No	3	Earth tester	1 No	4	Digital Tong tester	1 No	5	Digital Multi-meter with Graphic display	1 No	6	Tool box	1 No	7	Crimping tool (2.5 to 240sq mm)	1 No	8	Insulation stripper	1 No	9	Analog multi meter	1 No	10	Analog tong tester (AC/DC)	1 No	11	Electronic Relay Testing Kit	1 No	12	Torque Wrench	2 Nos	13	Breaker lifting / handling truck of each type	1 No	14	Fuse pullers of each type	5 Nos	15	PV Array Tester	1 No	16	IR Hand-held Temperature Scanner	1 No	17	Temperature Indicator	1 No	18	Solar Module Portable Cleaning Kit	1 No	19	Rheostat	1 No	20	C.R.O	1 No	21	Function Generator	1 No	
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	22	Inverter Testing Kit	1 No																															
	Note: Details of equipment / instrument, make, numbers, range, accuracy, Etc. shall be furnished in the bid. Make / model number etc. shall be approved by BHEL/NLC prior to procurement.																																	
5.39	Office furniture: Adequate and appropriate ergonomically designed furniture of approved make for the office, SCADA room, AC and non AC stores shall be included in the offer. The furniture should be chosen in such a way that it matches with the décor of the rooms. Furniture shall be modular design and make shall be Godrej or equivalent reputed supplier. The furniture to be included in the scope shall not be limited to the list given below. <table><tr><td>Sl.No.</td><td>Description</td><td>Quantity</td></tr><tr><td>1</td><td>Executive steel table with glass top and 3 sliding drawers</td><td>3 Nos.</td></tr><tr><td>2</td><td>Height adjustable cushioned chair with arm rest</td><td>5 Nos.</td></tr><tr><td>3</td><td>Steel table with 3 sliding drawers for stores</td><td>2 Nos.</td></tr><tr><td>4</td><td>SCADA workstation table (Modular design)</td><td>1 Set</td></tr><tr><td>5</td><td>Computer station chair with hand rest, back and height adjustment</td><td>2 Nos.</td></tr><tr><td>6</td><td>Standard filing Cabinet</td><td>2 Nos.</td></tr><tr><td>7</td><td>Standard steel cupboard</td><td>2 Nos.</td></tr><tr><td>8</td><td>Slotted angle racks for stores</td><td>6 Nos.</td></tr><tr><td>9</td><td>Workers locker (6 compartment design)</td><td>2 Nos.</td></tr></table> Vendor shall arrange to get the modular furniture arrangement as well as furniture types approved by BHEL/NLC before proceeding with the procurement.			Sl.No.	Description	Quantity	1	Executive steel table with glass top and 3 sliding drawers	3 Nos.	2	Height adjustable cushioned chair with arm rest	5 Nos.	3	Steel table with 3 sliding drawers for stores	2 Nos.	4	SCADA workstation table (Modular design)	1 Set	5	Computer station chair with hand rest, back and height adjustment	2 Nos.	6	Standard filing Cabinet	2 Nos.	7	Standard steel cupboard	2 Nos.	8	Slotted angle racks for stores	6 Nos.	9	Workers locker (6 compartment design)	2 Nos.	
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5.40	Supply, Installation and commissioning of Fire detection, protection and firefighting system: (1) The Power Export Sub Station shall be equipped with suitable fire protection & firefighting systems for protection of entire equipment as per CEIG requirements. Bidder shall comply with recommendation of Tariff Advisory Committee / LPA for incurring minimal premium for insurance. The installation shall include fire / smoke detection and alarm system for 33 kV Switch gear room and SCADA room, Fire alarm panel, clean agent gas extinguishing system such as IG 541/IG 55 and portable DCP fire extinguishers. (2) Vendor to provide intelligent microprocessor based main fire alarm panel																																	



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	of modular construction complete with central processing unit, input and output modules, power supply module, supervision control and isolator modules with 10% spare provisions. Fire detection alarm system shall include alarm initiating devices e.g. multi sensor type smoke detectors and alarm notification Appliances (Audio device). (3) Fire Alarm Control Panel: - Alarm conditions shall be immediately displayed on the control panel of Power Export Sub Station Control Room. Alarm LED shall flash on the control panel until the alarm has been acknowledged. Once acknowledged the LED shall remain lit. A subsequent alarm received from another zone after acknowledgement shall illuminate the alarm LED and the panel display shall show the new alarm information. - During an alarm condition, an alarm tone shall sound within the control panel until the alarm is acknowledged. - If the audible alarm signals are silenced for any reason, they shall automatically resound if another zone is activated. - All alarm signals shall be automatically "locked in" at the control panel until the operated device is returned to its normal condition and the control panel is manually reset. (4) Vendor shall submit the layouts, design, drawings and data sheets related to fire detection, protection and firefighting system for the approval of BHEL/NLC. (5) Vendor shall supply the firefighting system of required quantity as per the relevant statutory requirements and as per the BHEL/NLC approved drawings. (6) During operation and maintenance period, vendor shall refill the fire extinguishers as per manufacturer's recommendation before expiry.																
5.41	Safety related items <table border="1"> <tr> <td>1</td><td>Gas Mask</td><td>2 Nos</td></tr> <tr> <td>2</td><td>First Aid Box with essential medicines and bandage cotton, antibiotic cream, Dettol, etc.</td><td>2 set</td></tr> <tr> <td>4</td><td>Hand Gloves 1KV for Maintenance of SMB</td><td>2 sets</td></tr> <tr> <td>5</td><td>Discharge rod</td><td>2 Nos</td></tr> <tr> <td>6</td><td>Safety Helmet</td><td>10 Nos</td></tr> </table>	1	Gas Mask	2 Nos	2	First Aid Box with essential medicines and bandage cotton, antibiotic cream, Dettol, etc.	2 set	4	Hand Gloves 1KV for Maintenance of SMB	2 sets	5	Discharge rod	2 Nos	6	Safety Helmet	10 Nos	
1	Gas Mask	2 Nos															
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5	Discharge rod	2 Nos															
6	Safety Helmet	10 Nos															
5.42	Pre-commissioning inspections / checks / tests and coordination with state departments for necessary approvals and clearances for commissioning, synchronization with grid and post-commissioning operation of the plant: (A) Vendor shall carry out following minimum pre-commissioning checks: (1) Verification of firmness of terminations in all electrical equipment:																



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	SMCBs, PCUs/LT Bus panels, RMUs, HT switchgear panels, transformers, SCADA stations, weather monitoring equipment, Control and Metering (C&M) Panel, ACDB, DCDB, Battery and Battery Charger etc. (2) Verification of earthing for all these electrical equipment. (3) Measurement and verification of parameters at SMCBs at solar array field: string current, voltage, combined SMCB output current, module temperature, SMCB temperature. (4) Measurement and verification of parameters on DC input side of PCUs: DC current and voltage; Vendor shall support the PCU engineer on these tests. (5) Insulation resistance measurements (HV megger tests) for all the electrical equipment of PCSS and PESS. (6) Functional checks for LT Bus panels (Air circuit breakers): ACB on/off operations, spring charging, LED indications, etc. (7) Functional checks for PCUs: Vendor shall support the PCU engineer during the pre-commissioning tests. (8) Functional checks for transformer marshalling box: Availability of AC/DC power supply, (b) Responses of the relays at VCB relay chamber in RMU panels and corresponding indications/annunciations for various transformer alarm/trip faults. (9) Functional and annunciation checks for RMU panels and C&M panels: (a) Availability of AC/DC power supplies, (b) VCB on/ off, (c) spring charging, (d) LED indications, (e) functioning of electromagnetic and numerical relays, (f) responses at VCB panels to remote operations from SCADA station, (g) indications on annunciation windows, alarm accept/reset operations. (h) all functional & operational checks at C&M panel (b) Verification of interlock operations related to upstream and downstream VCBs. (10) Verification of parameters at SCADA station: (a) DC/AC parameters from SMCBs, PCUs, RMUs, 33kV HT switchgear panels, ACDB panels, Metering panels, (b) status of ACB/VCB breakers and transformer protection relays, (c) weather monitoring parameters. (11) Functional checks on SCADA software: mimic diagrams, trend graphs, remote accessibility etc. (12) Earth resistance measurements for solar array, PCSS and PESS equipment. (B) Pre-commissioning tests on transformers, CTs, PTs, vacuum circuit breakers, RMUs, relays, etc.: (1) Usually performed tests are indicated as below. However, exact type of tests required to be conducted at site prior to commissioning shall be in line with concerned state electricity board / CEIG requirements.	
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	(a) Transformers: As per the applicable standards and manufacturer's recommendations (b) 33kV vacuum circuit breaker panels: IR tests and continuity tests for panels, IR values for CTs/PTs, excitation test on CTs, primary injection tests for CTs, ratio test for PTs (c) RMU: As per the applicable standards and manufacturer's recommendations (d) Relays in VCB panels: open/close, tripping, and primary injection tests. (e) CTs/PTs: IR tests, Polarity tests, Ratio tests, Burden tests, Winding resistance tests, Primary injection tests, excitation tests. (f) NABL approved Lab/Third party based calibration of Energy meters as required for recording of performance (and recalibration as per calibration validity during O&M period as necessary to be provided) (2) Appropriate testing agency shall be arranged for the tests. (3) Vendor shall coordinate / liaison with concerned state / central electricity board departments / CEIG etc., as the case may be, to fix up test schedules and witness by their representatives. (4) Vendor shall prepare and submit the reports to concerned MRT departments and obtain their approval through necessary liaison activities. (C) Vendor shall submit detailed list of pre-commissioning tests/checks and commissioning procedure for PV plant which also covers above mentioned tests/checks for the approval of BHEL/NLC before commencing the activity. (D) Vendor shall coordinate and liaison with concerned state / central electricity departments / CEIG etc., as the case may be, prepare and submit the applications with necessary enclosures on behalf of BHEL / NLC and obtain their approval: (a) Approval for drawings (b) Approval for synchronization of plant with grid. (c) CEIG inspection of power plant (d) Provisional CEIG clearance to proceed with commissioning (E) Vendor shall implement corrective steps on the observations of CEIG, follow-up with them and obtain final clearance for licensed operation of the plant on a continuous basis. Note: Scope of coordinating with concerned state / central electricity departments, CEIG to get the clearances / approvals for licensed / statutory operation of the power plant on a continuous basis includes all transactions required for successful liaison and clearances. Application fees and renewal fees (say, in the form of DD) to be enclosed with application / renewal documents and all other expenses in the above process shall be in the scope of vendor.	
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5.43	Spares and Tools & Tackles	
5.43 .1	Spares and Consumables: (a) Vendor shall supply the below mentioned mandatory spares: i. LT MCCB – 1 No. of each type ii. LT MCB – 1 No. of each type iii. HRC Fuses – 10% of each type and rating iv. Contactors and Relays – 10% of each type and rating v. Indication lamps (bulbs) – 10% of each type vi. Push Buttons and Switches – 10% of each type vii. Terminal blocks – 10% of each type viii. Light fittings and bulbs – 10% of each type ix. Fire detection system PCBs – 1 No. of each type x. Smoke and Fire detectors – 1 No. of each type xi. Cable lugs and plugs -5% of each type xii. Surveillance Camera – 1 No. of each type xiii. Metrology Instruments – 1 No. of each type xiv. Pyranometer -1 No. xv. Multi-Function type Energy Meter - 0.2s class – 1 No. (b) Apart from the above mentioned mandatory spares, vendor shall include in his offer a list of spares for the equipment/system supplied for startup, commissioning and successful operation of the plant. The cost of such spares shall be included in the plant and machinery and shall be supplied along with the plant equipment. These spare items shall be based on vendor's experience in commissioning similar plants in the past. Vendor shall be responsible for having the required spares / items at site in sufficient quantities and any short fall at the time of startup or commissioning shall be made good without additional cost to BHEL/NLC. Any item of spares used by the vendor from out of the mandatory spares during start up and commissioning, warranty period or O&M contract period shall be replenished by the vendor free of charge before completion of contract. (c) In compliance with the requirements of tender documents, the prices for mandatory spares must be given separately, and shall be used for bid evaluation purposes. All these spares shall be delivered at site after provisional take over. Vendor shall maintain the mandatory spares, consumables & various components of the plant for smooth running during O&M period. Vendor shall also replenish the consumed mandatory spares during the 1 year warranty and 3 years O&M period to maintain the stock when handing over the plant to NLC for operation and maintenance. Vendor shall also mention the specification and the source of supply for these mandatory spares and consumables. (d) The spares supplied shall be strictly interchangeable with parts for which they are intended for replacement.	

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	(e) The spares shall be treated and packed for long storage (minimum 4 years) under the climatic conditions prevailing at the site.	
5.43 2	Tools and Tackles: Vendor shall include in his scope supply of all regular operation and maintenance tools. List of tools and tackles required to be supplied for operation and maintenance of the plant is mentioned in Clause 5.38. These tools and tackles shall be delivered along with the mandatory spares.	

6.0 Quality Assurance, Inspection and Testing:

6.1	BHEL and/or NLC shall witness routine / acceptance/type tests performed at manufacturer works for following items as per the BHEL/NLC approved Manufacturing Quality Plan (MQP). Vendor shall accordingly provide inspection call to BHEL, with submission of MQP to BHEL in advance for the approval of BHEL/NLC. 1. HDPE DWC pipe 2. Hard PVC conduit 3. Array Lightning Arresters 4. Weather monitoring station 5. ACDB 6. Battery Bank 7. Battery Charger and DCDB 8. CCTV Surveillance system 9. All cables under vendor scope 10. Earthing electrodes and earthing materials 11. MC4 connectors 12. Portable Jet Washer Units 13. Air conditioner 14. Fire alarm system 15. Fire extinguishers 16. Electrical insulation mat 17. Outdoor Lighting – luminaire and components 18. 33 kV termination kits (indoor, outdoor and straight through joint kits) 19. Auxiliary Transformer Note: In case the item is 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 for procurement of the item from dealers.	
6.2	For all spares and replacement items, the quality requirement as agreed for the main equipment supply shall be applicable.	

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6.3	No dispatches shall be made by the supplier without obtaining inspection certificate from BHEL/NLC along with clearance for dispatch. Where ever reworks are involved re-inspections may be conducted and all expenditure towards the same shall be borne by the vendor.	
6.4	Field Inspection and Testing: Field Quality Plans (FQP) for vendor's scope of works shall detail out all the site tests / checks to be carried out during receipt, storage, erection of the equipment. Vendor /sub-Contractor shall also furnish copies of the erection & commissioning manuals, reference documents and inspection procedure through soft as well as hard copy. FQP will be mutually discussed and finalized preferably in the format mentioned. After FQP finalization / approval the same shall be submitted in compiled form on CD-ROM. In these approved Field Quality Plans, BHEL/NLC shall identify customer hold points (CHP), i.e. test/checks which shall be carried out in presence of BHEL/NLC Project Manager or his authorized representative and beyond which the work will not proceed without consent of BHEL/NLC in writing. All deviations to the specifications, approved quality plans and applicable standards shall be documented and referred to BHEL/NLC along with technical justification for approval and for Completion Report.	

7.0 General conditions applicable during installation and commissioning phase

7.1	As already mentioned in previous clauses, vendor shall be provided with LT (415 V, 3 phase, 50 Hz) power supply at one point in the site near PESS for construction and O&M purposes at free of cost to vendor. But, all distribution and controls inside the power plant area shall be made by the vendor at his own cost.	
7.2	Similarly, water required for construction and O&M works shall be provided to vendor at free of cost to vendor at one location in plant. Vendor shall arrange required distribution and control arrangement at his own cost to make use of the available water for required construction and O&M purposes.	
7.3	All machinery such as cranes, hydra, JCBs, forklifts, transport trucks, trolleys etc. necessary for movement of materials shall be organized by the vendor.	
7.4	All necessary tools and tackles such as crimping tool (including heavy duty tools for crimping copper cables up to 300 sq-mm), screw driver set, power screwdrivers, 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 for RCC works, spade, shovel, hammer etc. shall be organized by the vendor.	

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7.5	All necessary measuring instruments such as digital multimeters, electrical testers, meggers (1kV, 2.5kV, 5kV), lamp load testers for solar array string measurements, earth resistance meters, weighing machines, water level indicators etc shall be organized by the vendor.	
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.	

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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	Any deviations shall be discussed with BHEL/NLC site engineers and implementation shall be taken up only after approval from BHEL/NLC.	
7.18	Vendor shall submit periodic status report, on daily as well as weekly consolidated basis, to BHEL/NLC on the progress of the contract.	

8.0 Operations and Maintenance

8.1	General:	
8.1.1	8.1.1 (a) After successful commissioning of entire SPV plant in all aspects, the plant shall be in testing and trial power exports for a period of 15 days. Date of Provisional take over shall be considered on the next day of completion of 15 day testing and trial period. The plant will be under warranty for One (1) year after provisional takeover. Operation and maintenance of the entire Solar PV Power Plant including its associated civil structures, Control Room buildings, Array Yard, Garden and live fence along the compound fencing etc. during the one year warranty period is in the scope of the vendor. The performance Guarantee test will be for a period of 1 year and this will be running concurrently with the 1 year warranty period. 8.1.1 (b) Final takeover of the plant shall be considered after the successful completion of one year PG test and Vendor shall carryout comprehensive O&M of the entire Solar PV Power Plant including its associated civil structures, Control Room buildings, Array Yard, Garden and live fence along the compound fencing etc. for a period of 3 years from the date of Final takeover.	

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8.1.2	The 33kV Transformer and the 33kV cabling and installation of equipment at the TANGEDCO 33kV substation should have also been completed by the time of commencement of O&M such that power export from the entire Solar PV Power Plant could commence.	
8.1.3	O&M work includes day to day operation and maintenance of Solar PV Power Plant including, maintenance of LT lines, MV lines up to evacuation point and maintenance of all Civil Works.	
8.1.4	Vendor will furnish necessary details regarding technical competence, qualification and number of different grades of personnel to be posted at site along with proposed maintenance (preventive) schedule for the operation and maintenance of the power plant for approval of BHEL/NLC.	
8.1.5	The maintenance staff of the vendor shall be available in the Power Plant for 24 hours every day irrespective of whether the plant is in operation or not unless otherwise instructed by the BHEL/NLC in writing.	
8.1.6	Vendor's representatives/employees shall conform to all general regulations in force at NLC site and to any special conditions affecting the local administration issued by NLC or duly authorized representative of NLC. All employees of the vendor living at site shall be deemed to be aware of dangers and risks incidental to the conditions of the NLC's land and works from time to time and BHEL/NLC shall not be responsible for any injury arising there from.	
8.1.7	BHEL/NLC reserves the right to ask the vendor to remove/transfer any staff of the vendor from site without assigning any reason whatsoever. Instructions issued in writing to the vendor in this matter shall be binding and the vendor shall replace the transferred/removed person with a suitable person immediately. BHEL/NLC shall also have power to disallow any maintenance personnel, if found unsuitable. Vendor shall have to replace such persons within 24 hours.	
8.1.8	All persons deployed by the vendor for regular maintenance & operation must remain in proper uniform while on duty. Vendor shall supply uniforms, raincoats, toolset, gloves, gumboots and other items required for carrying out the services.	
8.1.9	Vendor shall maintain attendance register for all their staff deployed for carrying out jobs on regular basis and shall be produced for verification on demand by authorized personal of BHEL/NLC.	
8.1.10	Vendor shall ensure that all safety measures are taken at the site to avoid the accidents to his employees or his sub-contractor's employees.	

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8.1.11	Vendor shall comply with the provision of all relevant Acts of Central or State Governments including payment of Wages Act 1936, Minimum Wages Act 1948, Employer's Liability Act 1938, Workmen's Compensation Act 1923, Industrial Dispute Act 1947, Maturity Benefit Act 1961, Employees State Insurance Act 1948, Contract Labour (Regulations & Abolishment) Act 1970 or any modification thereof or any other law relating whereto and rules made there under from time to time.	
8.1.12	In order to ensure longevity, safety of the core equipment and optimum performance of the system, the vendor shall use only genuine spares of high quality standards.	
8.1.13	Vendor shall immediately report the accidents, if any, to the Project Manager of BHEL/NLC and to all the concerned authorities as per prevailing laws of the state.	
8.1.14	Vendor shall coordinate with the suppliers of BHEL supplied items and with corresponding warranty terms for taking up O&M activities successfully during 4 years of O&M period.	
8.2	Scope:	
8.2.1	Vendor shall provide his maintenance staff at the power Plant for day-to-day operation and maintenance. The maintenance personnel shall be qualified, certified by competent authorities and well trained so that they can handle any type of operational hazards quickly and timely. The responsibility of providing suitable Personal Protection Equipment rests solely with the vendor.	
8.2.2	Vendor shall arrange to provide proper and elaborate O&M training of Solar Power Plant and associated power evacuation arrangement to the NLC's staff for successful takeover of the plant in due course of time.	
8.2.3	The security of the Power Plant will rest with the vendor, till such time, the operation and maintenance of the power plant have been taken over by NLC.	
8.2.4	The maintenance personnel shall be in a position to check and test all the equipment regularly, so that, preventive maintenance, could be taken well in advance to save any equipment from damage. Abnormal behavior of any equipment shall be brought to the notice of BHEL/NLC not later than 2 hours for taking appropriate action.	
8.2.5	All repairing & replacement works are to be completed by the vendor within 24 hours from the time of occurrence of fault or defect during the period when the solar panels are not generating power i.e., evening to morning. If it is not possible to set right the equipment within this time, the vendor shall notify BHEL/NLC indicating nature of fault & cause of damage etc. within 12 hours from the time of occurrence of the fault.	

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8.2.6	During operation and maintenance if there is any loss or damage to any component of the power plant due to miss-management/ miss-handling or due to any other reasons, what so ever, the vendor shall be responsible for immediate replacement / rectification of the same. The damaged component may be repaired, if it is understood after examination that after repairing performance of the components shall not be degraded, otherwise the defective components shall have to be replaced by new one without any extra cost to BHEL/NLC.	
8.2.7	The scope of maintenance work shall include the following:	
8.2.7.1	Regular operation and maintenance of the Solar PV Power Plant including water supply pump and submission of daily performance data of the power plant. Vendor shall maintain log book in this respect to clearly record the date of checking & comments for action taken etc.	
8.2.7.2	The scope of operation includes exporting power to the 33kV grid. Proper records of operation of Power Plant System are to be kept as per direction of BHEL/NLC.	
8.2.7.3	Cleaning of the Power Plant including array yard on regular basis using the battery operated portable jet washer unit with installed water sump and pump system. All three numbers Solar PV module charged battery operated washer units should be maintained in good working condition.	
8.2.7.4	Normal and preventive maintenance of the Power Plant such as cleaning of module surface, tightening of all electrical connections, Line accessories, Transformers (including transformer oil BDV check, top up and filtration) and associated switch gear on the HT side.	
8.2.7.5	Keeping & recording daily log sheet as per approved format for the Power Plant.	
8.2.7.6	Operation of the Power Plant has to be in accordance with the availability of Solar Energy and feeding to the grid. Under no circumstances, the operator shall run the power plant damaging the substation grid.	
8.2.7.7	Vendor's employees shall use no part of the power plant building for residential or any other purpose except for running the plant.	
8.2.7.8	Vendor shall submit monthly Performance report of Solar PV Power Plant indicating cumulative energy generation data as per approved format within 15 days of the following month. The reporting shall also include any mismatch or abnormality in the performance of the power plant based on SCADA details review.	
8.2.7.9	Vendor shall preserve all recorded data in either manual or through computer format and shall submit to BHEL/NLC every month.	

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8.2.7.10	Vendor shall maintain the garden as per landscaping details and live including daily watering and manuring as and when necessary and on regular basis. Maintenance of live fence by watering and manuring as required shall be carried out on regular basis.	
8.2.7.11	During operation and maintenance period, the Contractor shall refill the fire extinguishers as per manufacturer's recommendation before expiry.	
8.3	Calibration: All instruments and measuring devices shall be calibrated periodically and maintained with valid certificates.	
8.4	Reports: (a) Daily generation report along with maintenance work undertaken, consumption of spares, man power report, plant abnormalities, solar insolation values, weather data, performance parameters from SCADA and grid outages are to be submitted daily by email to concerned BHEL/NLC authorities. (b) Remote monitoring Unit is to be maintained perfectly to reflect the power generation on real time basis. (c) Vendor shall submit monthly report of Solar PV Power Plant as per approved format on the first of every following month. The reporting shall include any mismatch or abnormality in the performance of the power plant based on SCADA details review. (d) Vendor shall preserve all recorded data in either manual or through computer format and shall submit to BHEL/NLC every month.	
8.5	System Documentation: (a) Vendor shall maintain O&M manuals for all equipment and systems. Vendor shall also maintain all the drawings, data, design and engineering information in both soft copy (CD) and hard copy to BHEL/NLC along with a "Master Document List". (b) Any other engineering drawings, data, design and engineering information (whether specifically mentioned in the document or not) require to fulfill the stated scope of work shall be deemed to be included.	
8.6	Scope of Civil Maintenance:	
8.6.1	Cleaning of surface drain, toilets, lavatories, washbasins, sewerage lines, drainage outfall, down pipes, soil pipes and water pipe lines.	
8.6.2	Repairing or replacement, whatever necessary, and cleaning of all joineries in the unitized PCSS of power plant as and when necessary.	
8.6.3	Cleaning, Maintaining, Repairing and Replacement, whatever necessary, of doors, window fixtures, toilet accessories, etc. in PESS and other buildings as and when necessary.	

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8.6.4	Cleaning & maintaining of power plant area, garden area, live fencing along compound fence, landscape, clearing all weeds, leaves and other wood rejects.	
8.6.5	Painting of iron parts of array structures posts once in a year.	
8.6.6	Painting of PCSS, PESS, fencing, gates, etc. once in two years.	
8.6.7	All minor repair maintenance in case of buildings and all other structures as and when required as per the instructions of Project Manager of BHEL/NLC.	
8.7	Others: Any Electrical /Civil maintenance work which are not mentioned or included here but necessary for the longevity of the plant shall be carried out by the vendor.	

9.0 Project and Site Management

9.1	Within the scope of vendor, vendor shall be required to design, procure, assemble, supply, unpack and erect, all mechanical and electrical equipment, steelwork, piping, instruments and controls, cables and conduits, bus bars, earthing materials, etc. complete in all respects, test and carry out all works.	
9.2	After award of contract, vendor shall nominate a Project Manager who shall be coordinating with BHEL/NLC in all technical and commercial matters as well for all communications in respect of the 10 MW Grid interactive Solar PV Power plant.	
9.3	In order to ensure the activities at site by vendor and their sub-contracting agencies, a team of project / site experts relevant to the nature of work being carried out at site, shall be posted within 15 days of order placement. Vendor shall nominate a site-in-charge, who will be responsible for coordinating with BHEL/NLC on all day to day activities at site.	
9.4	The site office of the vendor shall be responsible for receiving and safe keeping of all materials supplied till installation and commissioning and following all security procedures of NLC including by the sub-Contractors.	
9.5	Erection of equipment and systems included in the scope shall be carried out in accordance with an approved procedure and in an expeditious manner in conformity with the drawings and specifications. The suitability and capacity of all plant, equipment etc. used for erection shall be to the satisfaction of BHEL/NLC. Vendor shall provide all skilled, semi-skilled and unskilled labour including riggers, certified welders, pipe fitters, instrument tube fitters, licensed electricians, licensed cable jointers, mechanics etc., supervisory staff, tools and tackles, consumables and erection materials.	

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9.6	Transporting from site storage, handling, rigging, assembling, bolting and satisfactory installation of all panels, inverters, cables, accessories and other materials in proper location according to drawings.	
9.7	Touching up the painting as per specification including supply of paint. Supply of all required consumables and erection materials, including but not limited to tools, gauges, bolts, nuts, rivets, shims and temporary supports as required for incidental works and for the completion of erection.	
9.8	Power and control cabling shall be done as per approved scheme and in sections taking adequate precautions against electrical shocks as the solar PV cells are capable of producing power on exposure to light. Necessary covers shall be supplied for covering the solar PV modules during cabling termination works.	
9.9	Vendor shall carry out pre-operational checks, instrument and device calibrations, control loop checks, interlock and trip checks based on a systematically planned procedure. All manufacturers' specific recommendations for testing shall be included. All test results shall be provided to BHEL/NLC for verification and acceptance during commissioning of the plant.	
9.10	Do general cleanup of all equipment and area within project limits prior to preparing the equipment for trial run and start-up. The startup and commissioning of the power plant shall be executed by the vendor in a planned coordinated sequence with other agencies responsible for power export system to grid.	
9.11	Calibration and commissioning of all instruments and control equipment supplied under this contract shall be executed by the vendor. Hardware required for erection of all instruments and control equipment covered under this contract shall be supplied by the vendor.	
9.12	The site team of the vendor shall provide effective handling of supplied materials, civil / structural checking and take over, equipment and systems erection / installation, testing, commissioning and conducting performance guarantee tests for the scope included in the contract.	
9.13	Pre-commissioning checks, individual loop checks, power initialization, verification of system functioning, trouble shooting, final solutions to application and / or instrument problems etc., are vendor's responsibility. All the required software and hardware changes as per vendor's scope shall be incorporated as required for successful commissioning to BHEL/NLC's satisfaction.	
9.14	For the storage of supply materials till they are moved to the place of erection, an open fenced area shall be created at the allocated space by the vendor. Necessary watch and ward for the open yard storage shall be provided with restricted and monitored access. All temporary covered storage erected by the vendor shall be dismantled at the completion of	

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	installation work.	
9.15	Contractor shall submit a detailed master schedule for all activities in MS Project. This master schedule shall be comprehensive and detailed in all aspects. The master schedule shall be elaborated as per the Work Breakdown Structure (WBS) and Cost Breakdown Structure (CBS) as per approved Billing Breakup for progress monitoring. After review and approval of this master schedule by BHEL/NLC, this approved master schedule shall be the basis for all erection works. Based on this master schedule, the vendor shall develop sub-schedules for all activities. The 'START' and 'COMPLETION' dates of all construction / erection activities and milestone activities shall be closely adhered to.	
9.16	Vendor shall maintain record of all non-consumable items such as tools, tackles, etc. belonging to him to facilitate easy identification and take-over while closing the site office.	
9.17	Supply and erect metallic tags on the equipment / instruments and accessories supplied by the vendor. The tags and connecting wires shall be of stainless steel and the size of the tags shall be adequate to accommodate tag number.	
9.18	Construction water and construction power will be made available by NLC free of charge at one point in the Solar PV Power Plant area. Further connections required from this point onwards shall be included by the vendor in his scope.	
9.19	Specific Requirements:	
9.19.1	Supply of adequate quantity of consumables required for the installation job till commencement of export of power to grid as per vendor's scope is covered under this contract. Supply of all required consumables and erection materials will include but not limited to shim stocks and bed plates, cover plates, tags, jointing compounds, tapes, connectors, brazing and soldering materials, welding and brazing gases and rods, electrodes and wires, grouting materials, erection cleats, bolts, nuts and rivets, rawl plugs, piano wires, packing materials, temporary supports, wood dunnage and blocks, spacers, templates, jute and cotton waste cloth, sand and emery paper, grease, oil, etc, as required for the completion of the work according to the contract. Additional embedment, if any, required for mounting of control panels etc shall be provided by the vendor. All materials used in connection with erection work shall comply with the appropriate Indian Standards, shall be new and shall be approved by BHEL/NLC.	
9.19.2	All temporary fencing, module cover sheets, any other temporary structures, piping / cabling and distribution accessories during erection, testing shall be in vendor's scope.	

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9.19.3	Vendor shall prepare as built drawings for the installation including actual routing of piping and cables between each instrument and device supplied by him. Vendor shall submit as installed drawing to BHEL/NLC as per contract provisions.	
9.19.4	During erection, commissioning and testing activities like un-packing module and other equipment packing, module cleaning etc., all the solid and liquid wastes before disposal shall be suitably treated by the vendor so as to meet the requirements of pollution regulations applicable for the plant area. It shall be the vendor's responsibility to satisfy plant pollution authorities in this regard.	
9.20	Safety and Cleanliness:	
9.20.1	The entire works as per vendor's scope will be carried out with necessary precautions to meet the rules of local statutory authorities to have the utmost protection to men and material. A full-fledged safety engineer shall be provided by the vendor to be in charge of the supervision of safety requirements at site. It is the vendor's responsibility to provide safety to his personnel and equipment.	
9.20.2	Vendor shall abide by general safety and security rules formulated by the NLC from time to time. As the construction, installation and commissioning of Solar PV Power Plant is to be undertaken near an operating township, extreme care shall be taken to adopt all safety precautions followed in respect of fire, smoke, dust and noise pollutions as well as entry, exit and in plant movement of men, machines and materials. Plant Safety Manual from NLC shall be obtained by the vendor for reference. Vendor may include in the scope all materials and services to fulfill the Plant Safety Norms in all respect.	
9.20.3	Vendor to provide required safety apparel for erection men, firefighting facilities, keeping the place clean and hand over in tidy condition after completion of work.	
9.20.4	Vendor shall ensure safe working practices. All scaffolding, temporary structures, safety devices etc., used by the supplier during erection shall be duly removed by him on completion of work.	
9.20.5	The removal of debris and waste to the dumping yard shall be done on a daily basis to keep the site clean and safe, at all times. Any waste/debris collected during work shall be removed promptly and site shall be handed over to operating agency in a clean and tidy condition on completion of work.	

10.0 Documents to be submitted for BHEL/NLC approval after receipt of purchase order

10.1	BHEL/NLC approval shall be obtained for the following technical documents, which shall be submitted to BHEL in phased manner based on priority sequence of activities. However, it shall be ensured that all	
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	documents are submitted within 10 days from date of purchase order. In the case of the documents where the necessary inputs are required from BHEL, vendor shall submit the documents within 3 days after receiving the required inputs from BHEL.	
10.2	Vendor, make, model number / part number, specification / sizes / dimensions / drawings / datasheets of all the vendor supplied items as listed in clause 5.0.	
10.3	General arrangement drawings / schemes / layouts/design documents etc. with bill of materials / quantities shall be submitted for the following: 1. Weather Monitoring Station 2. Lightening protection of PV plant 3. Cable tray arrangement in PESS 4. Cable trench details with layout and cross sectional details for all the cables wherever trench is applicable 5. Cable sizing calculations for all the cables 6. Earthing design calculations, layouts and pit cross sectional details – for array, LT & HT earthing 7. Auxiliary power distribution- SLD, design, sizing documents and BoM with drawings of Auxiliary Transformer, ACDB, DCDB, Battery and Battery Charger 8. Portable jet washer units 9. CCTV surveillance system 10. Overall and exterior lighting system 11. Fire alarm and detection system 12. Firefighting system 13. Sign Board 14. Pre commissioning checks/tests, erection and commissioning procedure, O&M check lists with formats. O&M manuals for vendor supplied items shall be provided by vendor. BHEL shall provide required inputs to vendor in preparing O&M formats, commissioning checklists and formats.	
10.4	Quality assurance plans for items under vendor's scope.	
10.5	Detailed activity-time chart for project implementation.	
10.6	Detailed manpower deployment schedule.	
10.7	Field Quality Plan (FQP) for the works involved in vendor's scope as explained in Clause 6.4.	
10.8	Any other documents which are required for the successful completion of the contract and which are involved in vendor's scope as per relevant standards and as per the instructions of BHEL/NLC. BHEL shall submit the MDL pertaining to vendor's scope to vendor during detailed engineering	

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	and vendor shall submit the documents as per MDL for the approval of BHEL/NLC. MDL which shall be submitted to vendor shall also cover the documents mentioned in Clauses 10.2 and 10.3.	
10.9	On completion of installation and commissioning, following shall be supplied: i. All as- Built Drawings as per vendor's scope of work. ii. Detailed Engineering Document with detailed specification, schematic drawing, circuit drawing and test results, manuals for all deliverable items, Operation, Maintenance & Safety Instruction Manual and other information about the items/works under vendor's scope. iii. Bill of materials for vendor supplied items Vendor shall provide necessary technical support to BHEL for conducting one year warranty cum performance guarantee (PG) test. On successful completion of demonstration of performance guarantees for the plant at the end of one (1) year of operation and maintenance under warranty following shall be supplied: i. Operation log book for 1 year ii. Power export log for 1 year On completion of three (3) years Operation and Maintenance on chargeable basis, following shall be supplied i. Inventory of spares at projects site ii. As-Built Drawings – Where ever corrections involved as per vendor's scope of work iii. Operation log book for 3 years iv. Power export log for 3 years v. List and description of major maintenance works done on equipment and buildings vi. Completion Report highlighting all major miles stone events, module, inverter ID list, Spares list with part number, do's and don'ts, special instructions, lessons learnt, plant potential, etc.	

11.0 Approved Vendor List – Vendor Compliance (Yes/No)

1	Power Conditioning Unit (PCU)	SMA, ABB, Satcon, Xantrex, Siemens, Zigor, Helios System, Solar Konzept, Vectron, Kako, Bonfiglioli, AEG, Schneider, GE, Delta, Ingeteam, Hitachi Hirel, Vacon Drives
2	String Monitoring Unit	SMA, Solar edge, Fat spaniel, Solar magic, AEG, Trinity, Hensel, ABB India
3	PV Surge Arresters	ABB, Carbon Lorraine, Cetel, Valtrab MS, DEHN guard, Siba Trinity

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4	Solar Diodes	Cree, Diodes, SolarMagic, Trinity
5	PV Junction Box	SMA, Siemens, Fibox, Volex India, Citel, Hubber+Suhner, Lumberge connect, Kitani electric, Voka, BDS, AEG, Trinity
6	PV Wires and Cables	Amer cable, Alfa solar, Bedea, Hubber+Suhner, Solar bos, Volex India, Scichem, Bizzlink, Lapp
7	DC Fuses	Bussmann, Carbon Lorraine, Littlefuse, Midnight Solar,Siba
8	Cast Resin Transformer	Siemens, SGB
9	33kV Breaker/RMU/Panel	L&T, Siemens, ABB, Schneider, GE, Merlin Gerin
10	LT Isolators	Siemens, L&T, GE Power, Merlin Gerin, Alstom
11	LT Bus Duct	Star Drive, Elec Mech, Control & Schematic
12	LT MCC	L&T, Control & Schematic, Siemens, ABB, GE, Alstom
13	Control Panels/Lighting Panel/JBs	Positronics, B, Control & Schematic, Vimax Electric, Prithvi Technology, Power Panel & Control
14	Annunciators	Procon, I&C
15	Power Contactor/Auxiliary Contactor	Siemens, ABB, L&T, Schneider
16	Protection relay for Switchgear	L&T, ABB, Alstom, Schneider
17	Auxiliary relay	GEC, Siemens, L&T, ABB, Schneider
18	Thermal relay	Siemens, L&T, ABB, Schneider
19	Thermal o/c relay	Siemens, L&T, ABB, Schneider
20	PT & CT	Kappa, Silcon, Prayog, Pragati
21	Control transformer	Kappa, Silcon, Powerpack, Pragati
22	Power Switch	Siemens, ABB, L&T, Schneider, EE
23	Selector switch	Kaycee, Siemens, L&T, Recon
24	Timers	GEC, ABB, Schneider, Siemens
25	Fuses	GEC, Siemens, L&T, Standard, Bussmann
26	MCCB	L&T, Siemens, AEG, Schneider
27	MCB	MDS, Siemens, Schneider
28	Meter	AEP, IMP, Mecor
29	Control Terminal	Elmex, Connect Well

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30	Lighting Fixtures	Philips, CGL, Bajaj, GE, Thorn
31	Battery	Exide, Amar Raja, HBL, Amco, Tata
32	Battery Charger	Chhabi, Amar Raja, HBL, Mass Tech
33	HT Power Cables	UCL, CCI, Incab, Fort Gloster, Crystal Cable Industries, Polycab, Asian, Nicco
34	LT Power & Control cables	UCL, CCI, Incab, Fort Gloster, Finolex, Polycab, Asian, Nicco
35	Cable Trays	Venus Steel, Indiana, Bharti Export, Vatco
36	Double compression cable gland	Comet, Electro Mag
37	Crimping Lugs	Dowell
38	UPS	Emerson, DB Power, Transteck, Hi-Rel, Vinitar, Numeric
39	SCADA	ABB, AEG, Honeywell, Allan Bradly, GE, Fanuc, Siemens, Emerson, Schneider, Forbes Marshall, Yokogawa
40	Trivector meter	ABB, L&T, SEMS
41	Communication system and EPABX	Kenwood, Motorola, Siemens, Philips, BPL, Sonar, Enky, Tata, National
42	Fire alarm system	TAC, LPA Approved
43	Air conditioning system	Blue Star, Voltas, Carrier, Onida, LG, Samsung, Hitachi, Panasonic
44	Water Pumps	KSB, Crompton, Jhonson, Grandfoss
45	Steel structure & reinforcement	SAIL, Tata
46	Cement	India Cements, Ultra tech, Ramco, Dalmia

Note A: If the bidder wants to propose any other vendors other than the given list, bidder to submit the credentials of such vendors as detailed below:

- 1. Vendor's Company Profile**
- 2. Product Catalog/Data Sheet**
- 3. List of Previous Installations**
- 4. Performance Certificate from end user – It must be as per attached format (please refer Annexure -1) and the system/equipment should have worked for more than one year from its date of commissioning/installation which means the time elapsed from date of issue of performance certificate and date of commissioning of the equipment/product shall be at least of one year and the rating of equipment/product given in the certificate shall be of same rating of that being**

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offered in this contract. Vendors shall not be considered if the performance satisfactory certificate is not as per attached format.

Note B: Order shall be placed on successful bidder only if bidder is approved by NLC and bidder has to furnish all the required supporting documents as sought by BHEL/NLC for obtaining vendor approval of NLC. Price bids will be opened for only NLC approved bidders.

Note C: If any of the items are not covered in the above mentioned list, vendor shall take the approval for the same by BHEL/NLC before commencement of supply/works by submitting supporting product's catalog/data sheet/technical details.

ANNEXURE -1 of BHEL PS 439-925

Date:

Place:

To whom so ever it may concern

Project Name and Rating:

Equipment Name and Rating:

Quantity:

Make:

Place of Installation:

The above mentioned equipment has been installed and commissioned on DD: MM: YYYY and its performance from DD: MM: YYYY to till date is satisfactory. This is for your kind information.

Customer/End User Signature

Note: Above mentioned content in this letter shall be on End user's letter head

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REF. DRG. No.

SIGN. & DATE

INVENTORY No.

REV.	DATE	ALTERED CHECKED	APPROVED

REV.	DATE	ALTERED CHECKED	APPROVED

NAME	SIGN	DATE
NVR		020714
SLR		020714
MS		020714

DEPT.	CODE
SC&PV	439



TITLE:

SINGLE LINE DIAGRAM

WBS. No.

DRG. No.

BH-NLC-001

No. OF
SHEETS

02

SHEET
No.

01

REV

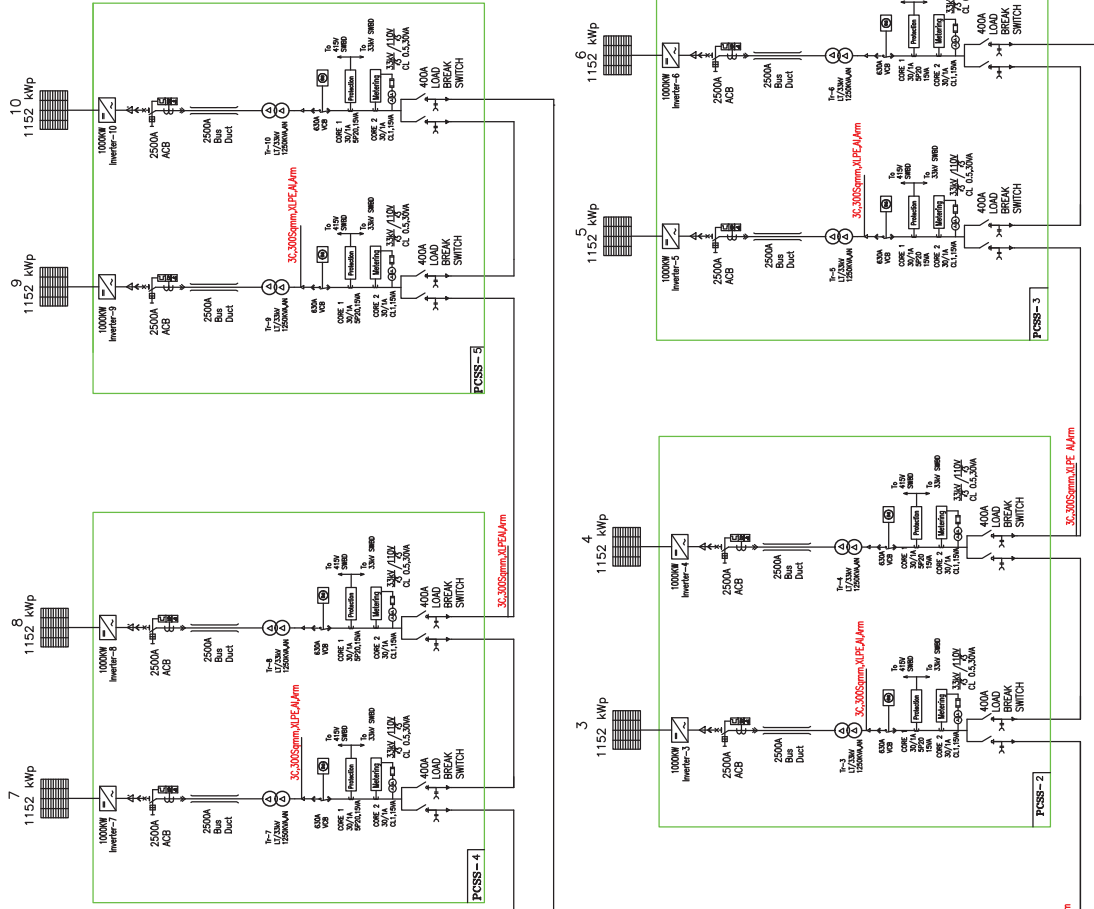
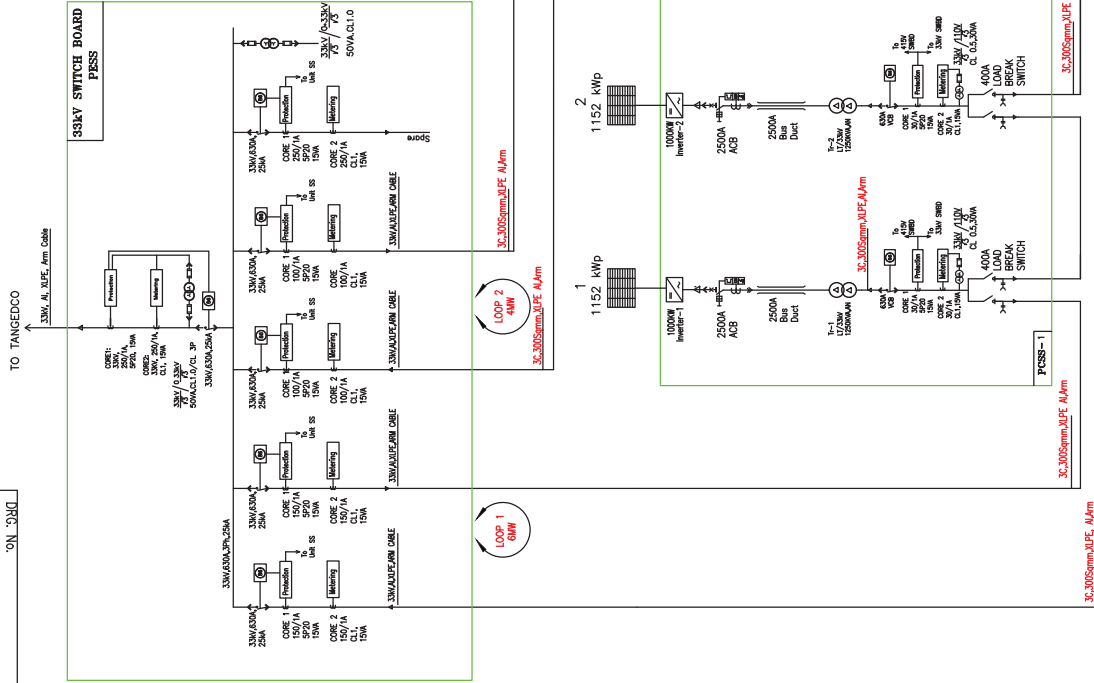
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SINGLE LINE DIAGRAM WITH 1MW PCU

PRODUCT : 10MW Solar Photovoltaic Power Plant, TN

CUSTOMER: NEYVELI LIGNITE CORPORATION, NEYVELI

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE



ANNEXURE-2
of
BHEL PS 439-925
1 of 2

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REV.	DATE	ALTERED CHECKED	APPROVED

REV.	DATE	ALTERED CHECKED	APPROVED

NAME	SIGN	DATE
NVR		020714
SLR		020714
MS		020714

DRAWN	CHECKED	APPROVED

DEPT.	CODE
SC&PV	439

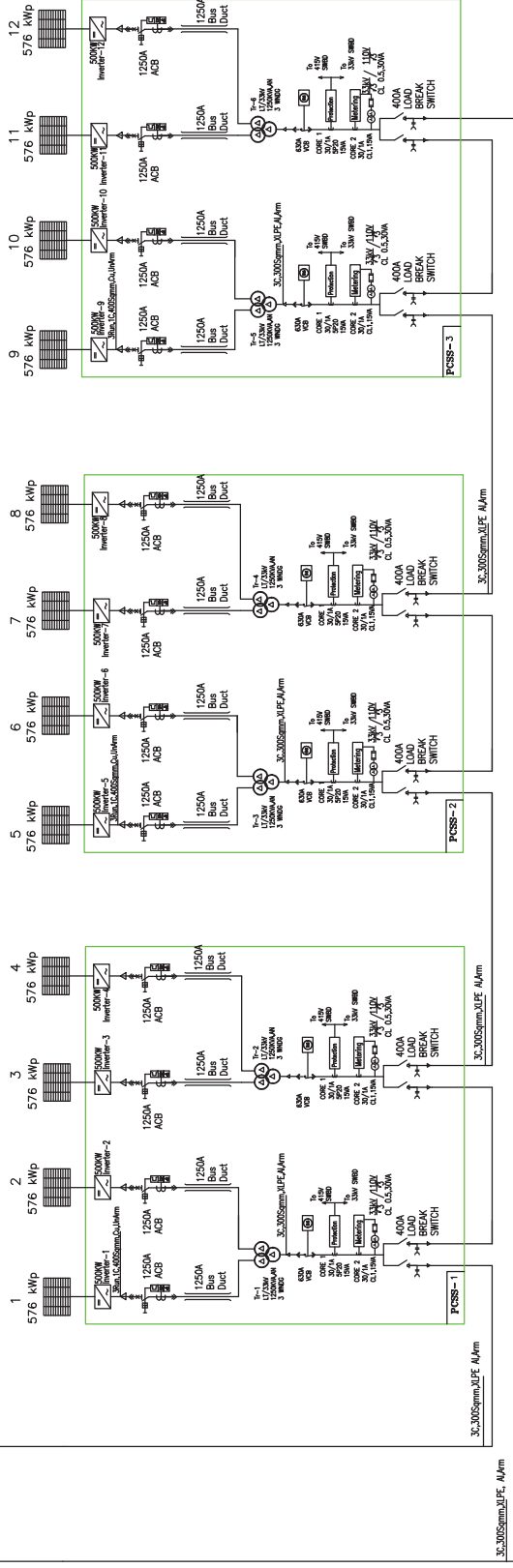
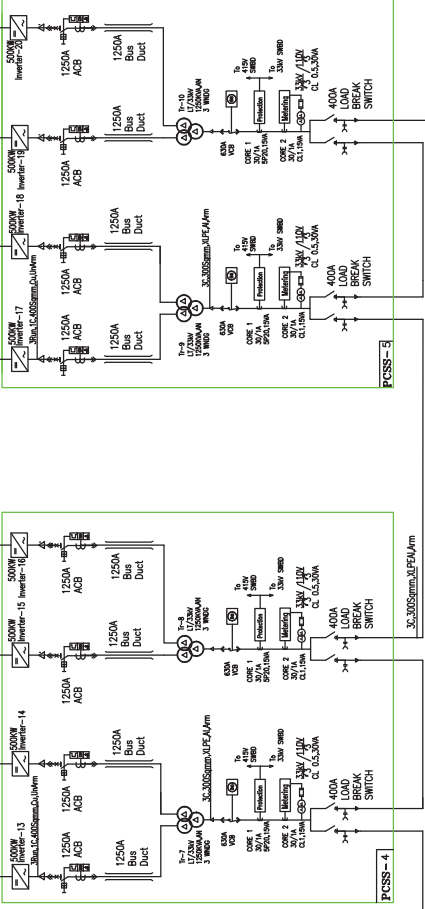
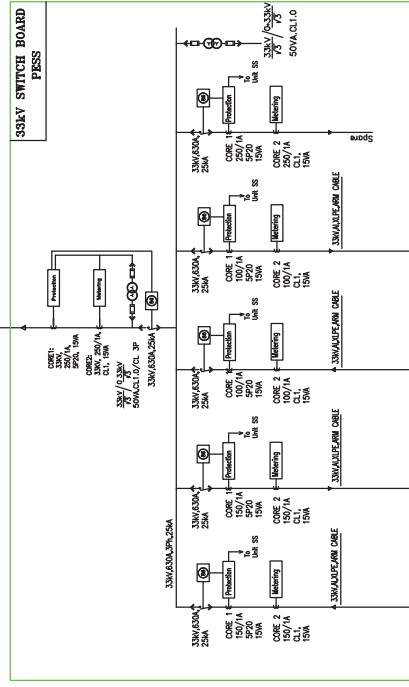
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TITLE:	
SINGLE LINE DIAGRAM	

No. OF SHEETS	02
SHEET No.	02
DRG. No.	BH-NLC-001
WBS. No.	

SINGLE LINE DIAGRAM WITH 500kW PCU

PRODUCT : 10MW Solar Photovoltaic Power Plant, TN
CUSTOMER: NEYVELI LIGNITE CORPORATION, NEYVELI
BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE



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REF. DRG. No.

SIGN. & DATE

INVENTORY No.

DRG. No.

2

3

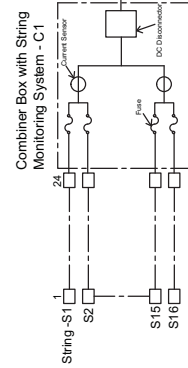
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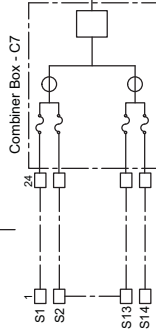
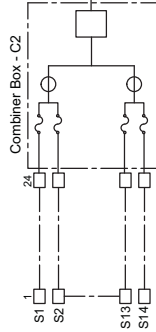


DC Bus Panel

Copper Bus bar

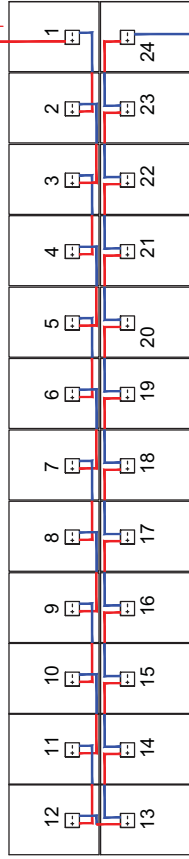
To 500kVA Inverter

DC Circuit Breaker



Note: 1. Scheme for one Inverter is shown in SLD. Same scheme applicable to remaining all Inverters.

2. DC Bus Panel can be a part of Inverter.



Typical Connection Diagram of a PV String

MODULE PARAMETER:-

Power - 240Wp
Imp-8.28 A
Vmp - 28V
IsC - 8.5A
Voc - 36V

REV.	DATE	ALTERED CHECKED APPROVED	REV.	DATE	ALTERED CHECKED APPROVED	NAME	SIGN
						NVR	
						SLR	
						MS	

DRAWN		080714	DATE		080714	
CHECKED		080714	DEPT.		SC&PV	
APPROVED		080714	CODE		439	

TITLE:

DC SINGLE LINE DIAGRAM

No. OF SHEETS	00
SHEET No.	01
REV	00

WBS. No.

DRG. No.

BH-NLC-002

ANNEXURE - 3

of

BHEL PS 439-925

PRODUCT : 10MW Solar Photovoltaic Power Plant, TN

CUSTOMER: NEYVELI LIGNITE CORPORATION, NEYVELI

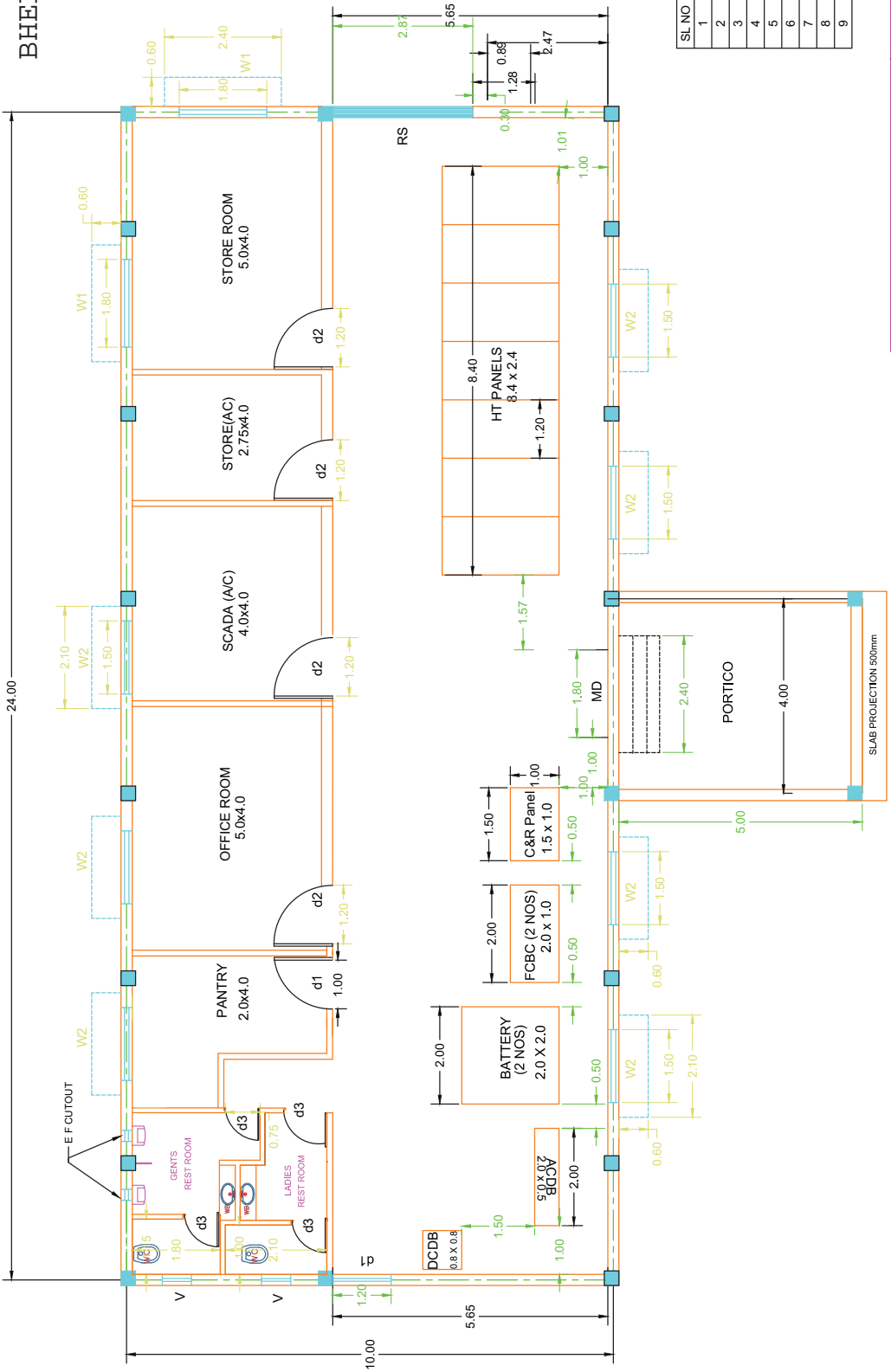
BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

DRAWING NO
BH-NLC-098-C-DRG

ANNEXURE - 5

of

BHEL PS 439-925



SL NO	DESCRIPTION	QTY.
1	MD	1
2	D1	2
3	D2	4
4	D3	4
5	V	2
6	RS	1
7	W1	2
8	W2	8
9	EF	2

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		PROJECT CONSULTANT		MITCON CONSULTANCY & ENGINEERING SERVICES LTD	
NEVELLIGNITE CORPORATION LTD					
		BHARAT HEAVY ELECTRICALS LIMITED		SIGN.	
ELECTRONICS DIVISION, BANGALORE		DRN		NAME	
		OCT14		A.N	
		OCT14		SR	
		OCT14		M.S	
		APPD		R.F.	
		REF. TO ASSY. DRG.		ITEM NO.	
		WEIGHT(KG)		ITEM NO.	
		SCALE		1 : 1	
		NTS			
					
		FOR UNSPECIFIED - TOLERANCES			
		REFER ED 0230499			
		DEPT. SCOPY			
		CODE 439			
		TITLE		DRAWING NO.	
		ARCHITECTURAL DRAWINGS OF PEES		BH-NLC-098-C-DRG	
		REV.		REV.	
		DATE		DATE	
		ALTERED		ALTERED	
		CHECKED		CHECKED	
		APPROVED		APPROVED	
		REV.		REV.	
		DATE		DATE	
		ALTERED		ALTERED	
		CHECKED		CHECKED	
		APPROVED		APPROVED	
		REV.		REV.	
		DATE		DATE	
		ALTERED		ALTERED	
		CHECKED		CHECKED	
		APPROVED		APPROVED	
		REV.		REV.	
		DATE		DATE	
		ALTERED		ALTERED	
		CHECKED		CHECKED	
		APPROVED		APPROVED	
		REV.		REV.	
		DATE		DATE	
		ALTERED		ALTERED	
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		APPROVED		APPROVED	
		REV.		REV.	
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No. 22/09/2009-10/St./NSM
Government of India
Ministry of New and Renewable Energy

Block-14, CGO Complex, Lodhi Road,
New Delhi-110003 dated 08th Jan. 2014

Office Memorandum

Subject:- Ineligible items to be excluded from the Total Bill of Material to be submitted to MNRE by the Solar Power Developers for issue of Excise Duty Exemption Certificate and Concessional Custom Duty Certificate.

While Considering the Total Bill of Material (BoM) received from the various Solar Power Developers (SPDs), it has been observed that the SPDs are including a number of items/components/parts in their BoMs which do not qualify for grant of duty exemption. The matter regarding finalization of a list of all such ineligible items and uploading the same on the Ministry's website for information of SPDs, has been under consideration in this Ministry in the light of the Notifications issued by the TRU Division, Department of Revenue. This has also been discussed in a few meetings held with Joint Secretary (TRU), Department of Revenue (Ministry of Finance). It has been broadly agreed that the Civil Work items, Earthing Material, Plant Lighting Material, Lightning Arrestor, Items for Plant Security and some miscellaneous items like Rubber Gloves, Fire Fighting Equipments etc. do not qualify for duty exemption.

2. This Ministry has now finalized an illustrative list of items/components and parts which are considered to be non-eligible for excise duty exemption and concessional customs duty. A copy of this list is enclosed. All the Solar Power Developers are requested to kindly ensure that the items figured in the enclosed list are not included in the BoM to be forwarded henceforth to this Ministry for approval. Heads/Chief Executives of all the State Nodal Agencies are also requested to kindly scrutinize the bills of material being received from the SPDs and delete the ineligible items from the BoM before forwarding/recommending it to this Ministry.


(A.N. Srivastava)
Director (NSM)
Phone No: 24363498

To

1. All Solar Power Developers
2. All State Nodal Agencies/Power/Energy Departments (as per standard list).
3. Joint Secretary (TRU), Deptt. Of Revenue (Min. of Finance), North Block, New Delhi.

Copy to:-

1. PSO to Secretary
2. PPS to JS/TK
3. Dir. (NIC) for uploading this on the MNRE Website
4. Order bundle

2 of 2

List of ineligible items which should not be included in the Total BoM to be submitted to MNRE by the Solar Power Developers for issue of Excise Duty Exemption Certificate and Concessional Custom Duty Certificate

Category I: Civil Work items like Cement, TMT(Saria), Pre-Fabricated/Pre Engineered Building, Inverter Exhaust Ducting and Machinery required for Civil Work such as Ramming Machine, Fork Lift etc.

Category II: Earthing Material like GI Earthing Strip, Earthing Electrode, Earthing Pit for Array Yard, Earthing Hook etc.

Category III: Plant Lighting Material like CFL, Tube-lights etc., Cable for lighting, Switch Board for lighting, Plant Lighting Transformer, LT AC Lighting Distribution Board, Lighting Pole, Lighting Fitting, Lighting Junction Board, Pathway Street Light Poles, Fixtures, Boundary Street Light Fixtures.

Category IV: Lightning Arrestors.

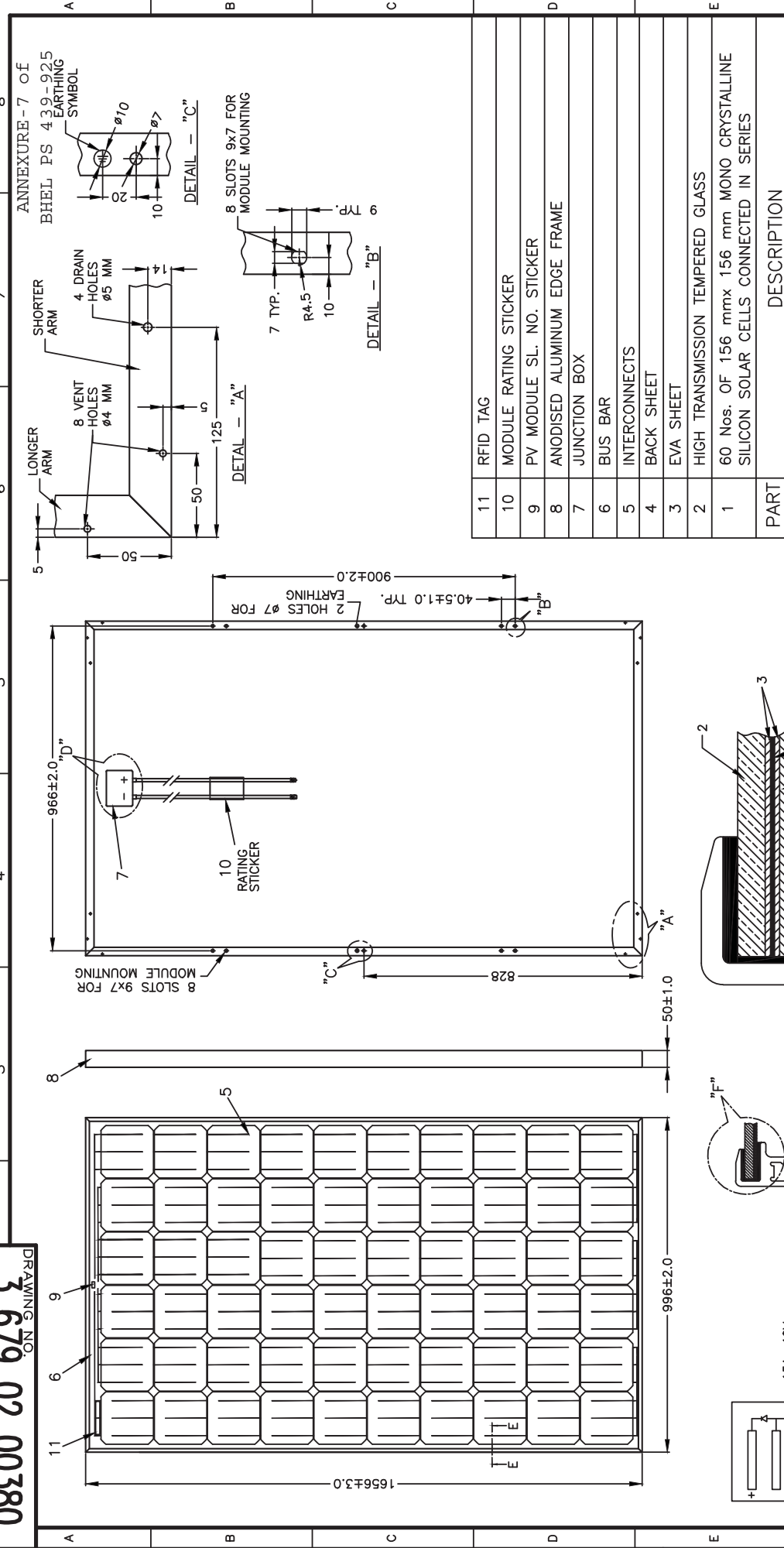
Category V: Items for Plant Security like Boundary Wall/Fencing, Watch Towers, Main Gate, C.C.T.V. Camera etc.

Category VI: Miscellaneous items like ISI marked Rubber Gloves, Sand, Sand Filled Bucket, Fire Fighting Equipments, etc.

Note: - **This is an illustrative list and not exhaustive. Any item/part/component found ineligible on a future date can also be included in this list.**

DRAWING NO. 3 679 02 00380

The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in anyway detrimental to the interest of the Company

[illegible]

COMMERCIAL TERMS & CONDITIONS				
RFQ No.HBSBOS025 DATED : 12.11.2014 DUE DATE(TECH BID) : 03.12.2014				
Sl No.	Terms	BHEL Term	Confirmation	Deviation / Remarks
1	Bidding	(a) Bid has to be submitted as Two Part – in two sealed covers- Techno Commercial Bid(Part-1) & Price Bid (Part-II)- clearly written on each cover both put in a single sealed envelope super-scribed with RFQ No. and Due date.	Agree / Not agree	
		(b) Annexures B & B1 to be submitted along with technical bid (Part-1) & Annexure B2 to be submitted along with Price bid (Part-II).	Agree / Not agree	
		(c) Clause-wise compliance to BHEL Purchase specification along with all documents as called in Technical specification to be submitted along with Technical Bid(Part-1).	Agree / Not agree	
2	Price Basis	Firm i.e., from the date of PO to completion of supply if I&C is not applicable. If I&C is in supplier's scope, then the prices shall remain Firm till commissioning & handing-over of the complete system. (PVC clause not acceptable).	Agree / Not agree	
3	Terms of Delivery	Free On Road Basis to NLC Site	Agree / Not agree	
4	Delivery Period	(a) Supply of main items +Spares : 10 weeks from Drawing Approval Drawing Submission: 1 week from PO Date	Agree / Not agree	
		(b) I&C: 4 weeks from Supply Date.	Agree / Not agree	
5	Payment Term	(a) Supply : 80% payment of Supply Value + 100% Taxes shall be made with 45 days credit from the date of receipt of material at site. 10% on completion of I&C and certification. Balance 10% on execution of PBG valid for warranty period + 6 months claim period from any of the BHEL Consortium banks.	Agree / Not agree	
		(b) I&C : 90% of basic I&C value + 100% Taxes & Duties on completion of I&C and certification line item wise on pro-rata basis. Balance 10% on execution of PBG valid for warranty period+ 6 months claim period from any of the BHEL Consortium banks.	Agree / Not agree	
		(c) O&M : 100% O&M charges are payable on monthly basis against report certified by BHEL	Agree / Not agree	
		(d) For any deviation in payment term, the offer will be liable for loading as per Clause 25A(ii) of Enquiry-General Terms & conditions (Doc Ref : SCPV/BOS/01-Rev 00)	Agree / Not agree	
6	Excise Duty	(a) To confirm whether applicable. If applicable, indicate prevailing rate of Excise duty.	Applicable / Not applicable	Prevailing rate of Excise duty : %
		(b) BHEL is trying to avail Customs Duty & Excise duty exemption. Successful bidder shall support with all relevant documents.	Agree / Not agree	
7	Sales Tax	(a) To confirm whether applicable. If applicable, indicate prevailing rate of Sales Tax against Form C.	Applicable / Not applicable	Prevailing rate of Sales Tax : %
		(b) For issue of form "C", vendor has to furnish "E1/E2" form. Please confirm that "E1/E2 Sale form" will be submitted. Wherever E1/E2 transactions are made, CST paid by sub vendor will not be reimbursed (As it is input cost to vendor)	Agree / Not agree	
8	Value Added Tax	Since it is inter-state movement of goods, VAT is not applicable. Only CST against form C is applicable	Applicable / Not applicable	
		OR Both are in the same State, VAT is applicable please indicate VAT applicable.	Applicable / Not applicable	Prevailing rate of VAT : %
9	Octroi	To confirm whether applicable, if applicable indicate current rate of Octroi.	Applicable / Not applicable	Octroi %

AUTHORISED SIGNATORY WITH SEAL

COMMERCIAL TERMS & CONDITIONS				
RFQ No.HBSBOS025 DATED : 12.11.2014 DUE DATE(TECH BID) : 03.12.2014				
Sl No.	Terms	BHEL Term	Confirmation	Deviation / Remarks
10	Service Tax	To confirm whether applicable, if applicable indicate current rate of Service Tax.	Applicable / Not applicable	Prevailing rate of Service Tax %
		Furnish following : Service Tax Regn. No. Confirmation that Service Tax register is maintained.	Applicable / Not applicable	Service Tax Regn. No.....
11	Freight	Freight shall be included (since it is on FOR basis to site) in unit rate quoted.	Agree / Not agree	
12	Insurance	Transit Insurance will be in vendor's scope.	Agree / Not agree	
13	Evaluation of L1 vendor	Over all L1 of Supply + I&C +O&M on "FOR" basis to site will only be considered.	Agree / Not agree	
		The percentage of Supply, Civil works and I&C values shall be in the range indicated below(approximately,with overall tallying to 100%) : (a) Supply : 45-47% (b) I&C :35-37 % (c) O&M : 15-17%	Agree / Not agree	
14	Warranty	(a) Warranty for Supply : 51 months from date of supply or 48 months from I&C whichever is earlier (b) Workmanship / I&C : 48 months from I&C (c) O&M: 6 months commencing from date of Commissioning.	Agree / Not agree	
15	Pre Shipment Inspection	Pre Shipment Inspection will be carried out by BHEL/Customer for which test report shall be sent one week in advance.	Agree / Not agree	
16	Penalty	(a) Penalty of 0.5% per week at the basic price of the good for undelivered quantity of supply portion, subject to a maximum of 10%. For Supply, Pre Shipment Inspection Call Letter Date (Receipt of test report) will be treated as delivery for purpose of penalty.	Agree / Not agree	
		(b)For any deviation in penalty term, the offer will be liable for loading as per Clause 25.B of Enquiry-General Terms & conditions (Doc Ref : SCPV/BOS/01-Rev 00)	Agree / Not agree	
17	Road Permit	Road permit if applicable will be given by BHEL before Dispatch of ordered Items	BHEL	
18	Despatch Documents	Complete set of despatch documents in 3 sets shall be forwarded to BHEL directly. Despatch documents include Commercial Invoice, Excise Invoice (if ED is applicable), Lorry receipt (L/R), Packing list, Warranty certificate, Insurance intimation letter, & Original Performance Bank Guarantee (Directly from issuing bank to BHEL). One set of Invoice, Packing list and L/R shall be faxed immediately after despatch to BHEL-EDN, Bangalore.	Agree / Not agree	
19	Other terms & conditions	For any other Terms and Conditions, kindly refer to the enclosed Enquiry-General Terms & Conditions of BHEL (Doc Ref : SCPV/BOS/01-Rev 00)	Agree / Not agree	
20	Reverse Auction	BHEL reserves the right to conduct Reverse Auction. Procedure for the same will be informed by BHEL .	Agree / Not agree	
21	Shipment	Kindly indicate the state from where the shipment will take place	State/Place	
22	Validity	Quotation should remain valid for a period of 90 days from the due date	Agree / Not agree	
23	PBG	(a)PBG shall be furnished in the BHEL prescribed format. (b) Deviation if any Please specify	Agree / Not agree	

AUTHORISED SIGNATORY WITH SEAL

Page 2 of 2

Address of Site:

NEYVELI LIGNITE CORPORATION LIMITED 10 MW
 NEYVELI SOLAR POWER PROJECT
 OPPOSITE TO BLOCK 8 POLICE STATION
 NEYVELI 607801
 TAMIL NADU

TECHNICAL BID ENCLOSURE FOR COMPLIANCE OF QUOTE									
RFQ No.HBSBOS025 DATED : 12.11.2014 DUE DATE(TECH BID) : 03.12.2014									
SI No.	DESCRIPTION	QTY	UNIT	QUOTED	TAXES				Remarks
					ED %	CST%	VAT %	SERVICE TAX %	
1	PS0679044647: Supply of Supply of MC4 connectors, crimping tools, cable ties, PVC conduits, HDPE DWC conduits, cable lugs, cable glands, hardware,cable trays etc. as per clauses 5.5 to 5.10 and 5.14 to 5.20.	1	ST	YES/NO				NA	Taxes Included
2	PS0679044655: Supply of LT Auxiliary power cables, control cables, data & communication cables, Optical fiber cables, 33kV termination kits and straight through joint kits etc. as per clauses 5.16, 5.19, 5.20, 5.25, 5.26 and 5.27.	1	ST	YES/NO				NA	Taxes Included
3	PS0679044663: Supply of Earthing System for Solar array structures, String monitoring combiner boxes, electrical panels in PCSS and PESS, PESS electrical room wiring circuits, Transformers in PCSS, lightning arresters, weather monitoring station equipment, compound fencing angles and all other panels/equipment/metallic structures as applicable as per clause 5.21 & 5.26.	1	ST	YES/NO				NA	Taxes Included
4	PS0679044671:Supply of lightning arrestors for solar array field (ESE type) with earthing items and lightning rod with earthing items for control room as per clauses 5.38 and 5.39 of BHEL spec PS-439-924.	1	ST	YES/NO				NA	Taxes Included
5	PS0679044680 :Supply of Weather Monitoring Station as per clause 5.23.	1	ST	YES/NO				NA	Taxes Included
6	PS0679044698: Supply of Exterior lighting including illumination of periphery path, approach roads/pathways, watch towers, main gate, PCSS & PESS building external areas as per clause 5.24 & 5.26.	1	ST	YES/NO				NA	Taxes Included
7	PS0679044701: Supply of miscellaneous items such as cable tags/markers, danger boards, cable route markers, hoarding board, sign boards, display boards, electrical insulation mats, checkered plates, air conditioners, office furniture etc as per clauses 5.31 to 5.37 and 5.39 & 5.41.	1	ST	YES/NO				NA	Taxes Included
8	PS0679044710: Supply of Fire detection, protection and firefighting system as per clause 5.26 & 5.40	1	ST	YES/NO				NA	Taxes Included
9	PS0679044728: Supply of auxiliary ACDB, Battery Bank, Battery Charger and DCDB for auxiliary power requirements of plant as per clause 5.30.	1	ST	YES/NO				NA	Taxes Included
10	PS0679044736: Supply of Surveillance CCTV system along with supply, laying and termination of associated cable laying as per clause 5.28.	1	ST	YES/NO				NA	Taxes Included
11	PS0679044744: Supply of solar PV module charged, battery operated portable jet washer units with water tank, high pressure pump, hose and jet nozzles as per Clause 5.29.	3	ST	YES/NO				NA	Taxes Included
12	PS0679044752: Supply of Tools and Tackles as per clause 5.38 and 5.43.2.	1	ST	YES/NO				NA	Taxes Included
13	PS0679044779:Supply of Auxiliary Transformer 125 kVA, 415 V/415 V Delta/Star, ONAN along with earthing material, fencing material, firefighting equipment etc. as per Clause 5.26	1	ST	YES/NO				NA	Taxes Included
14	PS0679044760:Supply of Mandatory Spares as per Clause 5.43.1	1	ST	YES/NO				NA	Taxes Included
15	PS0679044787: I&C: Temporary site office, storage yard, unloading and movement of consignments, arrangement for electrical power and water etc. as per clauses 5.1 to 5.4	1	AU	YES/NO	NA	NA	NA		Taxes Included
16	PS0679044795: I&C: Interconnection of SPV modules, cabling from strings to SMCBs, installation of SMCBs including cable terminations and inspection thereof as per clauses 5.5 to 5.10.	1	AU	YES/NO	NA	NA	NA		Taxes Included
17	PS0679044809: I&C: Formation of cable trenches and laying of DC power cables from SMCBs to respective PCSS, per PCSS basis, as per clause 5.11, 5.12 and 5.14 (1 AU = 2.3 MW)	5	AU	YES/NO	NA	NA	NA		Taxes Included
18	PS0679044817:I&C: Temporary site office, storage yard, bore wells, unloading and E&C: Erection of PESS panels such as HT switchgear panels, Control and Metering Panel, ACDB, SCADA panels, Battery Charger, Battery bank, DCDB, Fire alarm panels, etc. including grouting, erection of cable trays and cable supports, routing and terminations of DC and AC cables as per clauses 5.17 and 5.18.	1	AU	YES/NO	NA	NA	NA		Taxes Included
19	PS0679044825: I&C: Erection of PCSS on the civil platform as per clauses 5.13.	5	AU	YES/NO	NA	NA	NA		Taxes Included
20	PS0679044833: I&C: Cable trenches, cable laying, cable terminations for 33KV cables among PCSS rooms and also from PCSS rooms to HT switch gear panel and also from HT switchgear panel to 33kV grid as per clauses 5.15, 5.16 and 5.25.	1	AU	YES/NO	NA	NA	NA		Taxes Included
21	PS0679044841: I&C Cable trenches, cable laying, cable terminations for control, OFC and communication cables related to SMCBs, PCSS equipment, HT Panels, Control and Metering Panel and SCADA as per clauses 5.19 and 5.20.	1	AU	YES/NO	NA	NA	NA		Taxes Included

22	PS0679044850: I&Cof Earthing System for Solar array structures, String monitoring combiner boxes, electrical panels in PCSS and PESS, PESS electrical room wiring circuits, Transformers in PCSS, lightning arresters, weather monitoring station equipment, compound fencing angles and all other panels/equipment/metallic structures as applicable as per clauses 5.21 & 5.26.	1	AU	YES/NO	NA	NA	NA		Taxes Included
23	PS0679044868: I&C of Exterior lighting including illumination of periphery path, approach roads/pathways, watch towers, main gate, PCSS & PESS building external areas as per clause 5.24.	1	AU	YES/NO	NA	NA	NA		Taxes Included
24	PS0679044876: I&C of miscellaneous and safety items such as cable tags, danger boards, cable markers, hoarding board, sign boards, display boards, electrical insulation mat, checkered plates, air conditioners, office furniture, fire extinguishers, fire alarm system etc as per clauses 5.31 to 5.37 and 5.39 to 5.41.	1	AU	YES/NO	NA	NA	NA		Taxes Included
25	PS0679044884: I&C: of weather monitoring equipment including cable laying as per clause 5.23.	1	AU	YES/NO	NA	NA	NA		Taxes Included
26	PS0679044892: I&C:of CCTV surveillance system as per clause 5.28	1	AU	YES/NO	NA	NA	NA		Taxes Included
27	PS0679044906: I&C: of 33kV HT power cable in cable trench from outgoing feeder of HT switchgear panel located in PESS building of solar power plant to 33kV NLC substation as per clause 5.25.	1	AU	YES/NO	NA	NA	NA		Taxes Included
28	PS0679044914: I&C: of Auxiliary Transformer with necessary civil foundation, fencing for auxiliary transformer yard, associated earthing, jelly spreading etc. as per Clause 5.26	1	AU	YES/NO	NA	NA	NA		Taxes Included
29	PS0679044922: I&C: Pre-commissioning inspections / checks / tests, MRT tests and coordination with state and central departments such as Tamil Nadu SEBs/CEIG/SECI etc. for necessary approvals/ clearances for commissioning, synchronization with grid and post-commissioning operation of the plant as per clause 5.42.	1	AU	YES/NO	NA	NA	NA		Taxes Included
30	PS0679044930: Operation and Maintenance of PV plant for One year (12 Months) during performance guarantee (PG) test from the date of commissioning/ declaration of O&M as per clause 8.0.	12	MON	YES/NO	NA	NA	NA		Taxes Included
31	PS0679044949: Operation and Maintenance of PV plant for Three years (36 Months) from the date of completion of PG test as per clause 8.0.	36	MON	YES/NO	NA	NA	NA		Taxes Included
32	**Freight Charge including Service Tax on Freight(12.36% on 25% of Freight Value)	LUMPSUM		YES/NO	NA	NA	NA	NA	Included
33	**Insurance	LUMPSUM		YES/NO	NA	NA	NA	NA	Included

NOTE: 1.YOUR QUOTED PRICES SHALL BE on "FREE ON ROAD" basis to NLC Site.

2.PLEASE INDICATE TAXES : ED, VAT/CST, SERVICE TAX CLEARLY APPLICABLE AS ON DATE.

3. USE THIS FORMAT FOR COMPLIANCE(REPRODUCING ON YOUR LETTER HEAD IS ACCEPTABLE).

4. *ED shall not be considered as the project is under MNRE approval. Hence all inclusive rate for Supply is to be quoted without ED for SI No.1-13. However, the percentage of taxes considered against each item may pls be indicated in the column of Taxes for the purpose of availing Tax Credit.

5.Over all L1 of Supply + I&C + O&M on "FOR" basis to site will only be considered.

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18	PS0679044817: I&C: Temporary site office, storage yard, bore wells, unloading and E&C: Erection of PESS panels such as HT switchgear panels, Control and Metering Panel, ACDB, SCADA panels, Battery Charger, Battery bank, DCDB, Fire alarm panels, etc. including grouting, erection of cable trays and cable supports, routing and terminations of DC and AC cables as per clauses 5.17 and 5.18.	1	AU			NA	NA	NA		Taxes Included
Unit Rate in Words Rs.										
19	PS0679044825: I&C: Erection of PCSS on the civil platform as per clauses 5.13.	5	AU			NA	NA	NA		Taxes Included
Unit Rate in Words Rs.										
20	PS0679044833: I&C: Cable trenches, cable laying, cable terminations for 33KV cables among PCSS rooms and also from PCSS rooms to HT switch gear panel and also from HT switchgear panel to 33kV grid as per clauses 5.15, 5.16 and 5.25.	1	AU			NA	NA	NA		Taxes Included
Unit Rate in Words Rs.										
21	PS0679044841: I&C Cable trenches, cable laying, cable terminations for control, OFC and communication cables related to SMCBs, PCSS equipment, HT Panels, Control and Metering Panel and SCADA as per clauses 5.19 and 5.20.	1	AU			NA	NA	NA		Taxes Included
Unit Rate in Words Rs.										
22	PS0679044850: I&Cof Earthing System for Solar array structures, String monitoring combiner boxes, electrical panels in PCSS and PESS, PESS electrical room wiring circuits, Transformers in PCSS, lightning arresters, weather monitoring station equipment, compound fencing angles and all other panels/equipment/metallic structures as applicable as per clauses 5.21 & 5.26.	1	AU			NA	NA	NA		Taxes Included
Unit Rate in Words Rs.										
23	PS0679044868: I&C of Exterior lighting including illumination of periphery path, approach roads/pathways, watch towers, main gate, PCSS & PESS building external areas as per clause 5.24.	1	AU			NA	NA	NA		Taxes Included
Unit Rate in Words Rs.										
24	PS0679044876: I&C of miscellaneous and safety items such as cable tags, danger boards, cable markers, hoarding board, sign boards, display boards, electrical insulation mat, checkered plates, air conditioners, office furniture, fire extinguishers, fire alarm system etc as per clauses 5.31 to 5.37 and 5.39 to 5.41.	1	AU			NA	NA	NA		Taxes Included
Unit Rate in Words Rs.										
25	PS0679044884: I&C: of weather monitoring equipment including cable laying as per clause 5.23.	1	AU			NA	NA	NA		Taxes Included
Unit Rate in Words Rs.										
26	PS0679044892: I&C:of CCTV surveillance system as per clause 5.28	1	AU			NA	NA	NA		Taxes Included
Unit Rate in Words Rs.										
27	PS0679044906: I&C: of 33kV HT power cable in cable trench from outgoing feeder of HT switchgear panel located in PESS building of solar power plant to 33kV NLC substation as per clause 5.25.	1	AU			NA	NA	NA		Taxes Included
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28	PS0679044914: I&C: of Auxiliary Transformer with necessary civil foundation, fencing for auxiliary transformer yard, associated earthing, jelly spreading etc. as per Clause 5.26	1	AU			NA	NA	NA		Taxes Included
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29	PS0679044922: I&C: Pre-commissioning inspections / checks / tests, MRT tests and coordination with state and central departments such as Tamil Nadu SEBs/CEIG/SECI etc. for necessary approvals/ clearances for commissioning, synchronization with grid and post-commissioning operation of the plant as per clause 5.42.	1	AU			NA	NA	NA		Taxes Included
Unit Rate in Words Rs.										
30	PS0679044930: Operation and Maintenance of PV plant for One year (12 Months) during performance guarantee (PG) test from the date of commissioning/ declaration of O&M as per clause 8.0.	12	MON			NA	NA	NA		Taxes Included
Unit Rate in Words Rs.										
31	PS0679044949: Operation and Maintenance of PV plant for Three years (36 Months) from the date of completion of PG test as per clause 8.0.	36	MON			NA	NA	NA		Taxes Included
Unit Rate in Words Rs.										
32	**Freight Charge including Service Tax on Freight(12.36% on 25% of Freight Value)	LUMPSUM			INCLUDED					
33	**Insurance	LUMPSUM			INCLUDED					

NOTE: 1.YOUR QUOTED PRICES SHALL BE on "FREE ON ROAD" basis to OPCL Site.

2.PLEASE INDICATE TAXES : ED, VAT/CST, SERVICE TAX CLEARLY APPLICABLE AS ON DATE.

3. USE THIS FORMAT FOR COMPLIANCE(REPRODUCING ON YOUR LETTER HEAD IS ACCEPTABLE).

4. *ED shall not be considered as the project is under MNRE approval. Hence all inclusive rate for Supply is to be quoted without ED for SI No.1-13. However, the percentage of taxes considered against each item may pls be indicated in the column of Taxes for the purpose of availing Tax Credit.

5.Over all L1 of Supply + I&C + O&M on "FOR" basis to site will only be considered.

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Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division
PB No.2606, Mysore Road, Bangalore-560026, India

Enquiry - General Terms & Conditions (Two part bid)

I. Enquiry / Request for Quotation (RFQ):

- (a) Any Purchase Order resulting from this enquiry shall be governed by **these general terms and conditions listed below and special terms and conditions, if any, along with this enquiry** of Bharat Heavy Electricals Limited, Electronics Division, Bangalore-560026 (**hereinafter referred to as BHEL EDN**).
- (b) Any of the terms and conditions not acceptable to vendor, shall be explicitly mentioned in the quotation. Otherwise, it will be treated as that all terms and conditions of this enquiry are acceptable.
- (c) If counter terms and conditions are offered by vendor, BHEL EDN shall not be governed by such terms and conditions, unless it is agreed and incorporated in the Purchase Order of BHEL EDN.
- (d) Any deviation to the terms and conditions not mentioned in the quotation by vendor in response to this enquiry will not be considered, if put forth subsequently or after issue of order, unless clarification is sought for by BHEL EDN and agreed upon in the Purchase Order of BHEL EDN.
- (e) BHEL EDN reserves the right to adopt Reverse Auction for the enquiry sent, at its discretion.
- (f) BHEL EDN shall be at liberty to cancel the tender at any time, before ordering, without assigning any reason.
- (g) Any specific terms and conditions to be complied will be mentioned in RFQ.**

II. General Terms and conditions:

1. TWO PART BID: Quotation shall be submitted in two part bid i.e.

(a) Techno-commercial i.e., Un-priced Bid (in one sealed envelope):

Techno-commercial bid shall be submitted with complete description of the equipment, specification compliances to the enquired specification and all the commercial terms & conditions indicated in the **COMMERCIAL TERMS (ANNEXURE -A for Foreign Purchase and ANNEXURE-B for Indigenous Purchase)**. Any other enclosure, which the vendor wishes to submit like product catalogue, technical literature etc., may also be submitted in a sealed envelope super scribed clearly as **"TECHNO-COMMERCIAL BID" with RFQ No. and DUE DATE**. An un-priced copy of price bid (without price) as per **ANNEXURE A-1 for Foreign Purchase and ANNEXURE B-1 for Indigenous Purchase** shall also be enclosed with the techno-commercial bid for evaluation of commercial terms.

The vendor shall not give the price in the technical bid.

Confirmation to BHEL specifications shall be indicated by the vendor in the respective columns provided in the purchase specification wherever applicable. Deviations to the specification / item description, if any shall be brought out clearly indicating "DEVIATION TO BHEL SPECIFICATION" without fail as a part of technical offer.

Compliance to Pre-qualification criteria (if applicable) shall also be enclosed with the Techno-commercial bid.

Manufacturer's name, their trade mark and brand, part number, alternate material to the one asked in enquiry, if any, should be mentioned in quotation and illustrative leaflets giving technical particulars etc. are to be attached to facilitate consideration and technical evaluation of the quotation. BHEL EDN material code number (as in enquiry) shall be indicated for each item quoted.

(b) Price Bid (in one sealed envelope):

Price bid should contain basic unit prices, discount if any, applicable taxes & duties, packing & forwarding charges (if applicable), Freight & insurances (if applicable), FOB charge (if applicable) etc., in a sealed envelope super scribed clearly as **"PRICE BID" with RFQ No. and DUE DATE**.

It is preferred to indicate the rates in both figures and words. In such case, if there is a difference / discrepancy

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between the rates in figures and words, guidelines as per Annexure H shall be followed. **Price bid shall be quoted as per ANNEXURE A-2 for Foreign Purchase and ANNEXURE B-2 for Indigenous Purchase.**

(c) Tender Offer (above two envelopes inside another sealed envelope):

Both these sealed envelopes [(a) Techno-commercial i.e., un-priced Bid and (b) Price Bid] shall be kept in a single sealed envelope and super scribed clearly with **RFQ No. and DUE DATE**.

2. The above sealed envelope (Tender) shall reach our office on or before the due date by 13:00 hrs. Quotations are to be dropped in the tender box marked for the OPENING ON respective days i.e., **MONDAY (BOX No.4)/ WEDNESDAY (BOX No.6)/ FRIDAY (BOX No.8)** kept at BHEL-EDN's Reception area of our works with caption "**CE, SC & PV, DEFENCE**". **Quotations also can be dispatched by Couriers / Registered post / FAX / e-mail to the Purchase Executive indicated in the RFQ at the risk of vendor / bidder.**

Quotation through courier / register post / fax / email when addressed to the specific fax number and email address given in the enquiry, to be sent well in advance to enable BHEL EDN purchase personnel to drop in the tender box before the scheduled opening date and time. Vendor is fully responsible for lack of secrecy on information of such quotations. Vendor shall confirm with the concerned purchase executive after sending the offer regarding such delivery mode to ensure participation. BHEL EDN is not responsible for any delay in receipt of quotation sent by vendor through post/fax/email.

Late Tenders i.e., Tenders received after due date & time will be rejected.

3. The rate quoted shall be in units stated in the enquiry. Where quotation is in terms of unit other than that in enquiry, relationship between the two units must be furnished in the quotation.
4. As far as possible, the quotations shall be free from corrections / overwriting. Corrections / overwriting, if any should be signed by authorized person with the company seal. Any typographical errors, totaling mistakes, currency mistakes, multiplication mistakes, summary mistakes observed in your priced bids, BHEL may consider whichever is beneficial to BHEL for evaluation. Vendor shall doubly ensure that the quote is correct and complete. The corrections / overwriting if any shall be signed with the seal.
5. Quotations are to be duly signed. Unsigned bids/offers are liable for rejection.
6. Tenders will be opened at **13:30 hrs** & the venue is New Engineering Building, 2nd floor, MM conference hall, BHEL EDN, Bangalore. All the tenderers or their authorized representatives (with authorization letter from their principals) may witness opening of techno-commercial bid on the due date.
7. After evaluation of techno-commercial bids, price bids of only those which are technically & commercially accepted, will be opened on a subsequent date, which will be intimated to the concerned in advance for witnessing of price bid opening.
8. The quantity in each item to be purchased may vary from quantity enquired according to the actual requirement at the time of placing the purchase order.

9. DUN & BRADSTREET REPORT (for Foreign purchase):

In case of foreign vendors, BHEL reserves the right to verify the Dun & Bradstreet report during techno-commercial scrutiny. Please mention DUN Number in **Techno-Commercial bid**.

10. Payment of Agency Commission to Indian Agent (for Foreign purchase):

- a. BHEL shall deal directly with foreign vendors, wherever required, for procurement of goods. However, if the foreign principal desires to avail of the services of an Indian agent, then the foreign principal should ensure compliance to regulatory guidelines - which require mandatory submission of an Agency Agreement.
- b. It shall be incumbent on the Indian agent and the foreign principal to adhere to the relevant guidelines of Government of India, issued from time to time.

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- c. The Agency Agreement should specify the precise relationship between the foreign OEM / foreign principal and their Indian agent and their mutual interest in the business. All services to be rendered by agent/ associate, whether of general nature or in relation to the particular contract, must be clearly stated by the foreign supplier/ Indian agent. Any payment, which the agent or associate receives in India or abroad from the OEM, whether as commission or as a general retainer fee should be brought on record in the Agreement and be made explicit in order to ensure compliance to laws of the country.
- d. Any agency commission to be paid by BHEL to the Indian agent shall be in Indian currency only.
- e. Tax deduction at source is applicable to the agency commission paid to the Indian agent as per the prevailing rules.
- f. In the absence of any agency agreement, BHEL shall not deal with any Indian agent (authorized representatives / associate / consultant, or by whatever name called) and shall deal directly with the foreign principal only for all correspondence and business purposes.
- g. The "Guidelines for Indian Agents of Foreign Suppliers" shall apply in all such cases.
- h. The supply and execution of the Purchase Order (including indigenous supplies/ service) shall be in the scope of the OEM/ foreign principal. The OEM/ foreign principal should submit their offer inclusive of all indigenous supplies/ services and evaluation will be based on 'total cost to BHEL'. In case OEM/ foreign principal recommends placement of order(s) towards indigenous portion of supplies/ services on Indian supplier(s)/ agent on their behalf, the credentials/ capacity/ capability of the Indian supplier(s)/ agent to make the supplies/ services shall be checked by BHEL as per the extant guidelines of Supplier Evaluation, Approval & Review Procedure (SEARP), before opening of price bids. It will be the responsibility of the OEM/ foreign principal to get acquainted with the evaluation requirements of Indian supplier/ agent as per SEARP available on www.bhel.com.

The responsibility for successful execution of the contract (including indigenous supplies/ services) lies with the OEM/ foreign principal. All bank guarantees to this effect shall be in the scope of the OEM/ foreign principal.

11. Installation & Commissioning:

- (a) Scope will be as per Purchase Specification. I&C value should be quoted separately by bidders.
- (b) Wherever, Service Tax is applicable –
- (c)
 - 1. The Tenderers shall furnish the Service Tax Registration Number in their offer.
 - 2. If the Tenderer is not having Service Tax Registration Number, he shall submit an undertaking to the effect that,
 - a. in case he is awarded the contract, he shall register with Service Tax Authorities and furnish the Registration Number before commencement of work, OR
 - b. his turnover value is below the threshold limit prescribed by the Service Tax Act and in case he is awarded the contract, whenever his turnover crosses the threshold limit at any time during the execution of the contract, he shall forthwith register with Service Tax Authorities and furnish the Registration Number to BHEL. (This sub-clause is NOT applicable where the taxable turnover of the present tender is above the prescribed threshold limit).
 - 3. Any offer not complying with the above clauses is liable to be rejected.
 - 4. The above clauses apply even where the price quoted is "inclusive of taxes".
 - 5. If the Service Tax Registration Number is not furnished to BHEL before the first bill is submitted (except as provided in Clause 2(b) above), the bills will not be passed (even if the price is "inclusive of taxes").
 - 6. In case of contracts involving multiple bills, every bill (commencing with the 2nd bill) shall be accompanied with a declaration that the contractor has discharged his tax liability on the earlier bill (i) by paying the money to the Government (along with Challan details) or (ii) by utilization of Input Service Tax Credit available with him or (iii) being exempt as his turnover continues to be below the threshold limit. In the absence of such a declaration, the bill shall not be passed.
 - 7. In case of contracts involving a single bill, the bill shall be accompanied with an undertaking that the contractor shall discharge his tax liability on that bill as per law.

- 12. **TOTAL COST TO BHEL:** Purchase order will be placed on the lowest quotation (L1) only among the technically & commercially accepted quotations. Lowest quotation (L1) is determined on the basis of the total cost to BHEL. Loading Factors for deviation to BHEL Commercial terms and conditions will be considered.

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For Foreign offers, the Exchange rate (TT selling rate of SBI) shall be taken as under.

Single part bids	Date of Tender opening
Two/Three part bid	Date of Part-1 bid opening
Reverse Auction	Date of Part-1 bid opening

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.

- (1) If Freight is quoted extra, original money receipt from Transporter shall be submitted for payment of Freight charges.
- (2) C-form : For issue of form "C", vendor has to furnish "E1/E2" form.

12. FIRM PRICE:

Rates quoted should be firm from the date of offer, till completion of supply. No enhancement in the rates and changes in the techno-commercial terms will be allowed once the quotation is accepted and order is placed.

If Installation & Commissioning is in vendor's scope, then the price shall remain FIRM till commissioning & handing over of the complete system.

13. TERMS OF PAYMENT:

1. SUPPLY FOR FOREIGN PURCHASE : Payment will be made against "SIGHT DRAFT" on presentation of documents to our bankers . Payment through LC is also made subject to loading factors as per Clause 25 (A). For LC payment bank charges within India will be borne by BHEL and outside India will be to vendor's account.

The payment terms are as follows:

SIGHT DRAFT PAYMENT (direct payment):

SUPPLY :

(a) **I&C not included in vendor's scope :** 90% payment of Supply value + 100% Taxes shall be made with 45 days credit from the date of receipt of material at site. Balance 10% on execution of PBG valid for warranty period + 6 months claim period from any of the BHEL Consortium banks.

(b) **Supply & I&C in vendor's scope :** 80% payment of Supply value + 100% Taxes shall be made with 45 days credit from the date of receipt of material at site. 10% on completion of I&C and certification line item wise on pro -rata basis. Balance 10% on execution of PBG valid for warranty period + 6 months claim period from any of the BHEL Consortium banks..

(B) FOR INDIGENOUS PURCHASE (DIRECT PAYMENT):

1. For Supply :

(a) **I&C not included in vendor's scope :** 90% payment of basic Supply value + 100% Taxes and duties shall be made with 45 days credit from the date of receipt of material at site. Balance 10% on execution of PBG valid for warranty period + 6 months claim period from any of the BHEL Consortium banks. PBG value shall be 10% of basic supply PO value.

(b) **Supply and I&C in vendor' scope :** 80% payment of basic Supply value + 100% Taxes and duties shall be made with 45 days credit from the date of receipt of material at site. 10% on completion of I&C and certification line item wise on pro-rata basis. Balance 10% on execution of PBG valid for warranty period + 6 months claim period from any of the BHEL Consortium banks. PBG value shall be 10% of basic supply PO value.

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

3. Civil Works : 90% on completion of activity milestone and certification line item wise from site-in charge. Balance 10% against PBG for 10% of basic Civil value valid warranty period + 6 months claim period from any of the BHEL Consortium banks. PBG value shall be 10% of basic civil PO value.

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

If PBG cannot not be submitted, vendors can also accept for the final 10% payment, payable after the warranty period + 6 months of claim period against supplementary invoice subject to the completion of commissioning (if applicable) as PBG is linked to

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Warranty period.

For any deviation in payment term, the offer will be loaded as per Clause 25.00.

5. ADVANCE PAYMENT: Quotations with “Advance payment/Inland LC” shall be rejected.

14. PENALTY:

Failure to supply within the delivery time as per purchase order will make the vendor liable to an unconditional penalty of 0.5 % (half percent) per week at the basic price of the goods for the undelivered quantity, subject to a maximum of 10%.

Supply : Date of issue of pre -shipment inspection/ call letter with supporting documents like test reports/conformance to test carried by the vendor will be treated as date of dispatch for the purpose of penalty calculation wherever Pre-Inspection is carried out.

For all other activities, the actual date of completion of activity as certified by concerned site-incharge will be considered for the purpose of penalty calculation.

15. PBG:

Performance Bank Guarantee (PBG) to be submitted on non-judicial stamp paper as per the BHEL prescribed format given in **ANNEXURE-E for Foreign Purchase and Annexure-F for Indigenous Purchase** for 10% of the total supply value obtained from any BHEL member (consortium) banks indicated in **ANNEXURE-G**.

The Bank Guarantee shall be submitted directly to the concerned Purchase Executive by the issuing Bank with their forwarding letter. BHEL will verify independently with the bank to establish the authenticity. Alternately, standby LC issued from approved banker can also be considered.

16. TERMS OF DELIVERY:

(a) FOR IMPORTED PURCHASE:

Price offered shall be for goods packed and delivered **FOB** Seaport,/FCA International Airport 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. Approved Airports are as per **Annexure-C**. The consignment shall be handed over to BHEL approved freight forwarder as mentioned in PO.

(b) 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 transshipment and to take care of transit damages.

Smaller consignments can be dispatched through Courier services/ RPP with the prior approval of the purchasing Executive.

17. DELIVERY REQUIREMENT:

Delivery date mentioned in RFQ is tentative. Actual requirement is as per RFQ terms & conditions.

18. VALIDITY:

Quotation should remain valid for a period of **90 days** from the date of technical bid opening.

19. POST-ORDER REQUISITES:

- a. Vendor shall give an Order Acknowledgement indicating the delivery date within one week of receipt of PO.
- b. Pre-shipment inspection at vendor's works, if required, will be carried out by BHEL/Customer. Required assistance will have to be provided by the vendor at the time of pre-shipment inspection.
- c. Test certificates, Calibration certificates and warranty certificates as stipulated at the time of ordering shall be furnished.

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- d. Items shall be dispatched by Air worthy /Sea worthy/ Road worthy packing. Any damage and later rejection, due to poor / improper packing shall be to vendor's account.
- e. Any damage/rejection should be made good or replaced immediately without any extra cost to BHEL such as freight, duties, taxes etc. The liability is restricted to the value of the order.
- f. Wherever commissioning is involved, it shall be carried out by the vendor's qualified engineers. Scope of work includes installation, commissioning and start-up trials till satisfactory performance level is reached as certified by BHEL.
- g. BHEL will not be responsible for any loss, damage or injuries to vendor's personnel sustained during installation / commissioning / start-up trials. Vendor shall ensure compliance with all statutory requisites as laid down by local bodies, state & Central Government. Vendor shall indemnify BHEL for all damages/ losses to various personnel during their presence in BHEL's premises for whatever purpose.
- h. Suitable markings & damage control indicating devices shall be provided where applicable.
- i. Equipment shall comply with the standard requirements of ISO 14001 & OHSAS 18001.

20. RISK PURCHASE:

The purchaser at his discretion may also make purchase of the materials NOT supplied in time at the RISK & COST of the supplier. In this event, it will be obligatory on the part of the supplier who fails to supply the goods in time to make good to BHEL any loss due to such risk purchase.

21. GENERAL TERMS AND CONDITIONS GOVERNING REVERSE AUCTION (RA):

- (a) BHEL reserves the right to go for Reverse Auction (RA) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. All bidders to give their acceptance 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.
- (b) In case BHEL decides to go for Reverse Auction, only those bidders who have given their acceptance to participate in RA will be allowed to participate in the Reverse Auction. Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit "online sealed bid" in the Reverse Auction. Non-submission of "online sealed bid" by the bidder will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue."
- (c) **Kindly refer to Annexure D for Terms & Conditions of Reverse Auction.**
- (d) Vendor shall confirm acceptance for RA in **ANNEXURE A/B**.

22. REGRET LETTER: In case any vendor is unable to quote, vendor shall send a regret letter.

23. Any dispute arising out of this, shall be referred to the sole arbitration of Head of Dept. Materials Management of group concerned, BHEL EDN or any other officer nominated by him and his award shall be final and binding on the parties. The venue of the arbitration in all cases shall be Bangalore, India.

24. Any legal suit in respect of this enquiry lies in the court of Jurisdiction of Bangalore (India) only.

25. LOADING FACTORS:

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.

A (i). For non compliance of standard Terms of payment (For Foreign Purchase Orders)

Sl. No.	BHEL standard term	If you quote	Loading factor in % for non-compliance
1	80% against "SIGHT DRAFT" + 20% after commissioning and against PBG (where both commissioning & PBG are applicable)	Payment through Letter of Credit (LC)	10%

In general, if the quote is through L/C, it shall be opened 30 days prior to dispatch and valid for 3 months.

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A(ii).For non compliance of standard Terms of payment (For Indigenous Purchase Orders)

Sl. No.	BHEL standard term	If you quote	Loading factor in % for non-compliance
1	As per RFQ Terms	Any other Payment term	10%

B.For non compliance of standard Terms of Penalty

Sl. No.	BHEL standard term	If you quote	Loading factor for non-compliance
1	Penalty of 0.5% per week subject to max. of 10% on the basic value of the items not supplied /delayed	Other than the above.	Loading Factor 10%-Quoted Max %

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

ANNEXURE- C**LIST OF INTERNATIONAL AIRPORTS**

Sl. No	Country	Air Ports
1	Austria	Vienna, Linz, Graz
2	Australia	Sydney, Melbourne, Perth
3	Belgium	Antwerp, Brussels
4	Canada	Toronto, Montreal
5	China	Shanghai
6	Cyprus	Lamaca
7	Czech Republic	Prague (Via Frankfurt)
8	Denmark	Copenhagen
9	Egypt	Cairo
10	Finland	Helsinki
11	France	Paris (Rosy), Lyon
12	Germany	Darmstadt, Mannheim, Nurnberg, Hamburg, Stuttgart, Munich, Koln, Dusseldorf & Hannover, Frankfurt, Berlin
13	Hong Kong	Hong Kong
14	Italy	Rome, Milan, Turin, Bologna, Florence
15	Ireland	Dublin
16	Israel	Telaviv
17	Japan	Tokyo, Osaka
18	Malaysia	Kuala lumpur, Penang
19	Netherlands	Amsterdam, Rotterdam
20	New Zealand	Auckland
21	Norway	Oslo
22	Oman	Muscat
23	Philippines	Manila
24	Romania	Bucharest
25	Russia	Moscow
26	Saudi Arabia	Riyad
27	Singapore	Singapore
28	Slovakia	Bartislawa
29	South Africa	Johannesburg, Durban
30	South Korea	Kimpo
31	Spain	Barcelona
32	Sweden	Stockholm, Gothenburg, Milano
33	Switzerland	Basle, Zurich, Geneva
34	Taiwan	Taipei
35	U.A.E.	Dubai
36	U.K.	Landon (Heathrow), Newcastle, Oxford, Cheltham, Bristol, Welling borough, Birmingham, East Midland, Manchester, Leeds, Glasgow.
37	U.S.A.	New York, Chicago, San Francisco, Los Angeles, Atlanta
38	Ukraine	Kiev

Annexure - D**Terms & Conditions of Reverse Auction**

Against this enquiry for the subject item/ system with detailed scope of supply as per enquiry specifications, BHEL may resort to "REVERSE AUCTION PROCEDURE" i.e., ON LINE BIDDING (THROUGH A SERVICE PROVIDER). The philosophy followed for reverse auction shall be English Reverse (No ties).

- (1) For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.
- (2) Those bidders who have given their acceptance for Reverse Auction (quoted against this tender enquiry) will have to necessarily submit 'online sealed bid' in the Reverse Auction. Non-submission of 'online sealed bid' by the bidder for any of the eligible items for which techno-commercially qualified, will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.
- (3) BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on internet.
- (4) In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained.
- (5) Business rules like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.
- (6) Bidders have to fax the Compliance form (annexure IV) before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.
- (7) In line with the NIT terms, BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at "Total Cost to BHEL" like Packing & forwarding charges, Taxes and Duties, Freight charges, Insurance, Service Tax for Services and loading factors (for non-compliance to BHEL standard Commercial terms & conditions) for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.
- (8) Reverse auction will be conducted on scheduled date & time.
- (9) At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.
- (10) The lowest bidder has to fax/e-mail the duly signed and filled-in prescribed format for price breakup including that of line items, if required, (Annexure VII) as provided on case-to-case basis to Service provider within two working days of Auction without fail.
- (11) In case BHEL decides not to go for Reverse Auction procedure for this 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.
- (12) Bidders shall be required to read the "Terms and Conditions" section of the auctions site of Service provider, using the Login IDs and passwords given to them by the service provider before reverse auction event. Bidders should acquaint themselves of the „Business Rules of Reverse Auction", which will be communicated before the Reverse Auction.
- (13) 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*, shall be initiated by BHEL and the results of the RA scrapped/ aborted.
- (14) The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.
- (15) In case BHEL decides to go for reverse auction, the H1 bidder(s) (whose quote is highest in online sealed bid) may not be allowed to participate in further RA process.

ANNEXURE-E

PERFORMANCE BANK GUARANTEE
(FOR FOREIGN PURCHASE ORDERS)
BANK NAME AND ADDRESS

Bharat Heavy Electricals Limited (BHEL),
 Electronics Division,
 PB No. 2606,
 Mysore Road,
 BANGALORE- 560 026
 INDIA
 Dear Sirs,

Ref: CONTRACT PERFORMANCE GUARANTEE.

WHEREAS you have entered into a contract reference No PO NO. _____ with M/s _____ having its registered office at _____ for the supply of _____ as detailed in your purchase order No. _____ which is hereinafter referred to as "the said contract" and WHEREAS M/s _____ has undertaken to produce a Bank Guarantee for 10% (Ten Percent) of _____ the contract price amounting to _____ (_____) to secure its obligations to Electronics Division, BHEL having its registered office at New Delhi for the performance of the contract including the warranty of the equipment supplied, We _____ Bank _____ hereby expressly, irrevocably and unreservedly undertake and guarantee as principal obligors on behalf of M/s _____ that in the event Bharat Heavy Electricals Ltd. (B.H.E.L.) declares to us in writing that M/s _____ has not fulfilled any obligation according to the contractual obligation of the said contract, to pay you on demand and without demur to Bharat Heavy Electricals Ltd., Electronics Division, Mysore Road, P.B.No. 2606, Bangalore-560 026, India an amount of _____ (in words _____) subject to as may be determined below:

- 1) Notwithstanding any right M/s. _____ may have directly against you or any disputes raised by M/s _____, Your written demand shall be conclusive evidence to us that repayment is due under the terms of the said contract and shall be binding on us.
- 2) We shall not be discharged or released from this undertaking and Guarantee by any arrangements, variations made between you and M/s. _____ with or without our consent and Knowledge or by any alterations in the obligations of M/s. _____ by any forbearance whether as to payment, time, performance or otherwise.
- 3) This guarantee shall remain valid until the end of twenty-four weeks after the close of the warranty period or until the same is reported by BHEL to us whichever is earlier.
- 4) We agree and undertake not to revoke this guarantee during its validity unless discharged in writing by you subject to the provision of clause (7) below.
- 5) This guarantee shall be a continuing guarantee subject to the foregoing and shall not be discharged by any change in the constitution of the Bank or M/s. _____.
- 6) This guarantee shall be governed by and constructed in accordance with the Laws of India.
- 7) At any time _____ Bank may render this guarantee null and void by paying to Bharat Heavy Electricals Ltd. the full amount being _____ (in words _____)

Note:

- (1) To be executed in Non-Judicial stamp paper by any authorized Indian Bank.
- (2) To be submitted directly by banker to concerned executive in purchase dept., Please give BHEL address to banker.
- (3) Do not enclose with Bank document.
- (4) Any Modification & omissions to this are not permitted

Signature of tenderer / with seal

ANNEXURE – F**PERFORMANCE BANK GUARANTEE**
(FOR INDIGENOUS PURCHASE ORDERS)

THIS DEED OF GUARANTEE made and executed on the _____ day of _____ (year), by the _____ (Bank), registered under the Companies Act 1956/Nationalized Bank constituted under the Banking Companies (acquisition and transfer of undertakings) Act constituted under the State Bank of India Act / Subsidiary Banks Act, having its registered / head office at _____ represented herein by its Branch Manager / authorized representative Sri. _____ & Sri. _____ (Hereinafter called 'guarantor' which term shall mean and include its successors and assigns)

IN FAVOUR OF BHARAT HEAVY ELECTRICALS LIMITED

_____ (Buyer's Name), a company registered under the companies Act, 1956 having its registered office at BHEL House at Siri Fort , New Delhi -100 049 and its Electronics Division at Mysore road, Bangalore-26 (hereinafter referred to as the 'Company' Which term shall include its successors and assigns):

Whereas the company has placed an order on _____ (State the name of the company / firm and its address) (hereinafter referred to as the 'Supplier' which term shall mean and include its liquidators, successors and assign) for the supply of system under order / Contract No. _____ Dt. _____

AND WHEREAS the supplier has agreed to supply the materials and carryout the works as detailed and in accordance with the terms set out in the said order/contract.

AND WHEREAS the company is not required to pay to the supplier a sum of Rupees _____ being the 10% of the value of the goods supplied / Works performed / Services rendered under the said order / contract between the supplier and the company, till the company is satisfied with the mechanical Warranties and the performance standards stipulated in the said order / contract between the company and the supplier has been duly fulfilled, except against a Bank Guarantee for the said sum of Rs _____ in favour of the company by reputed Bank, in which case the company has agreed to make payment to the supplier of the said sum of Rupees _____ being (...%) of the value of the goods supplied / Works performed / Services rendered under the agreement between the supplier and the company and the Guarantor has at the request of the supplier, agreed to furnish this Guarantee subject to the terms and conditions stated below:

NOW THIS DEED WITNESSES THAT IN pursuance of the above said agreement, the guarantor hereby agrees and covenants With company is as follows :-

- 1) That during the period this contract of Guarantee remains effectual, the guarantor shall be liable in respect of the amount due and owing to the company in respect of the payments to the extent of Rs _____ (in words) _____ against any loss or damage caused to or suffered by the company by reasons of any breach of the terms of the said order / contract / Agreement by the supplier.
- 2) The Guarantor hereby undertakes to pay the amounts due and payable under this guarantee without any demur, merely on demand from the company intimating that the amount claimed is due by way of loss or damage caused to or suffered or would be caused or suffered by the supplier of any terms contained in the said order / contract. Any such demand made on the guarantor shall be conclusive as regards the amount due and payable by the Guarantor irrespective of the fact whether the Contractor / supplier admits or denies.
- 3) The Guarantor further agrees that the agreement herein contained shall remain in force and effect till all the supplies to be made / Works to be performed / Services to be rendered under the said order / contract / agreement are completed to the entire satisfaction of the company or till company certifies that the terms and conditions of the said order / contract / agreement have been fully and properly carried out by the said supplier and accordingly discharges the Guarantee. Unless a demand or claim under this guarantee is made on the guarantor in writing on or before the expiry of claim period indicated in clause 6 below, the guarantor shall be discharged from all the liability under this guarantee thereafter.
- 4) The guarantor further agrees with the company that the company shall have the fullest liberty without the consent of the guarantor and without effecting in any manner the obligations of the guarantor hereunder to vary any of the terms of the said order / contract / agreement or extend the time of performance by the said supplier from time to time or refrain from exercising the power exercisable by the company against the said supplier or to forbear or omit to enforce any of the terms and conditions relating to the said order / contract / agreement, and the guarantor shall not be relieved of its liability in whole or in part , by reason of any act, commission or forbearance on the part of the company or by reason of any such variation, or extension being granted to the said

Signature of tenderer / with seal

supplier or by reason of any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving the guarantor.

- 5) The guarantor undertakes not to revoke this guarantee during its currency except with the previous consent of the company in writing.
- 6) Notwithstanding anything herein above contained, the liability of the guarantor under these presents is restricted to Rs _____. The guarantee shall be in force till its expiry on _____ unless a demand is made on the guarantor within SIX months from the date of expiry, all the liability of the guarantor under this guarantee shall stand fully discharged. The decision of the claimant in regard to breach of contract is final and binding on the Bank.

IN WITNESS whereof, the guarantor, acting through its authorized representative has executed this deed of Guarantee on the day, month and year first above written.

(Seal of the Bank to be affixed)

WITNESS

- 1.
- 2.

Note:

- (1) To be executed in INR 100 Non-Judicial stamp paper by any authorized Indian Bank.
- (2) To be submitted directly by banker to concerned executive in purchase dept., Please give BHEL address to banker.
- (3) Do not enclose with Bank document.
- (4) Any Modification & omissions to this are not permitted.

Signature of tenderer / with seal

BHEL MEMBER BANKS (CONSORTIUM BANKS)**PBG SHALL BE ISSUED FROM THE FOLLOWING BANKS OR THEIR BRANCH OFFICES ONLY**

1	STATE BANK OF INDIA
2	PUNJAB NATIONAL BANK
3	HDFC BANK
4	SYNDICATE BANK
5	CANARA BANK
6	INDIAN BANK
7	ST. BANK OF HYDERABAD
8	ICICI BANK
9	STANDARD CHARTEREDBANK
10	UCO BANK
11	KOTAK MAHINDRA
12	ORIENTAL BANK OF COMMERCE
13	STATE BANK OF TRAVANCORE
14	CENTRAL BANK
15	IDBI BANK
16	FEDERAL BANK
17	HSBC LTD
18	DEUTSCHE BANK
19	CORPORATION BANK
20	CITI BANK
21	BANK OF BARODA
22	ABN AMRO BANK
23	UNITED BANK OF INDIA
24	VIJAYA BANK
25	UNION BANK OF INDIA
26	PUNJAB & SIND BANK
27	ANDHRA BANK
28	BANK OF INDIA
29	AXIS BANK

The above list is tentative and is subject to change from time to time.
The Purchase Executive shall be contacted for confirmation of the same.

Signature of tenderer / with seal

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 discrepancy between the unit price and the total price (which is obtained by multiplying the unit price by the quantity), the unit price shall prevail and the total price corrected accordingly, unless in the opinion 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.