6.5 MWp(DC)/ 5 MW(AC) GRID CONNECTED GROUND BASED SOLAR POWER PLANT AT NALANDA UNIVERSITY - RAJGIR, BIHAR							
Price Sheet							
Sl. No	**Name of Work**	**S/I/O**	**Unit**	**Qty**	**weightage in %**	**Rate/Unit**	**Total**
(A)	**Supply, installation, testing & commissioning:-**						
1	**Installation & commissioning of BHEL supplied items :**						
1(a)	PV Modules MC4 Connectors shall be supplied by Bidder & Min Two sets of Tool Kit shall be supplied by Bidder (Approx 1000 Sets)	I	Nos	19,120	10.246%	₹0.00	₹10.25
1(b)	Optimizer (2:1)	I	Nos	9,560	3.771%	₹0.00	₹3.77
1(c)	Inverter & Accessories (50kVA- 200kVA)	I	Nos	50	0.872%	₹0.02	₹0.87
1(d)	Erection of Module Mounting Structure Required number of nuts & Bolts for the Installation of MMS shall be supplied by Bidder (SS304) a) M6- 162000 Nos b) M10 - 60000 Nos c) M16 -12000 Nos	I	Per Module	19,120	22.870%	₹0.00	₹22.87
2	**ACDB supply & installation**						
2(a)	Supply of ACDB/ACCB (50kVA-200kVA)	S	Nos	50	5.734%	₹0.11	₹5.73
2(b)	ACDB/ACCB (50kVA-200kVA)	I	Nos	50	0.481%	₹0.01	₹0.48
3	**DC cabling**						
3(a)	DC cable Laying through conduit pipe/ cable tray as per requirement - 8x4 Sq mm DC	I	RMT	7,500	1.061%	₹0.00	₹1.06
3(b)	Cable Ties that shall be in contractor scope of supply	S	AU	1	0.514%	₹0.51	₹0.51
3(c)	Suplly of ferrule shall be in contactor scope	S	AU	1	0.386%	₹0.39	₹0.39
4	**AC power Cabling (From Inverter to ACDB)**						
4(a)	Supply of PVC sheathed XLPE copper conductor unarmoured 4core power cable of 1.1 KV grade of following size						
4(a)	50 Sqmm	S	RMT	75	0.607%	₹0.01	₹0.61
4(b)	Laying and fixing of PVC sheathed XLPE copper conductor unarmoured 4core power cable of 1.1 KV grade of following size (including supply of accessories such as lugs, gland).						
4(b)	Above 35 Sqmm to 95 Sqmm	I	RMT	75	0.011%	₹0.00	₹0.01
5	**AC LT power Cabling (From ACDB to LT Panel)**						
5(a)	Laying of PVC sheathed / XLPE, Armoured Aluminium conductor 4core power cable of 1.1 KV grade of following size direct in ground including excavation, sand cushioning, protective covering and refilling the trench etc as required						
	Above 95 Sqmm to 185 Sqmm	I	RMT	3,000	4.527%	₹0.00	₹4.53
6	**AC LT power bus duct (From LT Panel to Transformer)**						
6(a)	Busduct - 3200A	S	RMT	12	3.987%	₹0.33	₹3.99
6(b)	Busduct - 3200A	I	RMT	12	0.699%	₹0.06	₹0.70
7	**AC - HT (11kV) 3Core power cabling from Transformer to HT Panel**						
7(a)	Supply of PVC insulated and PVC sheathed / XLPE, 3 core Armoured Aluminium conductor power cable of 11 kV grade of following size						
	95 Sqmm	S	RMT	900	3.504%	₹0.00	₹3.50
7(b)	Laying of PVC insulated and PVC sheathed / XLPE, Armoured power cable of 11 KV grade of following size direct in ground including excavation, sand cushioning, protective covering and refilling the trench etc as required						
	Above 35 Sqmm to 95 Sqmm	I	RMT	900	1.690%	₹0.00	₹1.69
7(c)	Clamps, hooks, ties, double compression cable glands, cable lugs , SS304 bolts/nuts/ plain and spring washers, anchoring arrangement shall be in contractor scope of supply	S	AU	1	0.857%	₹0.86	₹0.86
8	**Supply & Installation of Conduits along with all accessories for cable laying**						

	Supplying and fixing of following sizes of medium class HDPE/uPVC conduit along with accessories in surface/recess including cutting the wall and making good the same in case of recessed conduit as required.						
8(a)	50 mm	S&I	RMT	3,000	2.032%	₹0.00	₹2.03
9	**Supply & Installation of cable tray**						
9(a)	upto 35sqmm	S&I	RMT	700	0.531%	₹0.00	₹0.53
9(b)	above 35sqmm upto 95sqmm	S&I	RMT	700	0.654%	₹0.00	₹0.65
9(c)	above 95sqmm	S&I	RMT	600	0.610%	₹0.00	₹0.61
10	**Supply and installation of Earthing Strip**						
10(a)	25x5 mm GI Strip	S&I	RMT	1,500	1.325%	₹0.00	₹1.32
10(b)	Earthing Wire (Green 2.5 Sqmm)	S&I	RMT	2,000	0.472%	₹0.00	₹0.47
11	**Supply of Earthing Material and Installation after making of Suitable pit as per standard.**						
11(a)	For chemical Earthing/ Conductor Earthing (Pipe) (as per Approved Documents)	S&I	No.	70	1.593%	₹0.02	₹1.59
12	**Integration of Power**						
12(a)	Supply of LT Panel having rating of (415 volt, 3200 Amp, 2000kVA)	S	No	3	9.325%	₹3.11	₹9.32
12(b)	Installation & commissioning of LT panel having rating of (415 volt, 3200 Amp, 2000kVA) including termination of incoming & outgoing cables/busduct	I	No.	3	1.350%	₹0.45	₹1.35
13	**Supply & Installation of :-**						
13(a)	Rating/Name Plate	S&I	No.	14	0.030%	₹0.00	₹0.03
13(b)	Display board	S&I	No.	2	0.171%	₹0.09	₹0.17
13(c)	Danger Board	S&I	No.	60	0.129%	₹0.00	₹0.13
14	**Fire fighting System**						
14(a)	Portable Fire extinguisher	S&I	Set	10	0.726%	₹0.07	₹0.73
14(b)	Fire Bucket set	S&I	Set	6	0.123%	₹0.02	₹0.12
15	**Lightning Protection**						
15(a)	Lightning Arrestor - ESE type	S&I	Nos	6	1.350%	₹0.23	₹1.35
15(b)	Event Counter	S&I	Nos	6	0.148%	₹0.02	₹0.15
15(c)	Mast (10 meter long)	S&I	Nos	6	0.315%	₹0.05	₹0.32
15(d)	Earthing strip (Cu 20 X 3)	S&I	RMT	80	0.098%	₹0.00	₹0.10
15(e)	Earthing pit (Cu plate type 600 X 600 X 3.15)	S&I	Set	12	1.363%	₹0.11	₹1.36
16	**Supply & installation of Surveillance System**						
16(a)	CCTV based including mounting accessories, cables, storage devices, etc as per technical specification 1. 2 Nos of PTZ camera with structure (2MP) 2. 8 Nos of Bullet camera with structure (2MP) 3. NVR with Minimum 180 days 4. Accessories for installation of above.	S&I	Set	1	3.108%	₹3.11	₹3.11
17	**Net Metering including supply & installation of Net meters, gross meters, CT, and other items & accessories alongwith liaisoning with all related local / Govt authorities.**	**S&I**	**Set**	1	7.288%	₹7.29	₹7.29
18	**Securty Round the clock**	**O**	**Months**	6	1.158%	₹0.19	₹1.16
19	**Unloading (BHEL Supplied Items)**	**O**	**Lump sum**	1	0.450%	₹0.45	₹0.45
(B)	**Civil Works:-**						
1	Foundation for inverter, ACDB, LT panel, etc.						
1(a)	PCC 1:1.5:3	S&I	Cum	30	0.805%	₹0.03	₹0.81
1(b)	Structure for Mounting GI	S	Kg	5,000	2.156%	₹0.00	₹2.16
1 (c)	Galvalume sheet for Canopy	S	SQM	240	0.823%	₹0.00	₹0.82
2	**Earth Work:-**						
2(a)	Excavation of earth	I	Cum	30	0.022%	₹0.00	₹0.02
2(b)	Back filling of earth	I	Cum	30	0.026%	₹0.00	₹0.03
Total							₹100.00

Offered Price		**₹100.00**

GST Extra as applicable

Index

Signature and seal of Bidder

Chapter 01

GENERAL INSTRUCTION TO BIDDERS

1. DISPATCH INSTRUCTION

1.1. The General Conditions of Contract form part of the Tender specifications. All pages of the tender documents shall be duly signed, stamped and submitted along with the offer in token of complete acceptance thereof. The information furnished shall be complete by itself. The Bidder is required to furnish all the details and other documents as required in the following pages.

1.2. Bidders are advised to study all the tender documents carefully. Any submission of tender by the Bidder shall be deemed to have been done after careful study and examination of the tender documents and with the full understanding of the implications thereof. Should the Bidders have any doubt about the meaning of any portion of the Tender Specification or find discrepancies or omissions in the drawings or the tender documents issued are incomplete or shall require clarification on any of the technical aspect, the scope of work etc., he shall at once, contact the authority inviting the tender well in time (so as not to affect last date of submission) for clarification before the submission of the tender. Bidder's request for clarifications shall be with reference to Sections and Clause numbers given in the tender documents. The specifications and terms and conditions shall be deemed to have been accepted by the Bidder in his offer. Noncompliance with any of the requirements and instructions of the tender enquiry may result in the rejection of the tender.

2. SUBMISSION OF TENDERS

2.1. The Bidders must submit their tenders to Officer inviting tender as per instructions in the NIT

- Offer shall be submitted online in e-procurement portal.
- No other mode of offer submission shall be acceptable & shall be rejected.

Note: Party can review & revise their submitted offers till due date & time of submission

2.2. The tenders received after the specified time of their submission are treated as late tenders and shall not be considered under any circumstances.

2.3. Tenders shall be opened by authorized officer of BHEL as specified in the NIT.

2.4. Bidders are supposed to be well acquainted with the actual working and other prevalent conditions at different regions for which bids are being submitted. No claim will be entertained later on the grounds of lack of knowledge of any of the conditions.

3. LANGUAGE

3.1. The Bidder shall quote the rates in English language and international numerals. These rates shall be entered in figures as well as in words. For the purpose of the tenders, the metric system of units shall be used.

3.2. All entries in the tender shall either be typed or written legibly in ink. Erasing and over-writing is not permitted and may render such tenders liable for rejection. All cancellations and insertions shall be duly attested by the Bidder.

4. PRICE DISCREPANCY:

4.1. All prices to be quoted strictly in the Price Bid formats only. Amount/Percentage etc. should NOT be quoted anywhere in the Technical or Commercial Offer. Otherwise the offer may be rejected.

4.2. When the rate quoted by the contractor in figures and words tallies but the amount is not worked out correctly, the rate quoted by the contractor shall be taken as correct and not the amount.

4.3. In case of lumpsum price, if there is any difference between the amount in figures and in words, the amount quoted by the bidder in words shall be taken as correct.

5. QUALIFICATION OF BIDDERS

5.1. Only Bidders who fulfil the required prequalification criteria forming part of the NIT are expected to quote for this work.

5.2. Offers from Bidders who are under suspension (banned) by any Unit/Region/Division of BHEL shall not be considered.

5.3. Offers from Bidders who do not comply with the latest guidelines of Ministry/Commissions of Govt of India shall not be considered.

6. EVALUATION OF BIDS

6.1. Technical Bids submitted by the Bidder will be opened first and evaluated for fulfilling the Qualification criteria and other conditions in NIT/Tender documents, based on documentary evidences submitted along with the offer.

6.2. Price Bids of unqualified bidders shall not be opened. Reasons for rejection shall be intimated in due course after issue of LOI/LOA to successful bidder and receipt of unqualified acceptance from the successful bidder.

7. EARNEST MONEY DEPOSIT (As applicable)

7.1. Every tender must be accompanied by the prescribed amount of Earnest Money Deposit (EMD) in the manner described herein.

7.2. EMD shall be furnished along with the offer in full as per the amount indicated in the Special Conditions of Contract.

7.3. EMD may be paid in following manner:

a) Cash (as permissible under Income Tax Act) OR by Pay order or Demand Draft or Banker's Cheque in favour of 'Bharat Heavy Electricals Limited' and payable at Regional Hq issuing the tender.

b) EMD can also be accepted in the form of FDR issued by Scheduled Banks/ Public Financial Institutions as defined in the Companies Act (FDR should be in the name of the Contractor, a/c BHEL)

c) EMD amount in excess of ₹ 2 lakh may also be accepted in the form of BG.

d) No other form of EMD remittance shall be acceptable to BHEL.

7.4. EMD by the bidder will be forfeited as per Tender Documents if:

a) After opening the tender, the bidder revokes his tender within the validity period or increases his earlier quoted rates.

b) The bidder does not commence the work within the period as per LOI/Contract. In case the LOI / contract is silent in this regard then within 15 days after award of contract.

7.5. EMD shall not carry any interest.

7.6. In the case of unsuccessful bidders, the Earnest Money will be refunded to them within a reasonable time (30 days) after acceptance of award by successful Bidder.

7.7. If the EMD is NOT submitted along with the offer – the Bidders's offer shall not be evaluated.

8. SECURITY DEPOSIT (As applicable)

8.1. Upon acceptance of Tender, Work order shall be finalized with the successful Bidder(s).

8.2. The security Deposit should be furnished before start of the work by the contractor.

8.3. Security Deposit should be submitted towards fulfilment of any obligations in terms of the provisions of the contract. The total amount of Security Deposit will be 5% of the contract value. EMD of the successful Bidder shall be converted and adjusted towards the required amount of Security Deposit.

8.4. Security deposit can also be recovered at the rate of 10% from the running bills. However, in such cases at least 50% of the Security Deposit should be deposited in any form as prescribed below, before start of the work and the balance 50% may be recovered from the running bills.

8.5. The balance amount of Security Deposit (after adjustment of EMD as SD) should be furnished before start of the work by the contractor.

8.6. Security Deposit may be furnished in any one of the following forms:

a) Cash (as permissible under the Income Tax Act)
b) Pay Order / Demand Draft in favour of BHEL.
c) Local cheques of scheduled banks, subject to realization.
d) Electronic Fund Transfer in favour of BHEL.
e) Bank Guarantee from Scheduled Banks/ Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format should have the approval of BHEL
f) Fixed Deposit Receipt issued by Scheduled Banks/ Public Financial Institutions as defined in the Companies Act (FDR should be in the name of the Contractor, a/c BHEL)
g) Securities available from Indian Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (held in the name of Contractor furnishing the security and duly endorsed/ hypothecated/ pledged, as applicable, in favour of BHEL)

(Note: BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith)

8.7. The Security Deposit shall not carry any interest.

8.8. In case the value of work exceeds / reduces from the awarded / accepted value, the Security Deposit shall be correspondingly enhanced / reduced as given below:

 Signature and seal of Bidder

a) The enhanced part of the Security Deposit shall be immediately deposited by the Contractor or adjusted against payments due to the Contractor.
b) The validity of Bank Guarantees towards Security Deposit shall be initially upto the completion period as stipulated in the Letter of Intent / Award + 3 months, and the same shall be kept valid by proper renewal till the acceptance of Final Bills of the Contractor, by BHEL.
c) BHEL reserves the right of forfeiture of Security Deposit in addition to other claims and penalties in the event of the Contractor's failure to fulfill any of the contractual obligations or in the event of termination of contract as per terms and conditions of contract. BHEL reserves the right to set off the Security Deposit against any claims of other contracts with BHEL.
d) The recoveries made from running bills (cash deduction towards balance SD amount) can be released against submission of equivalent Bank Guarantee in acceptable form, but only once, before completion of work, with the approval of the authority competent to award the work.

8.9. POINTS TO BE NOTED IN CASE BANK GUARANTEES ARE SUBMITTED FOR EMD/SD

Where ever Bank Guarantees are to be furnished/submitted by the contractor, the following shall be complied with

a) Bank Guarantees shall be from Scheduled Banks / Public Financial Institutions as defined in the Companies Act.
b) The Bank Guarantees shall be as per prescribed formats
c) It is the responsibility of the bidder to get the Bank Guarantees revalidated/extended for the required period, as per the advice of BHEL. BHEL shall not be liable for issue of any reminders regarding expiry of the Bank Guarantees.
d) In case the Bank Guarantees are not extended before the expiry date, BHEL reserves the right to invoke the same by informing the concerned Bank in writing, without any advance notice/communication to the concerned bidder.
e) Bidders to note that any corrections to Bank Guarantees shall be done by the issuing Bank, only through an amendment in an appropriate non judicial stamp paper.
f) The Original Bank Guarantee shall be sent directly by the Bank to BHEL under Registered Post (Acknowledgement Due), addressed to the Subcontracting Department of the respective Region.

9. RETURN OF SECURITY DEPOSIT

Security Deposit shall be refunded/Bank Guarantee(s) released to the Contractor along with the 'Final Bill' after deducting all expenses / other amounts due to BHEL under the contract / other contracts entered into with them by BHEL.

10. VALIDITY OF OFFER

The rates in the Tender shall be kept open for acceptance for a minimum period of THREE MONTHS from latest due date of offer submission (including extension, if any).

11. EXECUTION OF CONTRACT AGREEMENT

The successful Bidder's responsibility under this contract commences from the date of issue of the Letter of Intent by Bharat Heavy Electricals Limited. The Bidder shall submit an unqualified acceptance to the Letter of Intent/Award within the period stipulated therein. The successful Bidder shall be required to execute an agreement in the prescribed form, with BHEL, within a reasonable time after the acceptance of the Letter of Intent / Award and in any case before releasing the first running bill. The contract agreement shall be signed by a person duly authorized / empowered by the Bidder. The expenses for preparation of agreement document shall be borne by BHEL. Format of the contract agreement can be provided before bid submission if required.

12. REJECTION OF TENDER AND OTHER CONDITIONS

12.1. Conditional tenders, unsolicited tenders, tenders which are incomplete or not in the form specified or defective or have been materially altered or not in accordance with the tender conditions, specifications etc., are liable to be rejected.

12.2. Tenders are liable to be rejected in case of unsatisfactory performance of the Bidder with BHEL, or Bidder under suspension (hold / banning / delisted) by any unit/ region/ division of BHEL or Bidders who do not comply with the latest guidelines of Ministry / Commissions of Govt of India. BHEL reserves the right to reject a bidder in case it is observed that they are overloaded and may not be in a position to execute this job as per the required schedule. The decision of BHEL will be final in this regard.

12.3. If a Bidder who is a proprietor expires after the submission of his tender or after the acceptance of his tender, BHEL may at their discretion, cancel such tender. If a partner of a firm expires after the submission of tender or after the acceptance of the tender, BHEL may then cancel such tender at their discretion, unless the firm retains its character.

12.4. BHEL will not be bound by any Power of Attorney granted by changes in the composition of the firm made subsequent to the execution of the contract. They may, however, recognise such power of Attorney and changes after obtaining proper legal advice, the cost of which will be chargeable to the contractor concerned.

12.5. If the Bidder deliberately gives wrong information in his tender, BHEL reserves the right to reject such tender at any stage or to cancel the contract if awarded and forfeit the Earnest Money / Security Deposit/any other money due.

12.6. Canvassing in any form in connection with the tenders submitted by the Bidder shall make his offer liable to rejection.

12.7. The successful Bidder should not sub-contract part or complete work detailed in the tender specification undertaken by him without written permission of BHEL's Construction Manager/Site Incharge. The Bidder is solely responsible to BHEL for the work awarded to him.

12.8. The Tender submitted by a techno commercially qualified Bidder shall become the property of BHEL who shall be under no obligation to return the same to the bidder. However unopened price bids and late tenders shall be returned to the bidders

12.9. BHEL shall not be liable for any expenses incurred by the bidder in the preparation of the tender irrespective of whether the tender is accepted or not.

Signature and seal of Bidder

CHAPTER-2

DEFINITION:

The following terms shall have the meaning hereby assigned to them except where the context otherwise requires

1.1. BHEL shall mean Bharat Heavy Electricals Limited (of the respective CFP- Rudrapur inviting the Tender), a company registered under Indian Companies Act 1956, with its Registered Office at BHEL HOUSE, SIRI FORT, NEW DELHI – 110 049, or its CFP-Rudrapur or its Authorized Officers or its Site Engineers or other employees authorized to deal with any matters with which these persons are concerned on its behalf.

1.2. "EXECUTIVE DIRECTOR" or 'GROUP GENERAL MANAGER' or "GENERAL MANAGER (Incharge)" or "GENERAL MANAGER" shall mean the Officer in Administrative charge of the CFP-Rudrapur.

1.3. "COMPETENT AUTHORITY" shall mean Executive Director or Group General Manager or General Manager (Incharge) or General Manager or BHEL Officers who are empowered to act on behalf of the Executive Director or General Manager (Incharge) or General Manager of BHEL.

1.4. "ENGINEER" or "ENGINEER IN CHARGE" shall mean an Officer of BHEL as may be duly appointed and authorized by BHEL to act as "Engineer" on his behalf for the purpose of the Contract, to perform the duty set forth in this General Conditions of Contract and other Contract documents. The term also includes 'CONSTRUCTION MANAGER' or 'SITE INCHARGE' as well as Officers at Site or at the Headquarters of the CFP-Rudrapur.

1.5. "SITE" shall mean the places or place at which the plants / equipments are to be erected and services are to be performed as per the specification of this Tender.

1.6. "CLIENT OF BHEL" or "CUSTOMER" shall mean the project authorities with whom BHEL has entered into a contract for supply of equipments or provision of services.

1.7. "CONTRACTOR" shall mean the successful Bidder/Bidder who is awarded the Contract and shall include the Contractor's successors, heirs, executors, administrators and permitted assigns.

1.8. "CONTRACT" or "CONTRACT DOCUMENT" shall mean and include the Agreement of Work Order, the accepted appendices of Rates, Schedules, Quantities if any, General Conditions of Contract, Special Conditions of Contract, Instructions to the Bidders, Drawings, Technical Specifications, the Special Specifications if any, the Tender documents, subsequent amendments mutually agreed upon and the Letter of Intent /Acceptance issued by BHEL. Any conditions or terms stipulated by the contractor in the tender documents or subsequent letters shall not form part of the contract unless, specifically accepted in writing by BHEL in the Letter of Intent/Award and incorporated in the agreement.

1.9. "GENERAL CONDITIONS OF CONTRACT" shall mean the 'Instructions to Bidders' and 'General Conditions of Contract' pertaining to the work for which above tenders have been called for.

1.10. "TENDER SPECIFICATION" or "TENDER" or "TENDER DOCUMENTS" shall mean General Conditions, Common Conditions, Special Conditions, Price Bid, Rate Schedule, Technical Specifications, Appendices, Annexures, Corrigendum, Amendments, Forms, procedures, Site information, etc and drawings/documents pertaining to the work for which the Bidders are required to submit their offers. Individual specification number will be assigned to each Tender Specification.

1.11. "LETTER OF INTENT" shall mean the intimation by a Letter/Fax/email to the Bidder that the tender has been accepted in accordance with provisions contained in the letter. The responsibility of the contractor commences from the date of issue of this letter and all terms and conditions of the contract are applicable from this date.

1.12. "COMPLETION TIME" shall mean the period by 'date/month' specified in the 'Letter of Intent/Award' or date mutually agreed upon for handing over of the intended scope of work, the erected equipment/plant which are found acceptable by the Engineer, being of required standard and conforming to the specifications of the Contract.

1.13. "PLANT" shall mean and cannote the entire assembly of the plant and equipments covered by the contract.

1.14. "EQUIPMENT" shall mean equipment, machineries, materials, structural, electrical and other components of the plant covered by the contract.

1.15. "TESTS" shall mean and include such test or tests to be carried out on the part of the contractor as are prescribed in the contract or considered necessary by BHEL, in order to ascertain the quality, workmanship, performance and efficiency of the contractor or part thereof.

1.16. "APPROVED", "DIRECTED" or "INSTRUCTED" shall mean approved, directed or instructed by BHEL.

1.17. "WORK or CONTRACT WORK" shall mean and include supply of all categories of labour, specified consumables, tools and tackles and Plants required for complete and satisfactory site transportation, handling, stacking, storing, erecting, testing and commissioning of the equipments to the entire satisfaction of BHEL.

1.18. "SINGULAR AND PLURALS ETC" words carrying singular number shall also include plural and vice versa, where the context so requires. Words imparting the masculine Gender shall be taken to include the feminine Gender and words imparting persons shall include any Company or Associations or Body of Individuals, whether incorporated or not.

1.19. "HEADING" – The heading in these General Conditions are solely for the purpose of facilitating reference and shall not be deemed to be part thereof or be taken as instructions thereof or of the contract.

1.20. "MONTH" shall mean calendar month unless otherwise specified in the Tender.

1.21. Day' or 'Days' unless herein otherwise expressly defined shall mean calendar day or days of twenty four (24) hours each. A week shall mean continuous period of seven (7) days.

1.22. "COMMISSIONING" shall mean the synchronization testing and achieving functional operation of the Equipment with associated system after all initial adjustments, trials, cleaning, re-assembly required at site if any, have been completed and Equipment with associated system is ready for taking into service.

1.23. "WRITING" shall include any manuscript type written or hand written or printed statement or electronically transmitted messages, under the signature or seal or transmittal of BHEL.

1.24. "TEMPORARY WORK" shall mean all temporary works for every kind required in or for the execution, completion, maintenance of the work.

1.25. 'CONTRACT PRICE' or 'CONTRACT VALUE' shall mean the sum mentioned in the LOI/LOA/Contract Agreement subject to such additions there to or deductions there from as may be made under provisions hereinafter contained

1.26. "COMMENCEMENT DATE" or "START DATE" shall mean the commencement/start of work at Site as per terms defined in the Tender.

1.27. "SHORT CLOSING" or "FORE CLOSING" of Contract shall mean the premature closing of contract, for reasons not attributable to the contractor and mutually agreed between BHEL and the contractor.

1.28. "TERMINATION" of Contract shall mean the pre mature closing of contract due to reasons as mentioned in the contract.

1.29. "DE MOBILISATION" shall mean the temporary winding up of Site establishment by Contractor leading to suspension of works temporarily for reasons not attributable to the contractor.

1.30. "RE MOBILISATION" shall mean the resumption of work with all resources required for the work after demobilization.

CHAPTER-3

LAW GOVERNING THE CONTRACT AND COURT JURISDICTION

The contract shall be governed by the Law for the time being in force in the Republic of India. The Civil Court having original Civil Jurisdiction at Rudrapur, Udham Singh Nagar, Uttarakhand shall alone have exclusive jurisdiction in regard to all claims in respect of the Contract. No other Civil Court shall have jurisdiction in case of any dispute, under this contract.

Signature and seal of Bidder

CHAPTER-4
ISSUE OF NOTICE

1.1. Service of notice on contractor

Any notice to be given to the Contractor under the terms of the contract shall be served by sending the same by Registered Post / Speed Post to or leaving the same at the Contractor's last known address of the principal place of business (or in the event of the contractor being a company, to or at its Registered Office). In case of change of address, the notice shall be served at changed address as notified in writing by the Contractor to BHEL. Such posting or leaving of the notice shall be deemed to be good service of such notice and the time mentioned to the condition for doing any act after notice shall be reckoned from the date so mentioned in such notice.

1.2. Service of notice on BHEL

Any notice to be given to BHEL in-charge / Region under the terms of the Contract shall be served by sending the same by post to or leaving the same at BHEL address or changed address as notified in writing by BHEL to the Contractor

Signature and seal of Bidder

CHAPTER-5

USE OF LAND

No land belonging to BHEL or their Customer under temporary possession of BHEL shall be occupied by the contractor without written permission of BHEL.

Signature and seal of Bidder

CHAPTER-6

COMMENCEMENT OF WORK

1.1. The contractor shall commence the work as per the time indicated in the Letter of Intent/Award from BHEL and shall proceed with the same with due expedition without delay.

1.2. If the contractor fails to start the work within stipulated time as per LOI/ LOA or as intimated by BHEL, then BHEL at its sole discretion will have the right to cancel the contract. The Earnest Money and/or Security Deposit with BHEL will stand forfeited without any further reference to him without prejudice to any and all of BHEL's other rights and remedies in this regard.

1.3. All the work shall be carried out under the direction and to the satisfaction of BHEL.

Signature and seal of Bidder

CHAPTER-7

MEASUREMENT OF WORK AND MODE OF PAYMENT:

1.1. All payments due to the contractors shall be made by e-mode only, unless otherwise found operationally difficult for reasons to be recorded in writing.

1.2. For progress running bill payments: - The Contractor shall present detailed measurement sheets in triplicate, duly indicating all relevant details based on technical documents and connected drawings for work done during the month/period under various categories in line with terms of payment as per contract. The basis of arriving at the quantities, weights shall be relevant documents and drawings released by BHEL. These measurement sheets shall be prepared jointly with BHEL Engineers and signed by both the parties.

1.3. These measurement sheets will be checked by BHEL Engineer and quantities and percentage eligible for payment under various groups shall be decided by BHEL Engineer. The abstract of quantities and percentage so arrived at based on the terms of payment shall be entered in Measurement Book and signed by both the parties.

1.4. Based on the above quantities, contractor shall prepare the bills in prescribed format and work out the financial value. These will be entered in Measurement Book and signed by both the parties. Payment shall be made by BHEL after effecting the recoveries due from the contractor.

1.5. All recoveries due from the contractor for the month/period shall be effected in full from the corresponding running bills unless specific approval from the competent authorities is obtained to the contrary.

1.6. Measurement shall be restricted to that portion of work for which it is required to ascertain the financial liability of BHEL under this contract.

1.7. The measurement shall be taken jointly by persons duly authorized on the part of BHEL and by the Contractor.

1.8. The Contractor shall bear the expenditure involved if any, in making the measurements and testing of materials to be used/used in the work. The contractor shall, without extra charges, provide all the assistance with appliances and other things necessary for measurement.

1.9. If at any time due to any reason whatsoever, it becomes necessary to re-measure the work done in full or in part, the expenses towards such re measurements shall be borne by the contractor unless such re measurements are warranted solely for reasons not attributable to contractor.

1.10. Passing of bills covered by such measurements does not amount to acceptance of the completion of the work measured. Any left out work has to be completed, if pointed out at a later date by BHEL.

1.11. Final measurement bill shall be prepared in the final bill format prescribed for the purpose based on the certificate issued by BHEL Engineer that entire works as stipulated in tender specification has been completed in all respects to the entire satisfaction of BHEL. Contractor shall give unqualified “No Claim” Certificate. All the tools and tackles loaned to him should be returned in satisfactory condition to BHEL. The abstract of final quantities and financial values shall also be entered in the Measurement Books and signed by both parties to the contract. The Final Bill shall be prepared and paid within a reasonable time after completion of work.

1.12. Quantity mentioned in BOQ is a lump sum quantity. Payment shall be made based on actual measurement done after completion of work. Variation of +10% change in BOQ Quantity (on overall value basis) is acceptable. Bidder to take prior approval from BHEL-CFP for this variation clause.

Signature and seal of Bidder

CHAPTER-8

RIGHTS OF BHEL

1.1. BHEL reserves the following rights in respect of this contract during the original contract period or its extensions if any, as per the provisions of the contract, without entitling the contractor for any compensation.

1.2. To withdraw any portion of work and/or to restrict/alter quantum of work as indicated in the contract during the progress of work and get it done through other agencies to suit BHEL's commitment to its customer or in case BHEL decides to advance the date of completion due to other emergent reasons/ BHEL's obligation to its customer.

1.3. To terminate the contract or withdraw portion of work and get it done through other agency, at the risk and cost of the contractor after due notice of a period of 14 days' by BHEL in any of the following cases:

a) Contractor's poor progress of the work vis-à-vis execution timeline as stipulated in the Contract, backlog attributable to contractor including unexecuted portion of work does not appear to be executable within balance available period considering its performance of execution.
b) Withdrawal from or abandonment of the work by contractor before completion of the work as per contract.
c) Non-completion of work by the Contractor within scheduled completion period as per Contract or as extended from time to time, for the reasons attributable to the contractor.
d) Termination of Contract on account of any other reason (s) attributable to Contractor.
e) Assignment, transfer, subletting of Contract without BHEL's written permission.
f) Non-compliance to any contractual condition or any other default attributable to Contractor.

Risk & Cost Amount against Balance Work:

Risk & Cost amount against balance work shall be calculated as follows:
Risk & Cost Amount= [(A-B) + (A x H/100)]
Where,
A= Value of Balance scope of Work (*) as per rates of new contract
B= Value of Balance scope of Work (*) as per rates of old contract being paid to the contractor at the time of termination of contract i.e. inclusive of PVC & ORC, if any.
H = Overhead Factor to be taken as 5
In case (A-B) is less than 0 (zero), value of (A-B) shall be taken as 0 (zero).
* Balance scope of work (in case of termination of contract):

Difference of Contract Quantities and Executed Quantities as on the date of issue of Letter for 'Termination of Contract', shall be taken as balance scope of Work for calculating risk & cost amount.
Contract quantities are the quantities as per original contract. If, Contract has been amended, quantities as per amended Contract shall be considered as Contract Quantities.
Items for which total quantities to be executed have exceeded the Contract Quantities based on drawings issued to contractor from time to time till issue of Termination letter, then for these items total Quantities as per issued drawings would be deemed to be contract quantities.
Substitute/ extra items whose rates have already been approved would form part of contract quantities for this purpose. Substitute/ extra items which have been executed but rates have not been approved, would also form part of contract quantities for this purpose and rates of such items shall be determined in line with contractual provisions.
However, increase in quantities on account of additional scope in new tender shall not be considered for this purpose.

NOTE: Incase portion of work is being withdrawn at risk & cost of contractor instead of termination of contract, contract quantities pertaining to portion of work withdrawn shall be considered as 'Balance scope of work' for calculating Risk & Cost amount.

LD against delay in executed work in case of Termination of Contract:
LD against delay in executed work shall be calculated in line with relevant LD clause of the contract, for the delay attributable to contractor. For limiting the maximum value of LD, contract value shall be taken as Executed Value of work till termination of contract.
Method for calculation of "LD against delay in executed work in case of termination of contract" is given below.

a) Let the time period from scheduled date of start of work till termination of contract excluding the period of Hold (if any) not attributable to contractor = T1
b) Let the value of executed work till the time of termination of contract= X
c) Let the Total Executable Value of work for which inputs/fronts were made available to contractor and were planned for execution till termination of contract = Y
d) Delay in executed work attributable to contractor i.e. T2=[1-(X/Y)] x T1
e) LD shall be calculated in line with LD clause of the Contract for the delay attributable to contractor taking "X" as Contract Value and "T2" as period of delay attributable to contractor.

1.3.1. In case Contractor fails to deploy the resources as per requirement, BHEL can deploy own/hired/otherwise arranged resources at the risk and cost of the contractor and recover the expenses incurred from the dues payable to

contractor. Recoveries shall be actual expenses incurred plus 5% overheads or as defined in TCC.

1.4. Recoveries arising out of Risk & Cost and LD or any other recoveries due from Contractor

Following sequence shall be applicable for recoveries from contractor:

a) Dues available in the form of Bills payable to contractor, SD, BGs against the same contract.
b) Demand notice for deposit of balance recovery amount shall be sent to contractor, if funds are insufficient to effect complete recovery against dues indicated in (a) above.
c) If contractor fails to deposit the balance amount to be recovered within the period as prescribed in demand notice, following action shall be taken for balance recovery:
    i. Dues payable to contractor against other contracts in the same Region shall be considered for recovery.
    ii. If recovery cannot be made out of dues payable to the contractor as above, balance amount to be recovered, shall be informed to other Regions/Units for making recovery from the Unpaid Bills/Running Bills/SD/BGs/Final Bills of contractor.
    iii. In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against contractor.

1.5. To terminate the contract or to restrict the quantum of work and pay for the portion of work executed in case BHEL's contract with their customer are terminated for any reason, as per mutual agreement.

1.6. To effect recovery from any amounts due to the contractor under this or any other contract or in any other form, the moneys BHEL is statutorily forced to pay to anybody, due to contractor's failure to fulfill any of his obligations. BHEL shall levy overheads of 5% on all such payments along with interest as defined elsewhere in the GCC.

1.7. While every endeavor will be made by BHEL to this end, they cannot guarantee uninterrupted work due to conditions beyond their control. The Contractor will not be normally entitled for any compensation/extra payment on this account unless otherwise specified elsewhere in the contract.

1.8. In case the execution of works comes to a complete halt or reaches a stage wherein worthwhile works cannot be executed and there is no possibility of commencement of work for a period of not less than One month, due to reasons not attributable to the contractor and other than Force Majeure conditions, BHEL may consider permitting the contractor to de mobilize forthwith and re mobilize at an agreed future date. Cost of such demobilization/remobilization shall be mutually agreed. The duration of

contract/time extension shall accordingly get modified suitably. In case of any conflict, BHEL decision in this regard shall be final and binding on the contractor.

1.9. In the unforeseen event of inordinate delay in receipt of materials, drawings, fronts, etc, due to which inordinate discontinuity of work is anticipated, BHEL on its own or contractor's request at its discretion may consider to short close the contract in following cases:

a) The balance works are minor vis a vis the scope of work envisaged as per the contract.
b) There has been no significant work in past 3 months OR no significant work is expected in next 3 months (due to reasons beyond the control of BHEL)
c) The balance works cannot be done within a reasonable period of time as they are dependent on unit shut down or on other facilities of customer or any other reasons not attributable to the contractor.
d) Work does not start within six months of LOI/ LOA date.

At the point of requesting for short closure, contractor shall establish that he has completed all works possible of completion and he is not able to proceed with the balance works due to constraints beyond his control. In such a case, the estimated value of the unexecuted portion of work (or estimated value of services to be provided for carrying out milestone/stage payments like Trial Operation/PG Test, etc) as mutually agreed, shall however be reduced from the final contract value.

CHAPTER-9

LIQUIDATED DAMAGES/PENALTY/COMPENSATION FOR DELAY

If the contractor fails to maintain the required progress of work which results in delay in the completion of the work as per the contractual completion period, BHEL shall have the right to impose Liquidated Damage/Penalty/Compensation for delay of work with maximum rate @1%(one percent) per month of delay to be computed on per day basis based on the quantum damage suffered due to stated delay on the part of contractor.

Provided always that the total amount of compensation for delay to be paid under this condition shall not exceed 10% (Ten Percent) of the accepted RFP/Tendered/Offered value of work. For this purpose, the period of delay shall be the delay attributable to the Contractor for the completion of work as per contract. Contract Value for this purpose, shall be the final executed value exclusive of ORC, Extra Works executed on Man-day rate basis, Supplementary/ Additional Items and PVC.

For Completion schedule of the project please refer NIT terms of the tender.

Signature and seal of Bidder

CHAPTER-10

RESPONSIBILITIES OF THE CONTRACTOR IN RESPECT OF LOCAL LAWS, EMPLOYMENT OF WORKERS ETC.

The following are the responsibilities of the contractor in respect of observance of local laws, employment of personnel, payment of taxes etc. The subcontractor shall fully indemnify BHEL against any claims of whatsoever nature arising due to the failure of the contractor in discharging any of his responsibilities hereunder:

1.1. As far as possible, Unskilled Workers shall be engaged from the local areas in which the work is being executed.

1.2. The contractor at all times during the continuance of this contract shall, in all his dealings with local labour for the time being employed on or in connection with the work, have due regard to all local festivals and religious and other customs.

1.3. The contractor shall comply with all applicable State and Central Laws, Statutory Rules, Regulations, Notifications, etc. such as Payment of Wages Act, Minimum Wages Act, Workmen Compensation Act, Employer's Liability Act, Industrial Disputes Act, Employers Provident Act, Employees State Insurance Scheme, Contract Labour (Regulation and Abolition) Act, 1970, Payment of Bonus & Gratuity Act, Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996, The Building and Other Construction Workers' Welfare Cess Act, 1996 and other Acts, Rules, and Regulations for labour/workers as applicable and as may be enacted by the State Government and Central Govt. during the tenure of the Contract and having force or jurisdiction at Site. The Contractor shall also comply with provisions of and give all such notices to the local Governing Body, Police and other relevant Authorities as may be required by the Law.

1.4. The Contractor shall obtain independent License under the Contract Labour (Regulations and Abolition) Act, 1970 for engaging contract labour as required from the concerned Authorities based on the certificate (Form- V) issued by the Principal Employer/Customer.

1.5. The contractor shall pay and bear all taxes, fees, license charges, Cess, duties, deposits, tolls, royalties, commission or other charges which may be leviable on account of his operations in executing the contract.

1.6. BHEL would pay the inspection fees and Registration fees of Electrical Inspectorate, all other arrangements for site visits periodically by the Inspectorate to site, Inspection certificate etc. will have to be made by contractor. However, BHEL will not make any

payment to the Inspectorate in connection with contractor's Electricians qualification tests etc.

1.7. Contractor shall be responsible for provision of Health and Sanitary arrangements (more particularly described in Contract Labour Regulation & Abolition Act), Safety precautions etc. as may be required for safe and satisfactory execution of contract.

1.8. The contractor shall be responsible for proper accommodation including adequate medical facilities for personnel employed by him.

1.9. The contractor shall be responsible for the proper behavior and observance of all regulations by the staff employed by him.

1.10. The contractor shall ensure that no damage is caused to any person/property of other parties working at site. If any such damage is caused, it is responsibility of the contractor to make good the losses or compensate for the same.

1.11. All the properties/equipments/components of BHEL/their Client loaned with or without deposit to the contractor in connection with the contract shall remain properties of BHEL/their Client.

1.12. In case the contractor is required to undertake any work outside the scope of this contract, the rates payable shall be those mutually agreed upon if the item rates are not mentioned in existing contract

1.13. Any delay in completion of works/or non achievement of periodical targets due to the reasons attributable to the contractor, the same may have to be compensated by the contractor either by increasing manpower and resources or by working extra hours and/or by working more than one shift. All these are to be carried out by the contractor at no extra cost.

1.14. The contractor shall arrange, coordinate his work in such a manner as to cause no hindrance to other agencies working in the same premises.

1.15. All safety rules and codes applied by the Client/BHEL at site shall be observed by the contractor without exception. The contractor shall be responsible for the safety of the equipment/material and works to be performed by him and shall maintain all light, fencing guards, slings etc. or other protection necessary for the purpose. Contractor shall also take such additional precautions as may be indicated from time to time by the Engineer with a view to prevent pilferage, accidents, fire hazards. Due precautions shall be taken against fire hazards and atmospheric conditions.

The contractor shall arrange for such safety devices as are necessary for such type of work and carry out the requisite site tests of handling equipment, lifting tools, tackles etc. as per prescribed standards and practices.
Contractor has to ensure the implementation of Health, Safety and Environment (HSE) requirements as per directions given by BHEL/Customer. The contractor has to assist in HSE audit by BHEL/Customer and submit compliance Report. The contractor has to generate and submit record/reports as per HSE plan/activities as per instruction of BHEL/Customer.

1.16. The contractor will be directly responsible for payment of wages to his workmen. A pay roll sheet giving all the payments given to the workers and duly signed by the contractor's representative should be furnished to BHEL site for record purpose, if so called for.
Contractor shall create awareness amongst their workforce by helping & encouraging in opening bank accounts and to encourage them to adopt digital mode of transactions. While releasing wages/ salary to their workers/ supervisors/ staff, Contractor shall comply with the GOI's guidelines for maximizing such transactions through Non-Cash / digital means.

1.17. In case of any class of work for which there is no such specification as laid down in the contract, such work shall be carried out in accordance with the instructions and requirements of the Engineer.

1.18. Also, no idle charges will be admissible in the event of any stoppage caused in the work resulting in contractor's labour and Tools & Plants being rendered idle due to any reason at any time.

1.19. The contractor shall take all reasonable care to protect the materials and work till such time the plant/equipment has been taken over by BHEL or their Client whichever is earlier.

1.20. The contractor shall not stop the work or abandon the site for whatsoever reason of dispute, excepting force majeure conditions. All such problems/disputes shall be separately discussed and settled without affecting the progress of work. Such stoppage or abandonment shall be treated as breach of contract and dealt with accordingly

1.21. The contractor shall keep the area of work clean and shall remove the debris etc. while executing day-to-day work. Upon completion of work, the contractor shall remove from the vicinity of work, all scrap, packing materials, rubbish, unused and other materials and deposit them in places specified by the Engineer. The contractor will also demolish all the hutments, sheds, offices, etc. constructed and used by him and shall clean the debris. In the event of his failure to do so, the same will be arranged to be done by the Engineer and the expenses recovered from the contractor.

1.22. The contractor shall execute the work in the most substantial and workman like manner in the stipulated time. Accuracy of work and timely execution shall be the essence of this contract. The contractor shall be responsible to ensure that the quality, assembly and workmanship conform to the dimensions and clearance given in the drawings and/ or as per the instructions of the Engineer.

Signature and seal of Bidder

CHAPTER-11

PROGRESS MONITORING, MONTHLY REVIEW AND PERFORMANCE EVALUATION

1.1. A detailed plan/ programme for completion of the contractual scope of work as per the time schedule given in the contract shall be jointly agreed between BHEL and Contractor, before commencement of work. The above programme shall be supported by month wise deployment of resources viz Manpower, T&P, Consumables, etc. Progress will be reviewed periodically (Daily/Weekly/Monthly) vis a vis this jointly agreed programme. The Contractor shall submit periodical progress reports (Monthly) and other reports/information including manpower, consumables, T&P mobilization etc as desired by BHEL.

1.2. The burden of proof that the causes leading to any shortfall is not due to any reasons attributable to the contractor is on the contractor himself. Contractor will ensure that prior information is given by them to BHEL regarding reason for delay, if any which is shortfalls attributable to (i) Contractor, (ii) Force Majeure Conditions, and (iii) BHEL

1.3. Performance of the Contractor shall be assessed as per prescribed formats and shall form the basis for 'Annual/Overall Performance Evaluation' of the Contractor and also for 'Assessment of Capacity of Bidder' for Tenders where the Contractor is a bidder. BHEL reserves the right to revise the evaluation formats during the course of execution of the works.

CHAPTER-12

TIME OF COMPLETION

1.1. The time schedule shall be as prescribed in the Contract. The time for completion shall be reckoned from the date of commencement of work at Site as certified by BHEL Engineers

1.2. The entire work shall be completed by the contractor within the time schedule or within such extended periods of time as may be allowed by BHEL.

Signature and seal of Bidder

CHAPTER-13

EXTENSION OF TIME FOR COMPLETION

1.1. If the completion of work as detailed in the scope of work gets delayed beyond the contract period, the contractor shall request for an extension of the contract and BHEL at its discretion may extend the Contract.

1.2. If any 'Time extension' is granted to the contractor to facilitate continuation of work and completion of contract, due to backlog attributable to the contractor alone, then it shall be without prejudice to the rights of BHEL to impose penalty/LD for the delays attributable to the contractor, in addition to any other actions BHEL may wish to take at the risk and cost of contractor.

1.3. A joint program shall be drawn for the balance amount of work to be completed during the period of 'Time Extension', along with matching resources (with weightages) to be deployed by the contractor as per specified format.

1.4. During the period of 'Time extension', contractor shall maintain their resources as per mutually agreed program.

1.5. At the end of total work completion as certified by BHEL Engineer, and upon analysis of the total delay, the portion of time extensions attributable to (i) Contractor, (ii) Force majeure conditions, and (iii) BHEL, shall be worked out and shall be considered to be exhausted in the same order. The total period of time extensions shall be the sum of (i), (ii) and (iii) above and shall be equal to period between the scheduled date of completion and the actual date of completion of contract. LD shall be imposed/levied for the portion of time extensions attributable to contractor and recoverable from the dues payable to the contractor.

Signature and seal of Bidder

CHAPTER-14

EXTRA WORKS

1.1. All rectifications / modifications, revamping, and reworks required for any reasons not due to the fault of the contractor, or needed due to any change in deviation from drawings and design of equipments, operation / maintenance requirements, mismatching, or due to damages in transit, storage and erection / commissioning, and other allied works which are not very specifically indicated in the drawings, but are found essential for satisfactory completion of the work, will be considered as extra works.

1.2. Extra works arising on account of the contractor's fault, irrespective of time consumed in rectification of the damage / loss, will have to be carried out by the contractor free of cost. Under such circumstances, any material and consumable required for this purpose will also have to be arranged by the contractor at his cost.

1.3. All the extra work should be carried out by a separately identifiable gang, without affecting routine activities. Daily log sheets in the pro-forma prescribed by BHEL should be maintained and shall be signed by the contractor's representative and BHEL engineer. No claim for extra work will be considered / entertained in the absence of the said supporting documents i.e. daily log sheets. Signing of log sheets by BHEL engineer does not necessarily mean the acceptance of such works as extra works.

1.4. BHEL retains the right to award or not to award any of the major repair / rework / modification / rectification / fabrication works to the contractor, at their discretion without assigning any reason for the same.

1.5. After eligibility of extra works is established and finally accepted by BHEL engineer / designer, payment will be released on competent authority's approval at the following rate.

1.6. MAN-HOUR RATE FOR ELIGIBLE EXTRA WORKS:

Single composite average labour man-hour rate, including overtime if any, supervision, use of tools and tackles and other site expenses and incidentals, consumables for carrying out any minor rework / repairs / rectification / modification / fabrication as certified by site as may arise during the course of erection, testing, commissioning or extra works arising out of transit, storage and erection damages, payment, if found due will be at Rs 100/- per man hour.

The above composite labour man hour rate towards extra works shall remain firm and not subject to any variation during execution of the work. PVC will not be applicable

for extra works. Rate revision, Over Run Charges/compensation etc will not be applicable due to extra works.

1.7. Extra Works for Civil Packages shall be regulated as follows

a) Rates for Extra Works arising due to (1) non availability of BOQ (Rate Schedule), OR (2) change in Specifications of materials/works (3) rectification/modification/dismantling & re-erecting etc due to no fault of Contractor, shall be in the order of the following:

   i. Item rates are to be derived from similar nature of items in the BOQ (Rate Schedule) with applicable escalation derived from All India Consumer Price Index for Whole Sale Commodities.
   ii. As per CPWD-DSR-2018 (or latest edition) with applicable escalation derived from All India Consumer price Index for Whole Sale Commodities, OR, Notification issued by the office of CPWD for 'Cost Index' in that Region where the project is being executed, whichever is less
   iii. Item rates are to be worked out on the basis of prevailing market rates mutually agreed between BHEL and Contractor, plus 15% towards Contractor's overheads and profit.

b) PVC and ORC will not applicable be for (a) above.

CHAPTER-15

SUPPLEMENTARY ITEMS

1.1. For NON Civil Works

Supplementary items are items/works required for completion of entire work but not specified in the scope of work. Subject to certification of such items/works as supplementary items by BHEL Engineer, rates shall be derived on the basis of any one of the following on mutual agreement:

a) Based on percentage breakup/rates indicated for similar/nearby items
b) In case (a) above does not exist, then BHEL/site may derive the percentage breakup/rates to suit the type of work.

1.2. For Civil Works

a) Rates for Supplementary Works/Additional Works arising out due to additions/alterations in the original scope of works as per contract subject to certification of BHEL Engineer shall be worked out as under:
   i. Item rates which are available in existing BOQ (Rate Schedule) shall be operated with applicable escalation derived from All India Consumer Price Index for Whole Sale Commodities
   ii. Items of works which are not available in existing BOQ shall be operated as an 'Extra Works' and rate shall be derived as per Relevant clause
b) Execution of Supplementary Works/Additional Works through the Contractor shall be at the sole discretion of BHEL, and shall be considered as part of executed contract value for the purpose of Quantity Variation as per Relevant clause
c) BHEL Engineer's decision regarding fixing the rate as above is final and binding on the contractor.
d) PVC and ORC will not be applicable for (a) above.

Signature and seal of Bidder

CHAPTER-16

INSURANCE

1.1. BHEL/their customer shall arrange for insuring the materials/properties of BHEL/customer covering the risks during transit, storage, erection and commissioning.

1.2. It is the sole responsibility of the contractor to insure his materials, equipments, workmen, etc. against accidents and injury while at work and to pay compensation, if any, to workmen as per Workmen's compensation Act. The work will be carried out in a protected area and all the rules and regulations of the client /BHEL in the area of project which are in force from time to time will have to be followed by the contractor.

1.3. If due to negligence and or non-observation of safety and other precautions by the contractors, any accident/injury occurs to the property / manpower belong to third party, the contractor shall have to pay necessary compensation and other expense, if so decided by the appropriate authorities.

1.4. The contractor will take necessary precautions and due care to protect the material, while in his custody from any damage/ loss due to theft or otherwise till the same is taken over by BHEL or customer. For lodging / processing of insurance claim the contractor will submit necessary documents. BHEL will recover the loss including the deductible franchise from the contractor, in case the damage / loss is due to carelessness / negligence on the part of the contractor. In case of any theft of material under contractor's custody, matter shall be reported to police by the contractor immediately and copy of FIR and subsequently police investigation report shall be submitted to BHEL for taking up with insurance. However this will not relieve the contractor of his contractual obligation for the material in his custody.

Signature and seal of Bidder

CHAPTER-17

STRIKES & LOCKOUT

1.1. The contractor will be fully responsible for all disputes and other issues connected with his labour. In the event of the contractor's labour resorting to strike or the Contractor resorting to lockout and if the strike or lockout declared is not settled within a period of one month, BHEL shall have the right to get the work executed through any other agencies and the cost so incurred by BHEL shall be deducted from the Contractor's bills.

1.2. For all purposes whatsoever, the employees of the contractor shall not be deemed to be in the employment of BHEL

Signature and seal of Bidder

CHAPTER-18

FORCE MAJEURE

1.1. "Force Majeure" shall mean any event beyond the reasonable control of the parties including but not limited to fire, flood, earthquake or other acts of God, war, riots, civil war and restraints of Governing States, as the case may be, and which is unavoidable notwithstanding the reasonable care of the party affected. The following events are explicitly excluded from Force Majeure and are solely the responsibilities of the non-performing party:

a. any strike, work-to-rule action, go-slow or similar labour difficulty
b. late delivery of equipment or material (unless caused by Force Majeure event)
c. economic hardship.

1.2. If either party is prevented, hindered or delayed from or in performing any of its obligations under the Contract by an event of Force Majeure, then it shall notify the other in writing of the occurrence of such event and the circumstances thereof within 15 (fifteen) days after the occurrence of such event.

1.3. The party who has given such notice shall be excused from the performance or punctual performance of its obligations under the Contract for so long as the relevant event of Force Majeure continues and to the extent that such party's performance is prevented, hindered or delayed. The Time for Completion shall be extended by a period of time equal to period of delay caused due to such Force Majeure event.

1.4. Delay or non-performance by either party hereto caused by the occurrence of any event of Force Majeure shall not

- Constitute a default or breach of the Contract.
- Give rise to any claim for damages or additional cost or expense occasioned thereby, if and to the extent that such delay or non-performance is caused by the occurrence of an event of Force Majeure

Signature and seal of Bidder

CHAPTER-19

ARBITRATION & CONCILIATION

1.1. ARBITRATION

1.1.1. In case amicable settlement is not reached in the event of any dispute or difference arising out of the execution of the Contract or the respective rights and liabilities of the parties or in relation to interpretation of any provision by the Contractor in any manner touching upon the Contract, such dispute or difference shall (except as to any matters, the decision of which is specifically provided for therein) be referred to the sole arbitration of the arbitrator appointed by BHEL / In charge(Rudrapur).

The award of the Arbitrator shall be binding upon the parties to the dispute subject as aforesaid, the provisions of Arbitration and Reconciliation Act 1996 (India) or statutory modifications or reenactments thereof and the rules made there under and for the time being in force shall apply to the arbitration proceedings under this clause. The venue of the arbitration shall be the place from which the contract is issued or such other place as the Arbitrator at his discretion may determine

1.1.2. In case of Contract with Public Sector Enterprise (PSE) or a Government Department, the following shall be applicable:

In the event of any dispute or difference relating to the interpretation and application of the provisions of the Contract, such dispute or difference shall be referred to by either party to the arbitration of one of the arbitrators in the department of public enterprises. The award of the arbitrator shall be binding upon the parties to the dispute, provided, however, any party aggrieved by such award may make further reference for setting aside or revision of the award to the Law Secretary, Department of Legal Affairs, Ministry of Law and Justice, Government of India. Upon such reference the dispute shall be decided by the Law Secretary or the Special Secretary or Additional Secretary when so authorized by the Law Secretary, whose decision shall bind the parties hereto finally and conclusively.

1.1.3. The cost of arbitration shall be borne equally by the parties.

1.1.4. Work under the contract shall be continued during the arbitration proceedings

1.2. CONCILIATION

If at any time (whether before, during or after the arbitral or judicial proceedings), any Disputes (which term shall mean and include any dispute, difference, question or disagreement arising in connection with construction, meaning, operation, effect,

interpretation or breach of the agreement, contract), which the Parties are unable to settle mutually, arise inter-se the Parties, the same may, be referred by either party to Conciliation to be conducted through Independent Experts Committee (IEC) to be appointed by competent authority of BHEL from the BHEL Panel of Conciliators.

Notes:

a. No serving or a retired employee of BHEL/ Administrative Ministry of BHEL shall be included in the BHEL Panel of Conciliators.

b. Any other person(s) can be appointed as Conciliator(s) who is/ are mutually agreeable to both the parties from outside the BHEL Panel of Conciliators.

CHAPTER-20

CLOSING OF CONTRACTS

The Contract shall be considered completed and closed upon completion of all contractual obligations and settlement of Final Bill or completion of Guarantee period whichever is later. Upon closing of Contract, BHEL shall issue a completion certificate as per standard format, based on specific request of Contractor.

Signature and seal of Bidder

CHAPTER-21

SUSPENSION OF BUSINESS DEALINGS

1.1. BHEL reserves the right to take action against Contractors who either fail to perform or Bidders /Contractor who indulge in malpractices, by suspending business dealings with them in line with BHEL guidelines issued from time to time.

1.2. Suspension could be in the form of 'Hold', 'De-listing' or 'Banning' a contractor.

1.3. A bidder may be put on HOLD for a period of 6 months, for future tenders for specific works on the basis of one or more of the following reasons:

a) Bidder does not honor his own offer or any of its conditions within the validity period.
b) Bidder fails to respond against three consecutive enquires of BHEL.
c) After placement of order, Bidder fails to execute a contract.
d) Bidder fails to settle sundry debt account, for which he is legitimately liable, within one year of its occurrence.
e) Bidder's performance rating falls below 60% in specific category (as per BHEL guidelines of performance evaluation)
f) Bidder works are under strike/ lockout for a long period.

1.4. A Bidder may be de-listed from the list of registered Bidders of the region for a period of 1 year on the basis of one or more of the following reasons: -

a) Bidder tampers with tendering procedure affecting ordering process or commits any misconduct which is contrary to business ethics.
b) Bidder has substituted, damaged, failed to return, short returned or unauthorized disposed of materials/ documents/ drawings/ tools etc of BHEL.
c) Bidder no longer has the technical staff, equipment, financial resources etc. required to execute the orders/ contracts.

1.5. A Bidder can be banned from doing any business with all Units of BHEL for a period of 3 years on the basis of one or more of the following reasons:

a) Bidder is found to be responsible for submitting fake/ false/ forged documents, certificates, or information prejudicial to BHEL's interest.
b) In spite of warnings, the Bidder persistently violates or circumvents the provisions of labour laws/ regulations/ rules and other statutory requirements.
c) Bidder is found to be involved in cartel formation
d) The Bidder has indulged in malpractices or misconduct such as bribery, corruption and fraud, pilferage etc which are contrary to business ethics.
e) The Bidder is found guilty by any court of law for criminal activity/ offences involving moral turpitude in relation to business dealings.

Signature and seal of Bidder

f) The Bidder is declared bankrupt, insolvent, has wound up or been dissolved; i.e ceases to exist for all practical purposes.

g)) Bidder is found to have obtained Official Company information/ documentation by questionable means.

h) Communication is received from the administrative Ministry of BHEL to ban the Bidder from business dealings.

1.6. Contracts already entered with a contractor before the date of issue of order of 'HOLD' or 'DE-LISTING' shall not be affected.

1.7. All existing contracts with a 'BANNED' contractor shall normally be short closed.

1.8. Once the order for suspension is passed, existing offers/new offers of the contractor shall not be entertained

1.9. The above guidelines are not exhaustive but enunciate broad principles governing action against contractors

Signature and seal of Bidder

CHAPTER-22

OTHER ISSUES

1.1. Value of Non judicial Stamp Paper for Bank Guarantees and for Contract Agreement shall be not less than Rs 100/- unless otherwise required under relevant statutes.

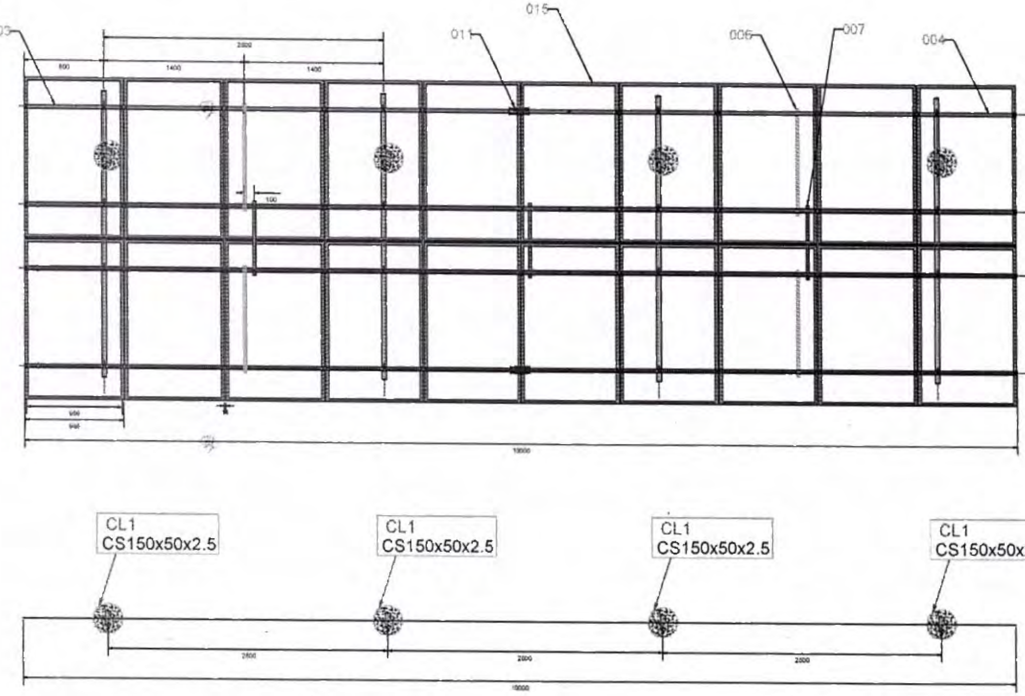
1.2. In case of any conflict between the General Conditions of Contract and Special Conditions of Contract, provisions contained in the Special Conditions of Contract shall prevail.

1.3. BHEL may not insist for signing of Contract Agreements in respect of low value and short time period contracts on case to case basis based on BHEL's own discretion like providing services for Hot water flushing, Chemical Cleaning, Transportation, etc.

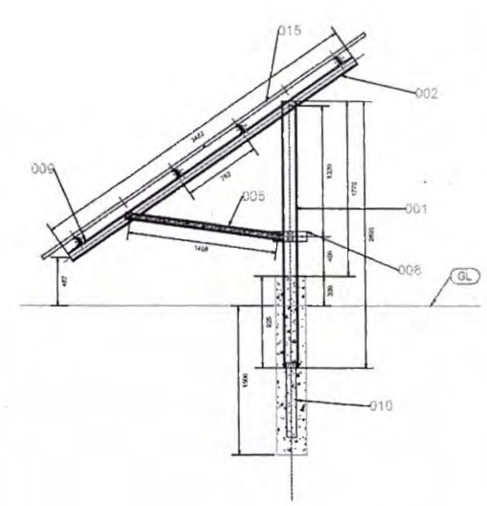
Signature and seal of Bidder

First Angle Projection

All Dimensions in 'mm'

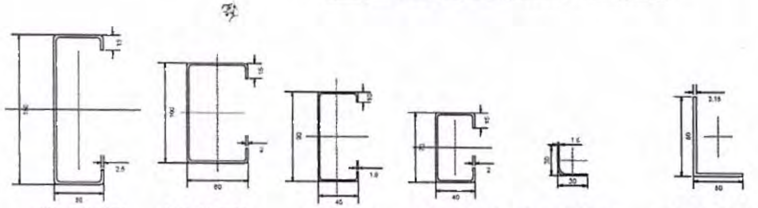


PLAN OF STRUCTURE(WITH PV MODULE)



GENERAL NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
2. DO NOT SCALE THE DRAWING ONLY WRITTEN DIMENSIONS TO BE READ.



CL1-COLUMN	RF1-RAFTER	PU-PURLIN	BR1 BRACING	BR2-3 BRACING	L ANGLE COUPLER
(CS150x50x2.5x15)	(CS100x60x2x15)	(CS90x40x1.6x10)	(70x40x2x15)	(30LU30x1.6)	(80x50x3.15)
SCALE - 10:1	SCALE - 10:1	SCALE - 10:1	SCALE - 10:1	SCALE - 10:1	SCALE - 10:1

BILL OF MATERIAL

IT.NO.	DESCRIPTION	QTY VAR00	UNIT	LONG	WEIGHT PER Mtr	WEIGHT PER ITEM	WEIGHT OF UNIT VAR 00	REF IS
015	PV Module	20						
014	Fastner (M-16)	12						
013	Fastner (M-10)	60						
012	Fastner (M-6)	162						
011	Purlin Plate : 5Thk x 70 x 200	4	NOS.	200		0.55	2.20	IS 2062
010	Splice Plate : 3Thk x 750 x 100	4	NOS.	750		1.77	7.08	IS 2062
009	L Angle Coupler: 80x50x3.15Thk	16	NOS.	40	3.15	0.13	2.02	IS 811
008	PL- Column Plate: 5 Thk x 340 x 100	4	NOS.	340		1.33	5.32	IS 2062
007	BR3- Bracing Angle: 30x30x1.6 Thk	3	NOS.	880	0.71	0.62	1.87	IS 811
006	BR2- Sag Angle: 30x30x1.6 Thk	6	NOS.	1300	0.71	0.92	5.54	IS 811
005	BR1- Bracing C Lip: 70CS40x2 Lip 15	8	NOS.	1250	2.56	3.20	25.60	IS 811
004	PU2- Purlin C Lip: 90CS40x1.6 Lip 10	4	NOS.	5000	2.21	11.05	44.20	IS 811
003	PU1- Purlin C Lip: 90CS40x1.6 Lip 10	4	NOS.	5000	2.21	11.05	44.20	IS 811
002	RF- Rafter C Lip: 100CS60x2.0 Lip 15	4	NOS.	3482	3.66	12.74	50.98	IS 811
001	CL- Column C Lip: 150CS50x2.5 Lip15	4	NOS.	2695	5.10	13.74	54.98	IS 811
	Total weight per table (KG)						243.98	

NOTES:(This note has to be read alongwith the Bill of material).

1. DIMENSIONS FOR COLD ROLLED STEEL ANGLE/CHANNEL SECTIONS SHALL BE IN ACCORDANCE WITH BOM.
2. DIMENSIONS OF PLATES, FLAT BARS SHALL CONFORM TO IS:1730.
3. FABRICATION AND ERECTION SHALL BE CARRIED OUT IN ACCORDANCE WITH IS:800 AND IS:801.
4. ALL MMS MEMBERS TO BE HOT DIP GALVANISATED IN ACCORDANCE WITH IS:2629-1985 AND IS 4759. HOWEVER THE MINIMUM GALVANIZATION THICKNESS TO BE 80 MICRONS AT ANY POINT.
5. SPECIFICATION OF THE COLUMN SPLICE (EXTENSION OF 750x100x3) IS GI WITH MINIMUM OF 80MICRONS OR EQUIVALENT WEIGHT 610 GRM/SQM).
6. NO WELDING ON ANY MEMBER.
7. GENERAL ASSEMBLY TOLERANCE LINEAR +/- 2MM.
8. GENERAL ASSEMBLY TOLERANCE ANGULAR +/- 1.
9. HOLE SIZES ARE SHOWN AFTER GALVANIZATION /TOLERANCE.
10. REMOVE ALL SHARP AND BURR EDGES.

REV.	DATE	ALTERED	CHECKED
–	–	–	–

DISTRIBUTION OF PRINTS

	NAME	SIGN	DATE
DRN	DILIP		08.07.21
CKD	ALOK		08.07.21
APPD	AYAN		08.07.21

DEPT.	CODE
REG	–

CUSTOMER: NALANDA UNIVERSITY

BHARAT HEAVY ELECTRICALS LTD.

RUDRAPUR

CARD CODE: –

TITLE: G.A. of Module Mounting Structure

NO. OF SHTS: 02 | SHT NO.: 01 | REV.: 01

SCALE: – | ORDER / ENQUIRY NO.: – | DRAWING NO.: 24012100001

SIZE -A2

DRAWING NO. 24012100001

INVENTORY NO. | SIGN & DATE | REF. DRG. NO.

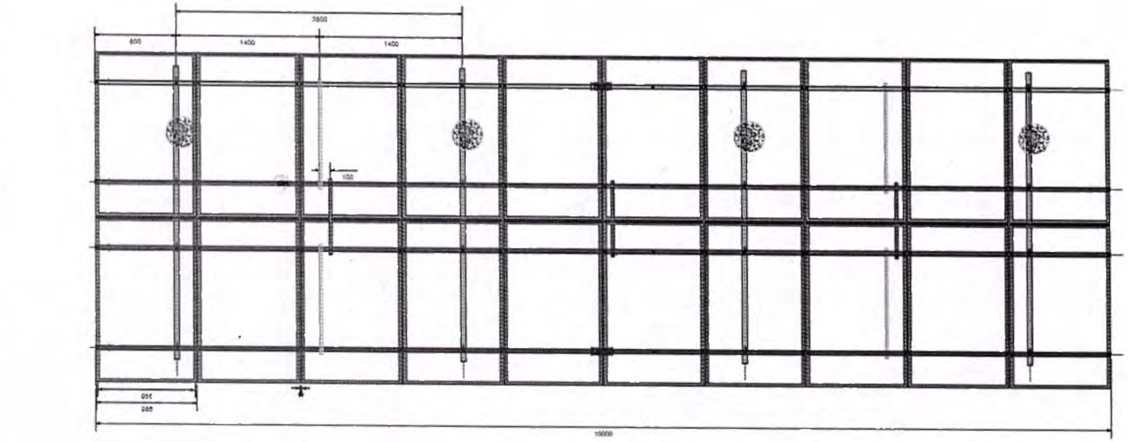
First Angle Projection

All Dimensions in 'mm'

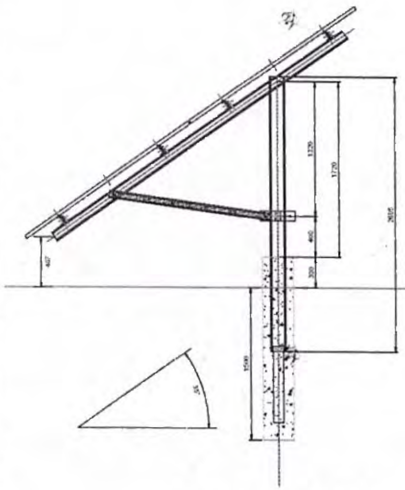
DRAWING NO. 24012100001

PV MODULE DETAIL

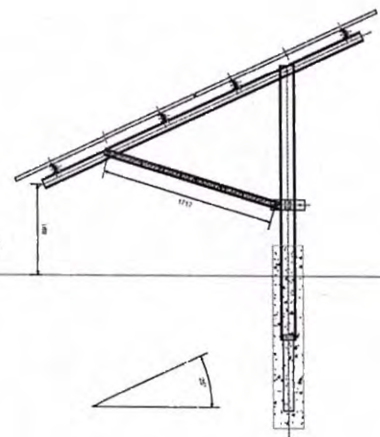
MAKE	SIZE (MM)	Pitch-(Hor)mm	Pitch-(Ver)mm
BHEL- 325 Wp(DCR)	1966x986	956	1200



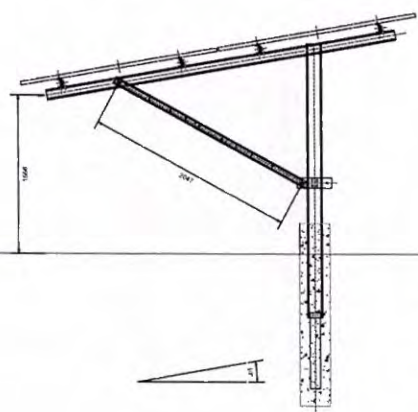
GENERAL TOLERANCES		
1	End Security:	+/- 2 mm
2	CD of Slot	+/- 2 mm
3	CD of Hole	+/- 2 mm
4	Hole Dia	
	<10 mm	+/- 0.4 mm
	>=10 mm	+/- 0.5 mm
5	Slot Dimensions	
	<10 mm	+/- 0.5 mm
	>=10 mm <30 mm	+/- 0.8 mm
	>=30 mm	+/- 1.0 mm
No positive tolerance is permitted in PV module mounting slots on purlins.		
6	Length	+/- 1 mm/m
7	Section Geometry	As per IS 811
8	Straightness	>1/600 of length both axis (As per IS 811)
9	Angular Tolerance	+/-2 degrees
10	Thickness	-0.05 mm to 1 mm



SIDE VIEW FOR 35° TILT PV MODULE



SIDE VIEW FOR 25° TILT PV MODULE



SIDE VIEW FOR 10° TILT PV MODULE

NOTES:(This note has to be read alongwith the Bill of material).

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REV.	DATE	ALTERED	CHECKED
–	–	–	–

	NAME	SIGN	DATE	DEPT.	CODE
DRN	DILIP		08.07.21		
CKD	ALOK		08.07.21		
APPD	AYAN		08.07.21	REG	–

CUSTOMER: NALANDA UNIVERSITY

BHARAT HEAVY ELECTRICALS LTD.

RUDRAPUR

CARD CODE: –

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NO. OF SHTS: 02 | SHT NO.: 02

SCALE	ORDER / ENQUIRY NO.	DRAWING NO.	REV.
–	–	24012100001	01

SIZE -A2

INVENTORY NO. | SIGN & DATE | REF. DRG. NO.

BIDDER SHALL SUBMIT BELOW PRE-QUALIFICATION REQUIREMENTS FORMAT, DULY FILLED-IN, SPECIFYING RESPECTIVE PAGE NUMBER AGAINST EACH REQUIREMENT AND FURNISH RELEVANT DOCUMENT IN THEIR OFFER.

SL. No	*PRE QUALIFICATION REQUIREMENTS*	*Bidders claim in respect of fulfilling the PQR Criteria*
A	Assessment of capacity of Bidder to execute the work: Documentary evidence of similar projects executed by the Bidder, including certification and present contact details of client representative.	
B	Bidder must have achieved the following criteria of during last 7 years as per the detailshereunder. B1: Three similar Works jobs of value not less than **Rs. 93.30 Lakhs** each. OR B2: Two similar Works jobs of value not less than **Rs. 116.63 lakhs** each. OR B3: One similar Works jobs of value not less than **Rs. 186.60 lakhs**"	
C	**Financial Criteria**	
1	**Turnover:** The Average annual financial turnover during last three years ending **31st March 2021** should be minimum **69.98 Lakh** Bidder have to submit audited balance sheet & profit and loss account of last three financial years. Bidder shall submit audited accounts (balance sheets and profit & loss account) in support of this. In case audited financial statements have not been submitted for all the three years as indicated above, then the applicable audited statements submitted by the bidders against the requisite three years, will be averaged for three years i.e. total divided by three.	

Signature and seal of Bidder

2	**Net worth:** Net worth of the Bidder based on the latest Audited Accounts as furnished for 'B1' above should be positive Net Worth = Equity plus General reserves (Free Reserves) minus Accumulated losses.	
3	**Profit:** Bidder must have earned cash profit in any one of the three Financial Years as applicable in the last three years defined in B1 above based on latest Audited Accounts. Profit shall be NET profit (PAT +Non cash expenditure viz. depreciation) earned during any one of the three financial years as in 'C-1' above	

31/03/21

Signature and seal of Bidder

Explanatory Notes for PQR

- For PQR above the word 'Executed 'means the bidder should have achieved the Technical Criteria, specified in the PQR (as in 'B' above), even if the total contract has not been completed or closed.
  (The Bidder shall submit the work completion certificate issued by Customer / Contractor.)

- If the Qualifying work is executed in the last seven years' period, as specified above, even if it has been started earlier, the same will also be considered meeting the qualifying requirements.

- Time period for achievement of the 'Technical' criteria of PQR (as in 'B' above) will be the last 7 years ending on the 'latest date' of Bid submission

- The word **'Similar Works'** means "

  - Vendor should have executed installation & commissioning works of Power Transformer
    AND
    Vendor should have executed laying and termination of cables of 11KV and above

    Or
  - Supply of Balance of system and Installation & commissioning in solar projects cumulative to 1MWp or above.

- Relevant documents, meeting above requirements at B & C, shall be submitted by bidders.

- The bidder can be a company under Companies Act, 1956 or Partnership firm or Proprietor firm.

- Audited financial statements have to be submitted for all the three years as indicated against C-1 above. They should also submit latest Income Tax return for FY mentioned in criteria C1.

- If the financial statement is not required to be audited statutorily, then instead of audited financial statements, financial statements are required to be certified by the Charted Accountant.

Signature and seal of Bidder

Index

Signature and seal of Bidder

Chapter-I:
General Intent of Specifications

1. INTENT OF THE SPECIFICATION

1.1. Various activities required for Supply and Installation of Solar Ground Mounted systems have been identified by BHEL. All the activities required for providing services related to BHEL supplied items, dismantling of existing system (If Required) and Installation of COMPLETE Solar Ground Mounted systems at site have been identified and listed. Supply of AC Cable, LT panel, CCTV, Lightening Arrestor (LA), other minor items, fittings etc. as per list have also been identified as separate line items. Apart from the items generally required for completion of a basic system – other items for supply, installation have also been identified which are required on cases to case basis against various specific requirements of our customer/end user.

1.2. BHEL will place the order with the lowest bidder for full scope of work. Works order is to be awarded to bidder who meet pre-qualification requirement, and techno-commercially qualified and quotes “lowest landed cost to BHEL” for complete specification and scope defined in tender enquiry

Chapter - II:
Delivery Period

1. DELIVERY PERIOD

As per NIT.

Signature and seal of Bidder

Chapter - III:

Obligations of Contractor

1. CONSUMABLES & OTHER ITEMS

The contractor shall provide within finally accepted price / rates, all Minor accessories, fitting items, Concrete etc for ensuring proper finish and completeness of the work. Other erection consumables such as Nuts and Bolts, ferrules tapes, CTC / other cleaning agents are to be provided by the contractor. Steel, packers, shims, wooden planks, scaffolding materials hardware items etc required for temporary works such as scaffoldings are to be arranged by the contractor. Wooden sleepers, for temporary work, required for completion of work except those which are specifically supplied by manufacturing unit are also to be arranged by the contractor.

2. TOOLS AND PLANTS / MONITORING AND MEASURING EQUIPMENT (MMEs)

T&Ps and MMEs to be provided by Contractor

2.1. All T&Ps and MMEs except those that are in BHEL scope are to be provided by the Contractor. Contractor has to make his own arrangement at his cost for completing the formalities, for bringing their materials, plants and equipment's at site for the execution of work under this contract.

2.2. Timely deployment of adequate T&Ps is the responsibility of the contractor. The contractor shall be prepared to augment the T&P at short notice to match the planned program and to achieve the milestones.

2.3. In the event of contractor failing to arrange the required tools, plants, machinery, equipment, material or non-availability of the same owing to breakdown, BHEL will make alternative arrangement at the risk and cost of the contractor. Decision of BHEL shall be final and binding on the contractor.

2.4. The T&P to be arranged by the contractor shall be in proper working condition and their operation shall not lead to unsafe condition. Their movements, should be such that no damage / breakage occurs to foundations, other equipment, material, property and men. All arrangements for the movement of the T&P etc shall be the contractor's responsibility.

2.5. Contractor shall ensure deployment of reliable and calibrated MMEs (Inspection measuring and Monitoring equipment). The MMEs shall have test / calibration certificates from authorized / Government approved / accredited agencies traceable to National / International standards. Each MME shall have a label indicating calibration status i.e. date of calibration, calibration agency and due date for calibration. A list of such instruments deployed by contractor at site with its calibration status is to be submitted to BHEL Engineer for control.

2.6. The contractor shall engage trained and experienced operators for the operation of T&Ps.

3. EPF/ESIC

For the persons deputed at site – Bidder should ensure EPF/ESIC registration and payment towards PF of employee as per applicable rules prevailing in the state/UT of work. Workmen compensation policy has to be taken by the Bidder and should be submitted to BHEL before start of work. Indemnity bond to this effect shall be submitted by vendor for release of payment.

Signature and seal of Bidder

Chapter – IV:
Responsibilities of Contractor in respect of Labour, Supervisory Staff, etc.

1. RESPONSIBILITIES OF CONTRACTOR IN RESPECT OF LABOUR, SUPERVISORY STAFF, ETC.

1.1. Refer relevant clauses of General Conditions of Contract (GCC) also in this regard

1.2. The contractor shall deploy all the necessary skilled/semiskilled/ unskilled labour including highly skilled workmen etc. These workmen should have previous experience on similar job. They shall hold valid certificates wherever necessary. BHEL reserves the right to insist on removal of any employee of the contractor at any time if he is found to be unsuitable and the contractor shall forthwith remove him.

1.3. Contractor shall also comply with the requirements of local authorities/ project authorities calling for police verification of antecedents of the workmen, staff etc.

1.4. It is the responsibility of the contractor to engage his workmen in shifts and or on overtime basis for achieving the targets set by BHEL. This target may be set to suit BHEL's commitments to its customer or to advance date of completion of events or due to other reasons. The decision of BHEL in regard to setting the erection and commissioning targets will be final and binding on the contractor.

1.5. The Contractor shall obtain Independent license under the Contract labour (Regulation and Abolition) Act 1970 from the concerned authorities based on Form-V issued by the Principal Employer/Customer. In order to issue Form-V by Customer, Contractor shall fulfill all Statutory requirements like Insurance Policy, PF Code/PF Account number etc as per the requirement of BHEL/Customer.

1.6. Contractor shall deduct the necessary amount towards Provident Fund and contribute equal amount as per Government of India laws. This amount will be deposited regularly to the provident Fund Commissioner. BHEL/Customer may insist for submission of the account code duly certified by PF Commissioner

1.7. Contractor may also be required to comply with provisions of ESI Act in vogue if applicable and submit evidence to BHEL.

1.8. BHEL / customer may insist for witnessing the regular payment to the labour which is to be done compulsorily trough e-payment mode. They may also like to verify the relevant records for compliance with statutory requirements. Contractor shall enable such facilities to BHEL/ Customer.

1.9. Contractor shall deploy only qualified and experienced engineers/ supervisors. They shall have professional approach in executing the work.

1.10. The contractor's supervisory staff shall execute the work in the most professional manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. They shall be responsible to ensure that the assembly and workmanship conform to dimensions and tolerances given in the drawings/instructions given by BHEL engineer from time to time.

1.11. The supervisory staff employed by the contractor shall ensure proper outturn of work and discipline on the part of the labour put on the job by the contractor. Also in general they should see that the works are carried out in a safe and proper manner and in coordination with other labour and staff employed directly by BHEL or other contractors of BHEL or BHEL's client.

1.12. It is the responsibility of the contractor to arrange gate pass for all his employees, T&P etc for entering the project premises. Necessary coordination with customer officials is the responsibility of the contractor. Contractor to follow all the procedures laid down by the customer for making gate passes. Where permitted, by customer / BHEL, to work beyond normal working hours, the contractor shall arrange necessary work permits for working beyond normal working hours.

1.13. The actual deployment will of Labour and Engineer/supervision staff shall be so as to satisfy the erection and commissioning targets set by BHEL. If at any time, it is found that the contractor is not in a position to deploy the required engineers/supervisors/workmen due to any reason, BHEL shall have the option to make alternate arrangements at the contractor’s risk and cost. The expenditure incurred along with BHEL overheads thereon shall be recovered from the contractor

1.14. Contractor shall not deploy women labour at night.

Chapter – V:
Drawings and documents

1. DRAWINGS

1.1. On award of work, for complete works, bidders shall arrange site visit and confirm feasibility as per drawings and rating provided by BHEL to the bidder.

1.2. The detailed drawings, specifications available with BHEL engineers will be made available to the contractor during execution of work at site. The contractor will also ensure availability of all drawings / documents at work place

1.3. Necessary drawings to carry out the erection work will be furnished to the contractor by BHEL on loan, which shall be returned to BHEL Engineer at site after completion of work. Contractor shall ensure safe storage and quick retrieval of these documents.

1.4. The contractor shall maintain a record of all drawings and documents available with him in a register as per format given by BHEL Engineer. Contractor shall ensure use of pertinent drawings / data / documents and removal of obsolete ones from work place and returning to BHEL.

1.5. The data furnished in various annexure enclosed with this tender specification are only approximate and for guidance. However, the change in the design and in the quantity may occur as is usual in any such project work. The contractors quoted rates shall be inclusive of the above factor

1.6. Should any error or ambiguity be discovered in the specification or information the contractor shall forthwith bring the same to the notice of BHEL before commencement of work. BHEL's interpretation in such cases shall be final and binding on the contractor.

1.7. Deviation from design dimensions should not exceed permissible limit. The contractor shall not correct or alter any dimension / details, without specific approval of BHEL.

2. DOCUMENTS

Below mentioned timeframe is an essential condition of contract

The Contractor shall furnish the following documents on Award/Intent and obtain approval

2.1. Confirmation of site mobilization date and list of persons to be deputed to site. (to be submitted with 03 days of award of work. (Site to be mobilized within 07days of award of work and civil foundation work to be lined up first).

2.2. PERT CHART – listing activities with start & finish date as per contract.
(to be submitted within 05 days of award of work)

2.3. General arrangement (Location of ACDB, DCDB, Inverter, etc.)
(within 05 days from order) – CONSIDERING 03 DAYS FOR SITE VISIT.

2.4. Drawing and its stability report for Mounting structure for ACDB, DCDB and Inverter.

2.5. As built drawings

2.6. O&M manual

Signature and seal of Bidder

Chapter – VI:
Inspection and Quality

1. Inspection, Quality Assurance, Quality Control

1.1. Preparation of quality assurance log sheets and protocols with customer/ consultants/statutory authority, welding logs, NDE records, testing & calibration records and other quality control and quality assurance documentation as per BHEL engineer's instructions, is within the scope of work/specification. These records shall be submitted to BHEL/customer for approval from time to time.

1.2. The protocols between contractor and customer/ BHEL shall be made prior to installation for correctness of foundations, materials, procedures, at each stage of installation, generally as per the requirement of customer/ BHEL. This is necessary to ensure elimination of errors or keeping them within tolerable limits and to avoid accumulation and multiplication of errors.

1.3. The protocols between contractor and customer/ BHEL shall be made prior to installation for correctness of foundations, materials, procedures, at each stage of installation, generally as per the requirement of customer/ BHEL. This is necessary to ensure elimination of errors or keeping them within tolerable limits and to avoid accumulation and multiplication of errors.

1.4. Contractor shall provide all the Measuring Monitoring Equipment's (MMEs) required for completion of the work satisfactorily. These MMEs shall be of brand, quality and accuracy specified by BHEL Engineer and should have necessary calibration and other certificates as per the requirement of BHEL Engineer. Decision of BHEL Engineer regarding acceptance or otherwise of the measuring instruments/gauges/tools for the work under this specification, is final and binding on the contractor. BHEL may give an indicative list of MMEs required for this work and to be made available by the contractor. The list will be reviewed by BHEL and the contractor shall meet any augmentation needed wherever required.

1.5. Any re-laying or re-termination of cables/re-erection of instruments/ recalibration of instruments etc. required due to contractor's mistake or design requirement and found at any stage inspection, shall be carried out by the contractor at no extra cost.

1.6. Total Quality is the watchword of the work and Contractor shall strive to achieve the Quality Standards, procedures laid down by BHEL. He shall follow all the instructions as per BHEL drawings and Quality Standards.

2. Stage Inspection By FES/QA Engineers

Apart from day-to-day inspection by BHEL Engineers stationed at Site and Customer's Engineers, stage inspection of equipments under erection and commissioning at various stages shall also be conducted by teams of Engineers from Field Engineering Services of BHEL's Manufacturing Units, Quality Assurance teams from Field Quality Assurance, Unit/Factory Quality Assurance and Commissioning Engineers from Technical Services etc. Contractor shall arrange all labour, tools and tackles etc along with proper access for such stage inspections free of cost

3. Statutory Inspection of Work

The work to be executed under these specifications has to be offered for inspection, at appropriate stages of work completion, to various statutory authorities for compliance with applicable regulations. The work related statutory inspections, though not limited to, are as under: 1) Inspectorate of Steam Boilers and Smoke Nuisance 2) Electrical Inspector 3) Factory Inspector, Labour Commissioner, PF Commissioner and other authoritiy connected to this project work The scope includes getting the approvals from the statutory authorities, which includes arranging for inspection visits of statutory authority periodically as per BHEL Engineer's instructions, arranging materials for ground inspection, taking rub outs for the pressure parts to be offered for inspection, submitting co-related inspection reports, documents, radiographs etc and following up the matter with them. Contractor shall also make all arrangements for offering the Products / Systems for inspection at location, as applicable, to the concerned authority.

4. Field Quality Assurance

4.1. Contractor shall carry out all activities conforming to the approved Field Quality Plan (FQP) as revised from time to time. Total quality shall be the watchword of the work and contractor shall strive to achieve the quality standards, procedures laid down by BHEL. He shall follow all the instructions as per BHEL drawings and quality standards. Contractor shall provide the services of quality assurance engineer as per the relevant clauses

4.2. Contractor has to fulfil quality requirement as per this chapter. In case of any gap in fulfilling these requirements by the contractor, financial penalty shall be imposed on the contractor with the rate mentioned in the "MEMO for penalty imposition against non-compliance in Quality area" enclosed as Annexure-IV.

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Chapter VII

HSE & OHSAS – SAFETY ARRANGEMENT & PRECAUTIONS

1. OCCUPATIONAL HEALTH, SAFETY & ENVIRONMENT MANAGEMENT/ QUALITY ASSURANCE PROGRAMME :

BHEL, Rudrapur has HSE certification (ISO14001& OHSAS18001) and accordingly, Contractor has to organize/ plan/ perform all their activities to meet with the applicable requirements of these standards.

BHEL, Rudrapur is certified for ISO 9001. Quality of work to customer's satisfaction and fulfillment of system requirements are the essence of ISO 9001 certification.

HSE (Health, safety & Environment):

Requirements of BHEL HSE compliance in brief is given below:-

1.1. Contractor will nominate only qualified and experienced employees. The site in-charge nominated by contractor will be responsible for all HSE related issues of contractor's work area. In case contractor feels that the site in-charge needs training regarding the HSE guidelines – he may request in writing to BHEL in this regard. All details shall be explained in detail to the person identified by contractor at BHEL Rudrapur unit.

The Site In-charge will have authority to stop any activity, in case he observes that the activity is not being carried out in safe manner. He will conduct surprise inspection as well as periodic inspection/drill (at least once in a month). He will conduct periodic meetings with different working groups and explain HSE issues and use of PPEs to them. Contractor will develop suitable work procedures based upon HSE guidelines and OCPs and implement it. Such work procedures will consist of Area of work, T&P Details, Work Procedure, PPE requirements etc.

No extra charges shall be payable to contractor towards compliance of the safety requirements as per BHEL HSE guidelines.

1.2. Requirement of all personnel protective equipments (PPEs), in adequate numbers shall be assessed by the site in-charge and will be made available at site for their regular use by all concerned. This will be ensured by site in-charge.

List of such PPEs shall be recorded in the site register and issue records to individuals with signature will be maintained.

1.3. Contractor will provide appropriate First Aid facilities for prompt treatment of injuries and illness at work place. Arranging training to contractor workmen/ employees for giving first aid.

1.4. All the following details shall be displayed properly for emergency reference. Information regarding the same shall also be provided to all workmen during HSE briefing.

a) Arranging ambulance in case of any emergency situation.
b) Identification of nearest hospital for health check-up of workmen/employees.
c) Identification of nearest fire station and display contact telephone nos./ person's name around work places for cases of emergencies.

1.5. Contractor will make arrangement for proper drinking water at work place.

1.6. Contractor will ensure that safety requirements at all power tapping points are fulfilled.

1.7. Red & White caution tape of proper width (1.5 to 2 inch) to be used for cordoning unsafe area such as open trench, excavation area etc.

1.8. Providing contractors company logo on cloths /uniform/ proper identity cards with photographs, for correct identification of people working at project site.

1.9. All scaffolding/ platforms should be made from materials of appropriate quality/grade so that these are safe for use. It should be certified/declared safe for use by an experienced contractor person, before any scaffolding/platform is used. Please refer IS:3696 part 1&2 and 4014 part 1 & 2 for further details.

1.10. Ensure that the regulatory requirement of excessive weight limits (to carry/ lift/ move weights beyond prescribed limits) for male and female workers are complied with.

1.11. Safety slogan, Safety/ Caution boards, wherever required to be displayed in consultation with BHEL.

1.12. Take suitable measures for waste management and environment related laws/legislation as a part of normal construction activities. Ensure proper cleanliness of work place, housekeeping and waste management (including proper waste disposal) on daily basis.

1.13. The Contractor is required to provide proper safety net systems (IS-11057) where ever the hazard of fall from height is present. The safety nets shall be fire resistant, duly tested and shall be of ISI Mark and the nets shall be located as per site requirements to arrest or to reduce the consequences of a possible fall of persons working at different heights.

1.14. Different risk areas shall be identified by the site in-charge and accordingly, all applicable OCPs (Operational control procedures) will be followed. Based on identified safety risks at site – the contractor may submit request to BHEL in writing for required assistance in making of suitable OCPs in case the same is not available with them. The OCPs are also available in BHEL website in downloadable format. Complete responsibility for identification of risk areas and displaying the OCPs prominently at site, explaining the procedure to each workman in the area, lies with the contractor.

2. **SUBMISSION OF SAFETY PLAN:**

The contractor shall take all necessary safety precautions and arrange for appropriate appliances to prevent loss of human lives, injuries, to personnel engaged and damage to property. Before commencing the work, the contractor shall submit a "Safety Plan" to the above authorized BHEL official and obtain approval on the same. The safety plan shall indicate in detail the measures that would be taken by the contractor to ensure safety of men, equipment, materials and environment during execution of the work. Area wise Electrical safety inspection is to be carried out and the report is to be submitted. This will also include an organization structure, role and responsibilities of the concerned key personnel, the safety practices that will be followed, PPEs deployed, plan for handling critical activities and emergencies.

3. During the course of construction, alternation or repairs, scrap with protruding nail, sharp edge etc and all other debris shall be kept clean from working areas, passage, ways and stairs in and around site.

4. Rigging equipment for materials handling shall be inspected prior to use in each shift and as necessary during its use to ensure that it is safe. Defective rigging equipment will be removed from service.

5. All workmen of the contractor working on construction area shall wear safety shoes, hand gloves, safety helmets and safety belt as applicable.

6. The contractor shall insure his workmen against all accidents and the policy shall be presented to BHEL Engineer on demand. In case of a fatal or disabling injury accident to any person at construction site due to lapses by the contractor, the victim and/or his/her dependents shall be compensated by the contractor as per statutory requirements. However, if considered necessary BHEL shall have the right to impose appropriate financial penalty on contractor and recover the same from payments due to the contractor for suitably compensating the victim and/or his/her dependence before imposing any such penalty. Appropriate enquiry shall be held by BHEL giving opportunity to the contractor for presenting his case. Above safety conditions are not exhaustive but gives an idea for the contractor and contractor shall adhere to all safety precaution given by the Engineer at site.

   The Contactor shall take all measures at the sites of the work to protect all persons from accidents and shall be bound to bear the expenses of defense of every suit, action or other proceeding at law that may be brought by any persons for injury sustained or death owing to neglect of the above precautions and to pay any such persons such compensation or which may with the consent of the Contractor be paid to compromise any claim by any such person should such claim proceeding be filed against BHEL, the Contractor hereby agrees to indemnify BHEL against the same

7. The contractor shall arrange at his cost adequate lighting facilities e.g. flood lighting, hand lamps, area lighting etc. at various levels for safe and proper working operations during night hours at the work spot as well as at the pre-assembly area.

8. The contractor shall be responsible for provision of all the safety notices and safety equipment as enjoined on him by the application of relevant statutory regulation / provisions and/or as called upon by BHEL from time to time. He shall be held responsible for any violation of statutory regulations (local, state or central) and BHEL instruction that may endanger safety of men, equipment and material.

9. The contractor shall provide temporary fencing wherever required as a safety measure against accident and damage to properties. Suitable caution notices shall be displayed where access to any part is found to be unsafe and hazardous.

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10. It will be the responsibility of the contractor to ensure safe lifting of the equipment, taking due precaution to avoid any accident and damage to other equipment and personnel. All requisite tests and inspection of handling equipment, tools & tackle shall be periodically done by the contractor by engaging only the COMPETENT PERSONS as per law. Defective equipment or uncertified shall be removed from service. Any equipment shall not be loaded in excess of its recommended safe working load.

11. The contractor should conduct periodical first –aid classes to keep his supervisor and Engineers properly trained for attending to any emergency.

12. The contractor shall arrange induction safety training for all employees before assigning work. In addition, awareness program, mock drill at regular intervals and daily tool box meetings shall be arranged.

13. All portable electric tools used by the contractor shall have safe plugging system to source of power and be appropriately earthed. Only electricians licensed by appropriate statutory authority shall be employed by the contractor to carry out all types of electrical works. Details of earth resource ad their test date to be given to BHEL safety officer as per the prescribed formats of BHEL

14. The contractor shall carefully follow the safety requirement of BHEL/ the purchaser with the regard to voltages used in critical areas.

15. The contractor shall use only properly insulated and armored cables which conform to the requirement of Indian Electricity Act and Rules for all wiring, electrical applications at site. BHEL reserves the right to replace any unsafe electrical installations, wiring, cabling etc. at the cost of the contractor. All electrical appliances used in the work shall be in good working condition and shall be properly earthed. No maintenance work shall be carried out on live equipment. The contractor shall maintain adequate number of qualified electricians to maintain his temporary electrical installations.

16. Suitable scaffolds shall be provided for workman for all works that cannot safely be done from the ground, or from solid construction except in the case of short duration of work which can be done safely from ladders. When a ladder is used, it shall be of rigid construction made of steel. The steps shall have a minimum width of 45 cm and a maximum rise of 30 cm. Suitable handholds of good quality wood or steel shall be provided and the ladder shall be given an inclination not steeper than ¼ horizontal and 1 vertical.

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17. Scaffolding or staging more than 3.6 m above the ground floor, swung or suspended from an overhead support or erected with stationery support shall have a guard rail properly bolted, braced or otherwise secured, at least 90 cm above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from saver, from swaying, from the building or structure.

18. Working platforms, gangways and stairways shall be so constructed that they do not sag unduly or unequally and if the height of the platform gangways provided is more than 3.6 m above ground level or floor level, they shall be closely boarded and shall have adequate width which shall not be less than 750 mm and be suitably fenced as described above.

19. Every opening in the floor or a building or in a working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 90 cm.

20. Wherever there is open excavation in ground, they shall be fenced off by suitable railing and danger signals installed at night so as to prevent persons slipping into the excavations.

21. Safe means of access shall be provided to all working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 m in the length while the width between side rails in rung ladder shall in no case be less than app. 29.2 cm for ladder upto and including 3 m in length. For longer ladders this width shall be increased at least ¼'' for each additional foot of length.

22. Adequate precautions shall be taken to prevent danger for electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public.

23. Electric wiring and other dangerous pump of hoisting appliances should be provided with efficient safe guards. When workers employed on electrical installations which are already energized, insulting mats, wearing apparel, such as gloves, sleeves and boots as may be necessary should be provided. The worker should not wear any rings, watches and carry keys or other materials which are good conductor of electricity.

    Hoisting appliance should be provided with such means as will reduce to the minimum the risk of any part of a suspended load becoming accidentally displaced.

24. These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent, place at work spot. The persons responsible for compliance of the safety code shall be named therein by the Contractor

25. Keeping the work area clean/ free from debris, removed scaffoldings, scraps, insulation/sheeting wastage /cut pieces, temporary structures, packing woods etc. will be in the scope of the contractor. Such cleanings have to be done by contractor within quoted rate, on daily basis by an identified group.

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Chapter VIII
Payment

1. PAYMENTS

Bills shall be raised by Contractor on and after completion of work recording and verification of work measurement as per Chapter-7 (Page 16-17) of GCC attached in this NIT. Any bill without Verified Measurement Sheet and duly filled and signed Format WAM6/WAM7 shall not be entertained by BHEL. Payments to Contractors shall be made as follows:

1.1. Running Account Bills (RA Bills)

a) These are for interim payments when the contract is in progress. The bills for such interim payments are to be prepared by Contractor in prescribed formats (RA Bill forms – WAM6).

b) Payments shall be made according to the extent of work done as per measurements taken up to the end of the calendar month and in line with the terms of payments described in the Tender documents.

c) The payment for running bills will normally be released within 45 days of submission of execution of work subject to acceptance and submission of running bill complete in all respects with all supporting documents like verified measurement sheet and format WAM6. It is the responsibility of the contractor to make his own arrangements for making timely payments towards labour wages, statutory payments, outstanding dues etc and other dues in the meanwhile. Following documents shall be submitted by bidder:

- Invoice - 01 original for buyer + 03 extra.
- Duly filled and stamped RA bill format WAM 6.
- LR/GR/Material Receipt copy
- List of all tools and tackles with calibration certificates.
- Test Reports of all BoS supplied by the Bidder and warranty card.
- Closure of BHEL raised quality punch points(along with Final Bills)
- For Final Bill Commissioning report, Handover certificate & training certificate
- Details of payment of PF and ESI of labours.
- Progress Schedule

~~During the Operation & maintenance following documents are required for processing O&M Bills~~

- ~~Invoice - 01 original for buyer + 03 extra.~~
- ~~Duly filled and stamped RA bill format WAM 6.~~
- ~~Monthly O&M report duly signed by BHEL/Customer~~
- ~~List of all tools and tackles with calibration certificates.~~

- ~~Details of payment of PF and ESI of labours.~~
- ~~Copy of Maintenance register , Monthly Generation report, Cleaning report as per the attached format available in this tender, O&M report dully signed by the Customer/BHEL representative.~~

- In case of any discrepancy in material supplied or service rendered or work executed by contractor, BHEL shall indicate the discrepancy, and payment shall be made within 45 days from the day of removal of such discrepancy.

- Recoveries on account of electricity, water, Liquidated Damages, all applicable statutory deductions like TDS under Income Tax, GST TDS, BOCW other Taxes. shall be made as per terms of contract.

d) Full rates for the work done shall be allowed only if the quantum of work has been done as per the specifications stipulated in the contract. If the work is not executed as per the stipulated specifications, BHEL may ask the contractor to re do the work according to the required specifications, without any extra cost. However, where this is not considered necessary 'OR' where the part work is done due to factors like non-availability of material to be supplied by BHEL 'OR' non availability of fronts 'OR' non availability of drawings, fraction payment against full rate, as is considered reasonable, may be allowed with due regard for the work remaining to be done. BHEL decision in this regard will be final and binding on the contractor.

e) All preconditions noted in the NIT for release of payment shall be necessarily complied with by the contractor while submitting the claim for payment.

1.2. Final Bill

Final Bill' is used for final payment on closing of Running Account for works or for single payment after completion of works. 'Final Bill' shall be submitted as per prescribed format WAM7 after completion of works as per scope and upon material reconciliation, along with the following.

a) Duly Filled and verified Final Bill Format WAM7
b) 'No Claim Certificate' by contractor
c) For Final Bill Commissioning report, Handover certificate & training certificate
d) Clearance certificates wherever applicable viz Clearance Certificates from Customer, various Statutory Authorities like Labour department, PF Authorities, Commercial Tax Department, etc

BHEL shall settle the final bills after deducting all liabilities of Contractor to BHEL.
Payment of Final bill shall be released within 45 days after acceptance of final Invoice submitted along with all document mentioned as above to this office.

Refund of Retention Amount shall be along with 'Final Bill'. No interest shall be applicable on retention amount.

1.3. BHEL shall release payment through Electronic Fund Transfer (EFT)/RTGS. In order to implement this system, Contractor to furnish details pertaining to his Bank Accounts where proceeds will be transferred through BHEL's banker, as per prescribed formats.

1.4. Security Deposit

The security deposit amount shall be retained until fulfilment of contractual obligation. After completion of scope and fulfillment of all contractual obligations as per contract, contractor shall submit request of return of security deposit as per Format WAM10.

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Chapter IX:
Performance Monitoring

1. Performance Monitoring

1.1. Performance of the contractor is monitored through various reports/reviews and shall be jointly evaluated every month for unit wise identified packages as per prescribed formats. Based on the net weighted scores obtained, Contractors shall be rated 'Good' or 'Satisfactory' or 'Unsatisfactory'

1.2. In case of any dispute on performance rating and the contractor refuses to sign on the performance rating given by BHEL package In-charge, the same shall be reviewed by BHEL site In-charge/Construction Manager and his decision shall be final.

1.3. Performance of the contractor will be taken into consideration for assessing the capacity of the bidder to execute future jobs under tender, as detailed in the Notice Inviting Tender.

1.4. In case of 'Unsatisfactory performance' for a continuous period of three or more months for a package or packages, BHEL has the right to get the balance works executed at the risk and cost of the contractor.

1.5. In case of 'Unsatisfactory performance' in a financial year, BHEL reserves the right to put on hold such Contractors for a period of six months for similar package or similar packages

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Chapter X
Performance Guarantee

1. PERFORMANCE GUARANTEE FOR WORKMANSHIP

1.1. The Contractor will be responsible for the quality of the workmanship of the work undertaken and shall ensure that the systems are in proper working condition for the period of Maintenance Contract as defined in the Conditions of Contract, for good workmanship. In the event of the Contractor failing to repair the defective works within the time specified by the Engineer, BHEL may proceed to undertake the repairs of such defective works at the Contractor's risk and cost, without prejudice to any other rights and recover the same from the Guarantee money.

1.2. BHEL shall release the Security Deposit subject to the following

a) Contractor has submitted 'Final Bill'
b) Maintenance period as per contract has expired
c) Contractor has furnished 'No Claim Certificate' in specified format
d) Contractor has carried out the works required to be carried out by him during the period of Maintenance and all expenses incurred by BHEL on carrying out such works is included for adjustment from the Guarantee money refundable.

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Terms & Condition

1. **Price basis:** Firm i.e. from date of Work Order.

2. **Supply, installation & commissioning and trial run:**
   a. Successful bidder will complete the supply, installation and commissioning work as per scope within **120 Days** from the date of Work order.
   b. Trial Run: The PG Test for Plant Facilities shall commence with a trial run for 7 consecutive days.
   The Contractor shall provide the data in requisite formats (specified elsewhere in the document) to SECI. SECI shall vet the data for any discrepancies and systemic errors and revert within 3 working days. Post the trial run period, the 30 days PR test will commence after communication from SECI/Customer in this regard.

3. **Payment terms:**

3.1:- Supply, Installation & Commissioning:-

The payment shall be made by BHEL in the following manner:

Each line item of BOQ of price bid has been divided into either of the three categories:

i. Cat. 1 : Only Supply (Code –S)
ii. Cat. 2 : Supply & Installation, T&C (Code – S&I)
iii. Cat. 3 : Only Installation, Testing & Commissioning (Code – I)

a) Supply Part:

i. **80%** of the PO value of supply portion of BoS shall be released (Cat.1) upon completion of supply. Receipt of material in Good condition and submission of MDCC (Materials Dispatch certificate), Test/Inspection report & Certificate shall be submitted along with invoice for the payment.
ii. **On completion of Installation: Balance 20 %** of the supply portion shall be released.

b) Installation & commissioning of system and successful training & Handing over Part: On Installation, Testing & Commissioning

i. 90% of the PO value of Installation and supply Portion of BoS shall be released (Cat. 2 & Cat.3) upon completion of Installation and commissioning. Installation and commissioning certificated issued by BHEL/Customer site in-charge shall be submitted along with invoice for the payment.
ii. On handing over of the site balance 10% of the Cat.2 and Cat.3 items shall be released.

c) Security and Unloading

i. **Security-** Monthly bill shall be raised by the Bidder and 100% of the billed value shall be released.
ii. **Unloading:** 100% of the line value shall be paid after I&C of the project.

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Table: Summary of payment terms

Sl. No	Category	Payment terms		
		Supply	I&C	Handing Over
1	Cat-1 (S)	80%	20%	-
2	Cat-2 (S&I)	-	90%	10%
3	Cat-3 (I)	-	90%	10%

Following documents are required for processing the running bills:

a. Invoice - 01 original for buyer + 03 extra.
b. Duly filled and stamped RA bill format WAM 6.
c. LR/GR/Material Receipt copy
d. List of all tools and tackles with calibration certificates.
e. Test Reports of all BoS supplied by the Bidder and warranty card.
f. Closure of BHEL raised quality punch points(along with Final Bills)
g. For Final Bill Commissioning report, Handover certificate & training certificate
h. Details of payment of PF and ESI of labours.
i. Progress Schedule

Please ref chapter VIII payment in REG2021-20210321 Part-04/05 of SCC for Running bill and measurement book.

4. **Earnest Money Deposit**: EMD to be necessarily submitted (whether or not registered as MSME). This is to be ensured in line with provisions of "works contract".
   All details related to submission of EMD has been given **in REG2021-20210321 / Part-05/05) in Chapter 01, Clause 7 (page 4/41) of GCC** in form of pay order or demand draft payable at Rudrapur or NEFT/RTGS to BHEL office in favor of BHEL along with Offer.

5. **Security Deposit:**

   5.1: - Supply, Installation & Commissioning: -

   Security Deposit (SD) amount shall be 5% of the Contract value (Including O&M Value). This will have to be deposited by the successful bidder within a week of award of work (minimum 50% SD amount, as per GCC).
   Complete details regarding submission of security deposit has been given in **GCC (REG2021-20210321 / Part-05/05) in Chapter 01, Clause 8 (page 5/41).**

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Return of Security Deposit: Security Deposit shall be refunded/Bank Guarantee(s) released to the Contractor along with the 'Final Bill except O&M' after deducting all expenses / other amounts due to BHEL under the contract / other contracts entered into with them by BHEL. **(REG2021-20210321 / Part-05/05) in Chapter 01, Clause 9 (page 6/41).**

6. Contract Performance Bank Guarantee:

The successful bidder will have to submit contract performance Bank Guarantee (CPBG) to BHEL within 10 days from 'final bill except O&M' so that final bill mentioned in clause 5.1 can be processed and Security money can be released.

The performance bank Guarantee of 3% of WO value has to be valid for warranty period of 05 years from the date of handing over of system with a claim period of 6 months. The Bank Guarantee towards Performance Guarantee will be released after completion of warranty period.

The CPBG may be furnished in any one of the following forms:

a) Bank Guarantee from Scheduled Banks/ Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format should have the approval of BHEL
b) Fixed Deposit Receipt issued by Scheduled Banks/ Public Financial Institutions as defined in the Companies Act (FDR should be in the name of the Contractor, a/c BHEL)
c) Securities available from Indian Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (held in the name of Contractor furnishing the security and duly endorsed/ hypothecated/ pledged, as applicable, in favour of BHEL)

(Note: BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith)

The CPBG shall not carry any interest.

In case, CPBG is not submitted by the bidder within 10 days from final bill and neither any commitment is received for submission in the next 10 days' time also – then BHEL will be hold Security deposit as a CPBG for 1 years as mentioned above.

7. Risk Purchase Clause:

If the supplier fails to deliver the services within the stipulated period mentioned in the work order, BHEL shall be entitled to terminate the contract and to order the same or the best and the nearest available substitute from elsewhere at the risk and cost of the seller either the whole or any part of the goods/Services. In case of deviation or

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non-acceptance of Risk Purchase clause, offer shall be liable for rejection. **Risk & Cost Amount payable by Supplier or recoveries in-lieu of Risk Purchase may be recovered from supplier by encashing/invoking Bank Guarantee, Security Deposits available with BHEL against the same or any other contract or may be adjusted against dues available in the form of bills payable to supplier by BHEL against the same or any other purchase orders/contracts/work orders etc. placed on the supplier by any unit/region etc. of BHEL or through any other legal remedy available to BHEL.**

Risk and Cost against Balance Work:

Risk & Cost Amount= [(A-B) + (A x H/100)]

Where,
A= Value of Balance scope of Work/ Supply (*) as per rates of new contract
B= Value of Balance scope of Work/ Supply (*) as per rates of old contract being paid to the contractor/ supplier at the time of termination of contract i.e. inclusive of PVC & ORC, if any.
H = Overhead Factor to be taken as 5
In case (A-B) is less than 0 (zero), value of (A-B) shall be taken as 0 (zero).
***(Balance scope of work/ supply)**
Difference of Contract Quantities and Executed Quantities as on the date of issue of Letter for 'Termination of Contract', shall be taken as balance scope of Work/ Supply for calculating risk & cost amount.
Contract quantities are the quantities as per original contract. If, Contract has been amended, quantities as per amended Contract shall be considered as Contract Quantities.

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8. GST Rate

Bidder(s) to ensure following while quoting: -

- To mention relevant HSN/ SAC Code for each item quoted by him.
- To mention GST registration number in the name of bidder in the quotation and to attach self-attested copy of GST Registration.

Loading by BHEL

The offers of those bidder(s) who are not registered with GST, their offers will be loaded by BHEL with applicable GST (as applicable) for the items quoted by such bidder(s).

Post- award

The successful bidder (s) under the tender required to ensure following: -

I. Should raise invoice as per the applicable GST Act/ Rules as amended from time to time with all the required details under relevant act/rules. The required details shall be clear and legible on the invoice. MSME Vendors, m ay ·send a draft sample of Invoice to be raised on BHEL in advance for the review and approval by BHEL.

II. A declaration on letter head duly signed by authorized signatory shall be furnished by bidder (s) to BHEL that they shall upload all relevant particulars on GSTN network/ portal alongwith details of any credit note(as intimated by BHEL from time to time) in timely manner and shall discharge tax liability on invoices raised to BHEL in timely manner to enable BHEL to take input credit in timely manner against invoice raised by them . In the event of delayed submission, submission of wrong data in returns or non-payment of GST they shall compensate BHEL for any loss of Input credit alongwith interest thereon which is generally SBI PLR plus 6% (as being charged by BHEL).

III. In case of multiple Invoice Numbering System by Vendor, the Invoice No. which is linked/ uploaded on GSTN network should be clearly highlighted and separately informed to concerned officials of BHEL.

Payment of GST

As BHEL, evaluates offers of the bidder(s) on the basis of Total Landed Cost to BHEL and Input Credit of GST being passed on by Bidder(s) to BHEL is reduced while working out Landed Cost by BHEL. Hence, it is the responsibility of Bidder(s) to take utmost

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care on his part to ensure that Input Credit is smoothly availed by BHEL for GST charged by them.

The payment made by BHEL towards GST charged in Invoice by the bidder(s), shall be treated as advance until input credit is finally availed by BHEL.

In case, BHEL finds at any stage that BH EL is denied input credit on GST charged by bidder(s) due to fault/ omission of bidder, the loss of input credit so incurred by BHEL should be compensated by the bidder(s) to BHEL alongwith interest and penalty.

The decision of BHEL regarding fault/ omissions made by bidder(s) in following GST provision resulting loss of input credit to BHEL, will be final and binding on Vendor

Note: Non-acceptance/non-submission of any of the above requirements will render the offer liable for rejection.

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DECLARATION BY THE BIDDER

I/We ..... (Hereinafter referred to as Bidder) being desirous of participating for tender, having fully understood the scope of tender and having carefully noted all the terms and conditions, specifications etc. as mentioned in the tender document (**REG2021-20210321, REV 00**) do hereby declare that-

1. The Bidder is fully aware of all the requirements of the tender document (**REG2021-20210321, REV 00)** and agrees with all provisions of the tender document and accepts all risks, responsibilities and obligations directly or indirectly connected with the performance of the tender.
2. The Bidder is fully aware of all the relevant information for proper execution of the proposed scope of work, with respect to the proposed place of works/ site, its local environment, approach road and connectivity etc. and is well acquainted with actual and other prevailing working conditions, availability of required materials and labour etc. at site.
3. The Bidder is capable of executing and completing the work as required in the tender and is financially solvent and sound to execute the tendered work. The Bidder is sufficiently experienced and competent to perform the contract to the satisfaction of BHEL The Bidder gives the assurance to execute the tendered work as per specifications, terms and conditions of the tender on award of work.
4. The Bidder has no collusion with other Bidders, any employee of BHEL or with any other person or firm in the preparation of the tender.
5. The Bidder has not been influenced by any statement or promises by BHEL or any of its employees but only by the tender document.
6. The Bidder is familiar with all general and special laws, acts, ordinances, rules and regulations of the Municipal, District, State and Central Government that may affect the work, its performance or personnel employed therein.
7. The Bidder has never been debarred from similar type of work by any Government undertaking /Department. (An undertaking on Stamp paper in this regard shall have to be submitted)
8. The Bidder accepts that the earnest money may be absolutely forfeited by BHEL if the Bidder fails to sign the contract or to undertake the work within stipulated time.
9. All the information and the statements submitted with the tender are true.

Signature and seal of Bidder

6.5 MWp (DC) / 5 MW (AC) GRID INTERACTIVE GROUND MOUNTED SOLAR POWER PLANT NALANDA UNIVERSITY –RAJGIR BIHAR

GENERAL & TECHNICAL SPECIFICATION FOR SUPPLY OF BoS, INSTALLATION, TESTING & COMMISSIONING

IMPORTANT NOTE

"BIDDER IS REQUESTED TO VISIT THE SITE IN PERSON AND THEN SUBMIT THEIR BEST OFFER. ANY TYPE OF DENIAL /OBJECTION SHALL NOT BE ENTERTAINED AFTER FINALIZATION OF ORDER."

Signature and seal of Bidder

BRIEF ABOUT THE PROJECT:

The proposed campus of Nalanda University is planned to be developed on a mostly flat terrain in the foot hill of Nalanda Hills. The site is located in Gangatic plains area of Southern Bihar.

Site is located along the Patna - Rajgir Highway and is well connected with the city of Rajgir, Bihar. Total area of the site is approximately 455 acres ("Site") out of which 20 acres area has been allotted and marked for the Ground Mounted Solar PV System and associated job for setting up 5MWp AC, ILR1.3/6.5MWp DC Capacity Grid Connected Ground Mounted Solar PV system including DESIGN, PROCUREMENT, INSTALLATION, TESTING, COMMISSIONING and 5 YEARS CMC at the permanent campus of Nalanda University (NU), Nalanda, Rajgir, Bihar.

SALIENT FEATURES

S No	Particulars	Detail
Detail of Location		
1	Site	Nalanda University
2	Location	Rajgir
3	District	Nalanda
4	State	Bihar
5	Pin Code	803 116
6	Site Latitude	25.00° N
7	Site Longitude	85.22° E
8	Nearest Railway Station	Rajgir Railway Station
9	Annual Average Temperature	26 °C
Technical *		
10	Capacity of Power Plant	5MWp AC/ 6.5MWp DC
11	Type of solar system	Ground Mounted
12	Installable area offered	20Acre single piece of land
13	No of PV Modules	~19,120 nos
14	Power optimizer	~10000 Nos
15	No of string inverters	>50 nos
16	PV Module Mounting	Seasonal Tilt Type
17	Mounting Tilt angles	10° , 25° & 35°
18	Grid interfacing voltage	415V
19	CUF	>19% on commissioning

Above indicated technical data is tentative & will be finalized up on having clarity over make & rating of string inverters & power optimizers.

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1. NAME OF WORK: -

Supply of BoS, installation, testing & commissioning of 6.5 MWp(DC) / 5 MW(AC) Ground Mounted grid connected Solar Power Plant at Nalanda University- Rajgir, Bihar.

2. SCOPE OF WORK: -

The scope of work shall include "**Supply of BoS, Installation, testing & commissioning of 6.5 MWp (DC)/5 MWp (AC) ground-mounted grid interactive solar power plant in the premises of Nalanda University, Rajgir- Bihar**".

Scope of work includes:

(a) Installation of Module Mounting Structure (MMS) as per approved design & drawing. Structure shall be supplied by BHEL. Civil work related to foundation of module mounting structure shall be carried out by BHEL though other agency. However, all necessary fasteners/ hardware in bidder's scope.

(b) Mounting & commissioning of PV modules. PV Modules shall be provided by BHEL.

(c) Mounting & commissioning of Power Optimizer. Power Optimizer shall be provided by BHEL.

(d) Installation & commissioning of solar Inverters/Power Conditioning Units. Inverters/ Power Conditioning Unit shall be provided by BHEL.

(e) Supply, installation & commissioning of ACDB along with other protective devices (if required) such as switch fuse unit (SFU), disconnecting switch box etc.

(f) Laying/fixing of DC cables through conduit pipe/cable tray. Supply of connecters, cables lug, gland, conduit pipe/ cable tray & other required accessories shall be part of contractor's scope. DC cable shall be supplied by BHEL.

(g) Supply (HT Cable) & laying/fixing of AC cables of required length & size through cable tray/trenches. Supply of connecters, cables lug, gland, cable tray & other required accessories including civil work shall be part of contractor's scope.

(h) Supply & installation of bus trunking system to provide connection between LT panel & Primary Side of Transformer.

(i) Integration with 3nos transformers – 415V/11kV (2.5MVA each) included. Its civil foundation shall be done by other agency & considered out of the contractor's scope.

(j) Termination & charging of 3 Nos transformers – 415V/11kV (2.5MVA each) will be the responsibility of the contractor.

(k) Supply & installation of earthing system. Adequate earthing shall be provided as per requirement of the project.

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(l) Supply & installation of Lightning & surge voltage protection. Adequate number of lightning arresters shall be provided by the contractor.

(m) Design, supply, installation & commissioning of CCTV based surveillance system including IP rated cameras with required mounting arrangement, IP rated termination box, cable, hoods, centralized DVR system & other required accessories.

(n) Supply & Installation of safety system including all required aspects not limited to fire detection system/firefighting system.

(o) Net metering & gross metering of the plant shall be part of contractor's scope including all required supply, liaising with DISCOM, respective authorities at Nalanda University & all other local authorities (if required).

(p) Co-ordination and approval from SECI, BERC, DISCOM and third part vetting as well.

(q) Transit insurance, transportation of BoS to site supplied by Bidder & storage at site.

(r) Contractor to arrest the overall voltage drop to maximum 2%.

Note: - Fasteners/ hardware such as Nut, Bolt, Washer etc. (Made of SS 304) required for installation shall be supply by the bidder.

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GENERAL SPECIFICATION

1. DEFINITION: -

A Grid connected ground mounted Solar Photo Voltaic (SPV) power plant consists of SPV array, Module Mounting Structure, Array Junction Boxes, Optimizer, PCU / String Inverter consisting of Maximum Power Point Tracker (MPPT), DC & AC cables, transformers, AC Distribution Board with MFM, LT panels, SCADA with all accessories for the remote monitoring, Switches and Controls & Protections with earthing and lightning protections along with CCTV based surveillance system. PV Array is mounted on a suitable structure.

Grid tied SPV system is without battery and should be designed with necessary features to supplement the grid power during day time. Components and parts used in the SPV power plants including the PV modules, metallic structures, cables, junction box, switches, PCU / String Inverter etc., should conform to the BIS or IEC or international specifications, wherever such specifications are available and applicable.

Solar PV system shall consist of following equipment/components.

- Solar PV modules consisting of required number of Crystalline PV modules.
- Mounting structures
- Grid interactive Power Conditioning Unit with Remote Monitoring System (SCADA).
- 0.4/11 KV Step up Transformers, ACBD & LT panels (2 MW capacity each).
- Junction Boxes.
- Earthing and lightning protections.
- IR/UV protected DC Cables, HT & LT AC Cables, cable tray, pipes and accessories.
- CCTV based surveillance system.

2. GENERAL REQUIREMENT: -

(a) The system shall be completed with PV modules, inverters/PCU, junction box, ACDB, DCDB, Cables, Earthing & Lightning protection, Transformer, LT panel, performance & weather Monitoring, Communication interface, CCTV Surveillance system & any other equipment(s) necessary for safe and efficient operation of grid connected ground based solar power plant.

(b) All the fittings & accessories that might not have been mentioned specifically in the specification but are necessary for the plant, shall be deemed to be included in the specification and shall be supplied & fixed without any extra cost.

(c) The equipment/items under BoS shall conform in all respects to high standards of engineering, design and workmanship and be capable of performing in commercial operation up to Bidder's guarantee in a manner acceptable to the BHEL, who will interpret the meaning of drawings, specification and shall have the power to reject any work or materials, which is his judgment are not in full accordance therewith.

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(d) Installation shall be done by licensed Engineer who has adequate experience with installation of the PV System. A checkout procedure should be developed to ensure an efficient and complete installation.

(e) Contractor shall be responsible to obtain all necessary statutory & other clearance in well advance from the competent authorities.

(f) Any kind of coordination, liaison, authority supervision / approval etc. & preparation of related documents etc. shall be in the scope of contractor. All kind of required approvals shall be taken by the contractor on behalf of client. No extra charges to be paid to contractor for these.

(g) All the necessary co-ordination with authorities at BHEL/Nalanda University regard installation, commissioning & testing shall be carried out by contractor on prior base.

(h) Power supply, Water Supply & One Internet Connection shall be provided to the contractor at one predefined point to the solar farm, from that point onwards, everything shall be in the scope of Solar Contractor. Power will be measured through a sub meter which shall be arranged by the contractor as per given specification in this document. Charges for the power & internet to be reimbursed to the BHEL, while provision for water meter to be kept in the system at present for water part of this.

(i) Considering the reliability of the grid, no electrical storage batteries shall be required as excess electricity generated by the solar panels which are not required by the equipment/ devices in the building premises shall be exported to grid.

(j) All Electrical High Side Equipment starting with Transformer of 415 V to 11 KV, its related earthing, UPS for 11 KV System, Safety Equipment for 11 S/S, 11 KV Panels etc. will be provided by client at desired location.

(k) This scope shall also include providing competent manpower for dealing with SLDC requirements to generate & provide adequate data to State Load Dispatch Centre on behalf of client as per requirement.

(l) All necessary support as on required shall be extended by the contractor for subsidy to the client for the project.

(m) Supplier shall follow the latest engineering practice to ensure long-term compatibility requirement and continuity of equipment supply and the safety of the operating staff.

3. SITE MOBILIZATION: -

A notice shall be given by the contractor to BHEL for the site mobilization. Contractor shall deploy adequate qualified manpower as per the contract requirement within 7 days from award of work. Details of manpower shall be forwarded to BHEL before the deployment (within 3 days from award of work). The contractor shall arrange at his own expense all erection & construction equipment, tools & tackles, plant and equipment required for execution of the

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work. Details of machinery, equipment, tools & tackle to be used, are also required to be forwarded BHEL.

Moreover, on site mobilization, contractor shall arrange following on first priority: -

(i) Unloading, safe storage and movement of supplied items received at site:

(a) Contractor shall organize all necessary resources such as labour, machinery and tools, cranes, hydra, forklifts, transportation trucks/ trolleys, lifting accessories etc. for unloading the BHEL supplied items from the transport vehicle reaching identified location at site and subsequent movement to storage yards/sheds.

(b) Similar arrangements shall also be made by contractor for movement of the stored items from storage yards/sheds to the exact construction locations within the project site.

(c) Contractor shall maintain proper registers/ files/ records of invoices, LRs, delivery challans, material receipt certificates etc. Also, proper records shall be maintained to keep track of material entry (for storage) and material issue (for construction).

(d) All such documents shall be suitably preserved for further handing over to BHEL.

(e) Safety of items shall be in contractor scope. Accordingly, contractor will make all requisite arrangements for safe storage and preservation of BHEL supplied material.

(f) All the equipment shall be handled very carefully to prevent any damage or loss. No untested wire ropes / slings etc. shall be used for unloading / handling. The equipment shall be properly protected to prevent damage either to the equipment or to the floor where they are stored. The equipment from the stores shall be moved to the actual location at the appropriate time so as to avoid damage of such equipment at site.

(g) The material received shall be properly inspected for any damage caused during transit and the Goods Receipt Document of the Transporter shall be acknowledged after verifying the condition of goods received. Any damage shall be immediately reported to BHEL. In cases when such information is not given to BHEL in time – it will be presumed that material was received in good condition by contractor and damage may have taken place at a later stage. Such damage or loss shall be attributable to the contractor.

(h) Contractor shall ensure that while lifting slings shall be put over the points indicated on the equipment or as indicated in the manufacturer's drawings. Slings / shackles of proper size shall be used for all lifting and rigging purposes. All care shall be taken to safe guard the equipment against any damage.

(i) Contractor shall be responsible for examining all the plant and materials issued to him and notify the Engineer immediately of any damage, shortage, discrepancy etc. before they are moved out of the stores / storage area. The contractor shall be solely responsible for any shortages or damages in transit, handling, storage and erection of the equipment once received by him.

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(j) The contractor shall maintain an accurate and exhaustive record-detailing out the list of all equipment received by him for the purpose of erection and keep such record open for the inspection of the engineer at any time.

(k) All the material in the custody of contractor and stored in the open or dusty locations must be covered with suitable weather proof covering material wherever applicable and shall be blocked up on raised level above ground.

(l) The contractor shall hand over all parts / materials supplied by BHEL and remaining extra over the normal requirement with proper identification tags and measurements to BHEL before site closure. Such intimation will be given in writing to BHEL well in time.

(m) It shall be the responsibility of the contractor to keep the work / storage areas in neat, tidy and working conditions. All surplus/unusable packing and other materials shall be removed and deposited at location(s) as identified within the project premises.

(n) All suitable lifting arrangement and local transport arrangement within premises for material handling at stores/yard/siding of BHEL/Customer/Contractor are included in scope.

(o) Quoted rates for various items shall include cost of unloading, safe storage & transporting to the place of erection & disposal of the packing material at a designed place given by customer. No extra payment shall be made for all these activities.

(ii) Preservation of components

(a) After taking delivery from BHEL / customer's stores, plant materials storage shall be subjected to the following protection besides other provisions indicated in these specifications elsewhere.

(b) Items stored outdoors shall be stacked up at least six inches (6") off the ground. Items should not be stored in a low lying area where water logging is a possibility.

(c) Electrical items shall be stored indoors or otherwise protected against getting wet/ damaged, using suitable measures and should be protected from direct rain.

(iii) Security & safekeeping of BHEL supplied material.

For all system capacities and in all situations – it is the prime responsibility of the contractor to ensure security and safekeeping of the BHEL supplied material till handing over of complete system in working condition to customer. The contractor will make their own assessment based on prevailing condition at site and will make all arrangements for security and safekeeping of BHEL supplied material. The contractor shall also indemnify BHEL towards any loss incurred towards loss of damage to BHEL supplied material.

In case of damage/theft of any item till the handing over of plant, the item shall be provided/replaced by the contractor free of cost. Any kind of theft shall be reported in proper manner & contractor will solely responsible for the all legal activities

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No extra payment will be made for arrangement & deployment of the required number of security personnel. Quoted rates for various items shall include the cost of safe storage at site, irrespective of whether the material is supplied by BHEL or contractor.

4. SUPPLY TO BE MADE BY BHEL: - (SCOPE OF SUPPLY only)

Following items shall be supplied by BHEL at site -.

S.No.	Item Description	Remarks
1.	PV MODULE	ONLY SUPPLY
2.	MODULE MOUNTING STRUCTURE	ONLY SUPPLY
3.	INVERTERS/PCU & OPTIMIZERS	ONLY SUPPLY
4.	DC Cable	ONLY SUPPLY
5	AC Cable Aluminium	ONLY SUPPLY

Contractor has to identify central area within the CUSTOMER/USER premises for unloading and storing of BHEL supplied items. Subsequent arrangement for unloading, safekeeping, shifting of the material to site for installation shall be part of services to be offered by the contractor associated with BHEL supplied items.

5. SERVICE TOWARDS INSTALLATION TO BE PROVIDED BY BHEL: -

S.No.	Item Description	Remarks
1.	LEVELLING, COMPACTING & GRADING WORK	IN OTHER AGENCY'S SCOPE
2.	FOUNDATION/PILING WORK OF PEDESTAL	IN OTHER AGENCY'S SCOPE
3.	INSTALLATION OF "LEG" OF MMS Note : **Assistance to be provided for final installation of MMS to avoid any mismatch during installation of other section of MMS like Rafter and Purlin which is in the scope of bidder**	(Only LEG)IN OTHER AGENCY'S SCOPE
4.	FENCING WORK	IN OTHER AGENCY'S SCOPE
5.	DRAINAGE WORK	IN OTHER AGENCY'S SCOPE
6.	CONSTRUCTION OF ROAD/PATHWAYS	IN OTHER AGENCY'S SCOPE
7.	SUPPLY & INSTALLATION OF LIGHTING POLES	IN OTHER AGENCY'S SCOPE
8.	INSTALLATION OF CLEANING SYSTEM	IN OTHER AGENCY'S SCOPE

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Notes: -

1. BHEL's scope includes only supply of PV modules, Inverters/Power Conditioning unit, Mounting Structure, Optimizer, DC and AC Cable. Civil work related to foundation of module mounting structure shall also be part of BHEL scope and done by other agency.
2. Any other item(s) except BHEL's scope, which is not explicitly identified or listed herein & to be required for the completion of work shall be part of contractor's scope. The same shall be supplied, installed & commissioned under this contract to ensure completion of the system and facilitate proper operation & easy maintenance. No extra cost for such item(s) shall be absorbed by BHEL.

6. CODE & STANDARD: -

All supplied items pertaining to contractor's scope shall comply relevant prevailing or latest Indian / international standard for the safety aspects & ensuring expected service life & weather resistance. Installation, commissioning & testing of plant shall be done in accordance with the guidelines issued by MNRE, SECI, BERC & other relevant Central/local Government Agency. During the installation, commissioning & testing of the plant, contractor shall be responsible for the comply of Indian Electricity Rules-1956.

7. ADDITIONAL SAFETY ARRANGEMENT FOR COMPLIANCE OF HSE/OHSAS REQUIREMENT

All necessary items required for compliance of safety norms as per SCC of this Tender document will be arranged and deployed by the contractor at the erection site.
All safety compliances as noted under SCC has to be mandatorily complied with. However, cost on this account is already built up within major heads of the BoQ.

8. REMOVAL OF TEMPORARY WORK & MATERIAL

Contractor shall remove all the temporary work carried out as per requirement in the execution of plant work including Debris, garbage etc., time to time during the progress of work. Extra quantity of materials used to carry out the execution of the plant shall be listed out by the contractor & to be examined by Engineer In-charge. Extra material shall be removed as per the instruction given to the contractor by Engineer In-charge.

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9. DRAWING & DOCUMENTATION: -

BHEL shall provide following approved drawings & documents to the contractor: -

S No	Category	DRG/DOC Title	Type
1	Structure Design	Module Mounting Structure	Drawing
2		Analysis & Design of Support structure	Document
3	Electrical	Module Layout	Drawing
4		Earthing Procedure	Document
5	Data Sheet	SPV Module Datasheet	Document
6		PCU/Inverter Datasheet	Document
7	Quality Plan	SPV Module MQP	Document
8		Field Quality Plan (FQP)	Document
9	Documents	PG Test Procedure	Document
10		Inspection Categorization Plan	Document

Contractor shall submit following drawings & documents to BHEL for approval: -

S No	Category	DRG/DOC Title	Type
1	Data Sheet	DC cables Datasheet	Document
2		AC Power cables(LT/HT) Datasheet	Document
3	Electrical	LT Panel GA	Drawing
4		Single line Diagram	Drawing
5		Lightning Protection System	Drawing
6		Main LT Panel GA with SLD	Drawing
7	Quality Plan	DC cable MQP	Document
8		AC Power Cable (LT/HT) MQP	Document
9	Documents	O&M Manual	Document

It is essential that the owner have complete documentation on the system. System documentation should include an owner's manual and copies of relevant drawings for whatever system maintenance might be required in the future.

10. INSPECTION & TESTING: -

Quality Assurance Plan (QAP) for each supplied item shall be submitted by contractor for prior approval to the BHEL. Inspection shall be carried out as per approved QAP. The contractor has to arrange complete visit & give a call for

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the Inspection & testing in prior (at least 7 days). The Company's/Engineer's Representative or duly authorized inspector shall be entitled to attend the said tests and/or inspection. All related cost for PDI to be bared by the contractor. If the Company's inspector fails to attend the test and or inspection at the time mutually agreed or if it is agreed between the parties that the Company's inspector shall not do so, then the Contractor may proceed with the test and/or inspection in the absence of the Company's inspector and provide the Company with a third party certified report of the results thereof.

Tests which required to be performed at site shall also be in the scope of contractor. Tests of materials, equipment, systems and workmanship shall include but are not limited to the tests referred to in and required by the Contract Specifications.

- The Supplier shall carryout all routine tests as specified in relevant standards on all major components in presence of the BHEL's representative (or third party nominated by NALANDA UNIVERSITY/BHEL for this purpose) at manufacturer's premises before dispatch of the material and furnish copies of test reports for BHEL's approval. If required, stage wise inspection will be carried out by the BHEL.
- Supplier shall carryout all routine and functional tests as specified in the relevant standards on the assemble SPV Plant with all accessories of the equipment in the presence of the BHEL's representative before dispatch and furnish copies of the test reports for approval before dispatch.
- Equipment shall not be dispatched unless the test certificates are duly approved by the BHEL.
- Two sets of copies of the complied and approved test certificates shall be submitted to the BHEL.

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TECHNICAL SPECIFICATION

1. Installation & commissioning of BHEL supplied items

1.1. PV Module: -

Bidder shall do the erection of the SPV module as per approved layout design of BHEL. Bidder shall implement the interconnection as per these drawings. Required number of nuts and bolts for the erection of Modules shall be supplied by bidders. These will be **made of SS 304 material - NUTS, BOLTS AND PLAIN WASHERS**.

Installation activity shall include placing on base, bolting, clamping with Structure material, Other fasteners like Clamp, brackets, M6 Screws shall also be supplied as required additionally.

Interconnection of SPV modules with Power Optimizer

Bidder shall interconnect the SPV modules to Optimizer as follows:

a) Each module is fitted with Optimizer integrally with a junction box having positive and negative polarity cables (4 Sqmm).

Bidder to check the module technical parameter along with Sr. No before final installation and fill the data in given format. Bidder shall mark the string and inverter number on both sides of the string.

1.2. Power Optimizer:

Bidder shall do the erection of the Power Optimizer as per approved Single Line Diagram and layout design of BHEL. Bidder shall implement the interconnection as per these drawings. Required number of nuts and bolts for the erection of Optimizer shall be supplied by bidders. These will be **made of SS 304 material - NUTS, BOLTS AND PLAIN WASHERS.**

2:1 or above Optimizers shall be used with 4 modules per optimizer for the optimization of solar power.

Installation activity shall include placing on base, bolting, clamping with Structure material, Ferrule Marking near String. Other fasteners like Clamp, brackets, M6 Screws shall also be supplied as required additionally

Series interconnection of Optimizer to form strings

Bidder shall interconnect Optimizer as follows:

a) Each Optimizer is fitted integrally with a junction box having positive and negative polarity cables (4 Sqmm).

b) Positive cable of one Optimizer shall be connected to the negative cable of adjacent Optimizer. **The cables have MC4 type of connectors to be supplied by contractor**. One polarity cable has male type connector, while the other has female type connector.

c) This way, Optimizer shall be connected in series. Each set of connections is called as a series string. Series formation may change as per approved layout and design.

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Interconnection of Optimizer strings to string inverters

a) Bidder shall connect each series string of Min 21 Nos Optimizers to the DCDB/string inverter using 1Cx 4 cable, copper, XLPO, unarmored as per TUV 2pfg 1169/08.2007.
b) MC4 connectors shall have rating of 1000VDC (IEC), rated current of 30A, Type approved by TUV Rhineland for product safety. **MC4 connector shall be supplied by Bidder.**
c) Min. Two sets of tool kits (with box enclosure) shall be supplied by bidder. This shall include crimping plier MC4, open end spanner set MC4, stripping plier MC4, socket wrench insert to tighten, socket wrench insert to secure etc.

Required number of MC-4 Connectors each set having a pair of male and female parts, to join both the cables along with ferrules shall be supplied by Bidder.
Bidder to check the Optimizer parameter along with Sr. No before final installation and fill the data in given format. Bidder shall mark the string and inverter number on both sides of the string.

1.3. Inverter & Accessories:

Design & drawing for mounting arrangement of PCU/inverter shall be submitted by the contractor for further approval.
Inverter shall be mounted on structures as per the approved drawing.
Minimum ground clearance shall be 500 mm.
Supply, fabrication & erection of structure (including civil work for the structure foundation) shall be the part of Contractor's scope.
Galvanized structure (minimum thickness of galvanizing 85 micron in accordance with IS: IS: 4759, IS: 2629, IS: 2633) shall be used. Fasteners such as Nut, Bolt, Plain Washer, Brackets etc. to be used should be made of SS304 material.
Canopy (if required) made of GI sheet of minimum 2mm thick shall also be provided by contractor to protect the inverters/PCU from weather
Earthing of inverter shall be done by 2.5/4 sqmm CU wire **green color.**

1.4. Erection of Module Mounting Structure:

Bidder shall do the installation of the Module Mounting structure as per approved layout design of BHEL provided along with the tender. Required number of nuts and bolts for the erection of Modules shall be supplied by bidder. Wherever, welding is carried out, bidder shall arrange for proper grinding and cleaning of the weld surfaces, followed by application of Metal primer and Metallic aluminum paint. Pre-Galvanized parts shall be sprayed with Zinc spray after work.
Required number of nuts and bolts for the installation of MMS shall be supplied by bidders.
Column structure of the MMS shall be embedded in concrete piles by the Civil Contractor. However, Bidder shall provide assistance during the installation of Column to maintain proper alignment and to avoid any mismatch during the installation of other MMS section which in scope of the Bidder.

Bidder may refer MMS drawing 24012100001 Rev 01 for module mounting details. Bidder to supply **SS 304 grade** Nuts, bolts & washers of M6, M10, M16 mentioned in the MMS drawing. Approximately, M6 = 1,62,000 nos, M10 = 60,000 nos and M1= 12,000 nos will be required .
If any other size is required to complete the installation work bidder shall provide the same without any extra cost to BHEL.

Note: ALL NUTS, BOLTS AND PLAIN & SPRING WASHERS shall be made of SS 304.

2. SUPPLY & INSTALLATION OF ACDB:-

2.1. Supply of ACDB

ACDB shall be supplied by contractor as per following specification: -

- AC Distribution Panel Board (DPB) shall control the AC power from PCU/ inverter, and should have necessary surge protection devices, MCB/MCCBs & AC circuit breaker with phase indication of R, Y, B. Interconnection from ACDB to mains at LT Bus bar while in grid tied mode.
- All switches and the circuit breakers, connectors should conform to IEC 60947, part I, II and III/ IS60947 part I, II and III.
- The changeover switches, cabling work should be undertaken by the bidder as part of the project.
- All the panels shall be metal clad, totally enclosed, rigid, structure mounted, air -insulated, cubical type suitable for operation on three phase, 415V, 50 Hz.
- The panels shall be designed for minimum expected ambient temperature of 45 degrees Celsius, 80 percent humidity and dusty weather.
- All panels will have protection of **IP65 or better**.
- It shall have AC disconnect switch and proper earthing arrangements
- It should conform to Indian Electricity Act and rules (till last amendment).
- All 415V AC devices / equipment like bus support insulators, circuit breakers, SPDs, VTs etc., mounted inside the switchgear shall be suitable for continuous operation and satisfactory performance under the following supply conditions: -

Variation in supply voltage	:	+/- 10%
Variation in supply frequency	:	+/- 3 Hz

2.2. Installation of ACDB/ACCB: -

- Design & drawing for mounting arrangement shall be submitted by the contractor for further approval.
- ACDB/ACCB shall be mounted on structures as per the approved drawing.

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- Minimum ground clearance shall be 500 mm.
- Supply, fabrication & erection of structure (including civil work for the structure foundation) shall be part of contractor's scope.
- Galvanized structure (minimum thickness of galvanizing 85 micron in accordance with IS: IS: 4759, IS: 2629, IS: 2633) shall be used. Fasteners such as Nut, Bolt, Plain Washer, Brackets etc. to be used should be made of **SS304** material.
- Canopy (if required) made of GI sheet of minimum 2mm thick shall also be provided by contractor to protect the ACDB/ACCB from weather.

3. DC CABLES:-

3.1. Supply of DC cable (BHEL's SCOPE)

Approximate 60000 Mtrs cable of 4 SQMM Single core multi strand copper conductor XLPO insulated & sheath DC cables shall be used for Solar Installation. DC Cable shall be supplied by BHEL as per following specification: -

- Temp. Range: -10 Degree C to +90 Degree C.
- Voltage Grade - 1.1 kV.
- Excellent resistance to heat, cold, water, oil, abrasion, UV radiation.
- Short Circuit temp: 250 degrees (for 5 sec).
- Flexible – Class 5 (as per IEC 60228).
- DC cable shall be single core multi strand Electrolytic Annealed Tinned Copper Conductor.
- The construction of DC Cable shall be in a two-layer construction with a low smoke halogen-free, flame retardant and sunlight resistant electron beam Cross-linked compound outer layer and halogen-free thermoset polyolefin inner layer. DC cables insulation & sheath shall also confirm:
  - Suitable for continuous operating temperature of 90°C wet or dry
  - Vertical Flame Performance: EN 60332-1 or equivalent
  - Excellent UV and Ozone resistant
  - Suitable for wet, damp and humid locations
  - Specially designed for excellent flexibility
  - Compatible with all major connectors
  - Cold bend and impact: -40°C
- 4 SQMM cable's outer layer/sheath shall be of "RED & BLACK Colour" (50%-50% of each colour of total quantity). Outer layer/sheath with partial "RED" colour is also accepted.
- Cable shall have marked "Manufacturer's Name, insulating material, conductor size, voltage class & standard on its surface at every 600 mm centers.

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3.2. DC CABLING: - (CONTRACTOR's SCOPE)

(I) Routing of DC cable below the SPV modules:

1Cx4 cables connecting the SPV module strings to DCDB/inverters shall be suitably routed below the SPV modules and along the horizontal purlin member of MMS structure. Also, the cables shall be fastened to the purlin using UV resistant ***cable ties that shall be in contractor scope of supply***. Spacing between two adjacent cable ties shall be so chosen as to ensure that there is no loose hanging of cables.

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. Width of the cable ties shall be minimum 4.5 mm. Length shall be so chosen as to ensure that the bunched cables are held firmly to the MMS structure. BHEL/CUSTOMER approval shall be obtained for the selected brand and sizes of cable tie.

(II) Routing of DC cable through Conduit pipe & GI cable trays

- UV-stabilized HDPE/uPVC conduit adequate diameter with a minimum wall thickness of 1.5mm, shall be used wherever required for covering DC cable.
- Where 1Cx4 cables run between two adjacent rows of structure and also where the cables run up to string inverters, routing shall be on GI cable trays, perforated type, with GI cover of minimum 2mm thick, coupler plates, GI hardware as per relevant IS standard. Suitable flexible PVC conduit shall be used wherever required for covering cable at entry into GI cable tray.
- ***Supply of all related accessories including conduit pipe, cable tray, tray cover, hardware,etc shall be under contractor's scope.***

(III) Termination & Ferruling of DC Cable

- 1Cx4 cables of positive and negative polarities originating from SPV module strings shall be terminated at the DC input side of string inverters using MC4 connectors that are in contractor scope of supply for both ends.
- For 1Cx4sqmm DC solar array cable, contractor shall provide UV resistant ferrules printed with source/destination identification of cable connection. Printing details shall be submitted for BHEL/CUSTOMER approval during detailed engineering. Printing shall be of appropriate size to ensure readability.
- Ferrules shall be provided on both the termination ends: module end, inverter end.
- ***Supply of ferrule shall be in contractor scope.*** Make shall be reputed brand. Approval for make/ type/ color/ dimension etc. shall be obtained from BHEL/CUSTOMER prior to procurement.

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4. AC Power CABLES: -

4.1. Supply of AC Power Cable (Inverter to ACDB)

All kind of AC cable shall be supplied by BHEL: -

LT AC CABLE (Inverter to ACDB): - Supply of 4 Core XLPE insulation & PVC sheath "ST-2", electrolytic class-2 copper conductor, un-armored cables to be used for transmission of between inverter to ACDB.

LT AC Cable shall be supplied as per following specification: -

- Temp. Range: -10 Degree C to +90 Degree C.
- Short Circuit temp: - 250 Degree.
- Voltage rating: 1.1 kV.
- Conductor: - electrolytic class-2 copper conductor.
- Insulation: - Cross Link Polyethylene.
- Inner & Outer Sheath: - PVC sheath "ST-2" type.
- Excellent resistance to heat, cold, water, oil, abrasion, UV radiation.
- Flexibility as per relevant standard.

4.2. **AC CABLING:** PVC or, XLPE insulated and PVC sheathed single or, multi-core multi-stranded un-armoured copper/ armoured aluminum cables of voltage grade 1.1 kV to 11 kV shall be used for transmitting the power. Laying & termination of cable shall be in contractor's scope. Evacuation of the solar energy shall be done on 11kV into main HT panel through 415 V/11 kV Step up transformer.

Laying of cables (to be done by Contractor): -

- **Through Cable Tray:** - GI cable trays of required size to be used for the laying of cables, perforated type, with GI cover of minimum 2mm thick, coupler plates, GI hardware as per relevant IS standard.
- **Through underground Trenches: -** Routing of AC HT & LT cable through underground trenches shall be done in accordance with IS:1225.
  Typical trench details/dimensions are below only for tender purpose. During detailed engineering, cable trench layouts and cross section drawings as per IS: 1255 shall be submitted for BHEL/CUSTOMER approval.
  i. Total trench depth = 750 mm minimum
  ii. Trench width = As per number of cables/ HDPE pipes
  iii. Trench shall have layers one over the other as below (from bottom to top):
    - Bottom layer shall be sand of IS: 383 with 75mm minimum thick.
    - Power cables shall be laid over the sand layer.
    - Another layer of sand of 75 mm minimum thick.
    - Single layer of brick as protective cover
    - Layer of sand of IS:383 with 75mm minimum thick

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- All communication cables shall be laid within HDPE pipe
- Layer of sand of IS:383 with 75mm minimum thick
- Single layer of brick as protective cover
- Trench shall, then, be filled with refill soil and compacted

Note: -

1. All termination accessories such as nickel plated brass double compression cable glands, cable lugs, SS304 bolts/ nuts/ plain and spring washers shall be in contractor scope of supply. Termination shall be carried out using appropriate tools and torque setting as per BHEL/CUSTOMER approval.
2. ***At pathway/road/drain/trench crossings, cables shall be routed through GI pipe of appropriate size that shall be in contractor scope of supply*** and technical details / brand etc. shall be submitted for BHEL/CUSTOMER approval. It shall be ensured that a maximum of 60% of inner space of GI pipe shall be occupied by cables.
3. Contractor shall take utmost care in laying the cables in order to prevent damages on outer sheath and inner insulation. In case cables found to be damaged/ cut after the laying in trenches, contractor shall remove the damaged portion and join the cut pieces using appropriate cable jointing kits that shall be in contractor scope of supply.

5. AC LT Power CABLES: -

5.1. Supply of AC LT Power Cable (ACDB to LT Panel) – BHEL's SCOPE

LT AC CABLE (ACDB to LT Panel): - Supply of 4 Core XLPE insulation & PVC sheath "ST-2", electrolytic class-2 Aluminum conductor, armored cables to be used for transmission of between ACDB to LT Panel.

LT AC Cable shall be supplied as per following specification: -

- Temp. Range: -10 Degree C to +90 Degree C.
- Short Circuit temp: - 250 Degree.
- Voltage rating: 1.1 kV.
- Conductor: - electrolytic class-2 aluminum conductor.
- Insulation: - Cross Link Polyethylene.
- Inner & Outer Sheath: - PVC sheath "ST-2" type.
- Excellent resistance to heat, cold, water, oil, abrasion, UV radiation.
- Flexibility as per relevant standard.

5.2. AC LT Power Cable laying as mentioned in clause 4.2 above.

6. AC LT Power Bus Duct

DESIGN, SUPPLY & INSTALLATION OF BUS TRUNKING SYSTEMS

LT panel & transformer shall be connected through bus duct trunking system. Contractor shall design & provide bus duct with all termination accessories including civil work as per following specification: -

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- Sandwich type bus trunking for use on 3 phase 4 wire as per IEC-60439-6.
- Power Rating : 2000 KW
- Voltage : 415 Volt
- Conductor : Aluminum/copper
- Current rating : 3200 Amp
- Short Circuit : 50 KA for 1 Sec, Peak short circuit withstand of 105 KA minimum
- Ambient Temperature : 45 degree

Contractor shall provide all related accessories like elbow, flange end, adopter box, copper flexible jumpers, canopy, supporting structure, etc.
Any civil work (if any) associated with the system shall be taken care by the contractor.
Related GA & layout drawings shall be submitted for approval.

7. AC HT (11 kV) 3 core power cabling from transformer to HT Panel
7.1. HT AC Cable supply

HT AC CABLE: - 3 Core XLPE insulation & PVC sheath "ST-2", class-2 Aluminum conductor, armored cables to be used for transmission of between HT side of transformer to the existing HT panel.

HT AC Cable shall be supplied as per following specification: -

- Temp. Range: -10 Degree C to +90 Degree C.
- Short Circuit temp: - 250 Degree.
- Voltage rating: -11 kV.
- Excellent resistance to heat, cold, water, oil, abrasion, UV radiation.
- Flexibility as per the relevant standard.
- Cables shall have XLPE insulation and PVC sheath ST-2, three-core class-2 Aluminum Conductor & armor.

Contractor's scope of work shall also have covered fixing/laying of the cables.

Note for Cable laying

All accessories for cable laying, including ***clamps, hooks, ties, double compression cable glands, cable lugs, SS304 bolts/ nuts/ plain and spring washers, anchoring arrangement shall be in contractor's scope of supply***. Cutting the wall/surface and making good the same as required is also included in the scope of the contractor. The Cable lengths supplied to site will NOT be in cut to size condition. Contractor has to arrange for cutting of the cables and jointing by using suitable cable jointing kits. All arrangement, tools & tackles in this regard will be in Contractor's scope.

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Generally, jointing of cables in the run between two ends is not allowed. Hence, utmost care has to be taken while cutting required length of cables. The joints, as required otherwise due to any particular reason - shall be made only after getting prior consent from BHEL.

Contractor will submit scheme for cable laying within 15 days of site mobilization. This scheme will include following details:

(A) Approximate length of various sizes of cables based on routing agreed with customer/user during joint assessment at site.

(B) Approximate requirement of laying through Conduits, Trays, Excavation etc.

(C) Contractor to purchase the quantity of conduits, trays etc. after getting written acceptance from BHEL.

IDENTIFICATION & MARKING OF CABLE

- Cable tags shall be provided at both ends of the cables: at SPV modules, string Inverters, data loggers, ACDB/ACCB, LT panels and so on.
- Cable tag shall be of rectangular shape.
- Cable tag shall be of 2mm thick aluminum with number punched (embossed) on it and securely attached to the cable by not less than two turns of 20 SWG GI wire conforming to IS:280.
- Reference shall be made to "Cable installation methodology" of this specification. Contractor shall submit the technical details of cable tags, ID numbering scheme for BHEL/ CUSTOMER approval during detailed engineering.
- Cable route markers and joint markers for underground cables shall be provided along the route of the cables as per section "Cable installation methodology" of this specification.

8. SUPPLY & INSTALLATION OF CONDUITS: -

Contractor shall supply along with all accessories for laying of cable through it and install medium class PVC conduit along with accessories in surface/recess including cutting the wall and making good the same in case of recessed conduit as required. Conduits pipes shall be lay as per the approved drawing/make list/ Instruction provided by BHEL/Customer.

HDPE pipe of PE63 grade, pressure rating PN6, appropriate nominal diameter and as per IS: 4984 (1995) shall be used. It shall be ensured that a max of 60% of inner space shall be occupied by the cables.

Method of measurement shall be as detailed against Sl. No. 6 above. The Scheme for laying of cable trays, conduits shall be submitted by contractor for approval of BHEL. After getting clearance from BHEL only – contractor shall make procurement of required quantity of cable trays, conduits etc.

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9. SUPPLY & INSTALLATION OF CABLE TRAY: -

Contractor shall supply along with all accessories for laying of cable through cable tray and install suitable size of Cable tray along with accessories in surface/recess including cutting the wall and making good the same in case of recessed tray as required. Cable Tray shall be lay as per the approved drawing/make list/ Instruction provided by BHEL/Customer. The Cable Tray shall be of GI material.

All couplers, fixing screws, 45/90-degree bends, intersections, dividers are included in scope.

For cable routing through exposed surfaces to rain – Cable Tray lid and Standoff brackets (for suitably raising the tray above surface for rain protection by minimum 50 mm) shall be used. Also, for important indoor locations Cable Tray lid shall be used for best aesthetic purpose.

The Scheme for laying of cable trays, conduits shall be submitted by contractor for approval of BHEL. After getting clearance from BHEL only – contractor shall make procurement of required quantity, particular size of cable trays.

Contractor has to supply and install cable tray with accessories. Cable Tray shall be laid as per instruction given by BHEL/Customer.

10. Supply and Installation of EARTHING STRIP: -

Vendor has to supply and install earthing strip (GI Strip) having size of 20x5 mm & earthing wire (copper, green – 2.5sqmm) for DC & AC earthing.

The Scheme for laying of Earthing strips shall be submitted by contractor for approval of BHEL. After getting clearance from BHEL only – contractor shall make procurement of earthing strip material in required quantity, particular size.

11. Supply of Earthing material and Installation after making suitable pit as per standard : -

Earthing is essential for the protection of the equipment & manpower. Two main grounds used equipments are:

- System earth: System earth is earth which is used to ground one leg of the circuit. For example, in AC circuits the Neutral is earthed while in DC supply +ve is earthed.
- Equipment earth: In case of equipment earthing all non-current carrying metal parts should be bonded together and connected to earth to prevent shock to the man power and also the protection of the equipment in case of any accidental contact.

To prevent the damage due to lightning the one terminal of the lightning protection arrangement is also earthed. The provision for lightning & surge protection of the SPV power source is required to be made.

In case the SPV Array cannot be installed close to the equipment to be powered and a separate earthing has to be provided for SPV System, it shall be ensured that all the earths are bonded together to prevent the development of potential difference between any two earths.

Earth resistance shall not be more than 1 ohm. It shall be ensured that all the earths are bonded together to make them at the same potential.

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The earthing conductor shall be rated for the maximum short circuit current & shall be 1.56 times the short circuit current. The area of cross – section shall not be less than 1.6 Sqmm in any case.
The array structure of the PV modules shall be grounded properly using adequate numbers of earthing pits. All metal casing / shielding of the plant shall be thoroughly grounded to ensure safety of the power plant.

SURGE PROTECTION DEVICE (SPD):
Internal surge protection shall consist of three MOV type arrestors connected from +ve and –ve terminals to earth (via Y arrangement) for higher withstand of the continuous PV-DC voltage during earth fault condition. SPD shall have safe disconnection and short circuit interruption arrangements through integrated DC in-built bypass fuse (parallel) which should get tripped during failure mode of MOV, extinguishing DC arc safely in order to protect the installation against fire hazards. Nominal discharge current (Imin) at 8/20 micro seconds shall be minimum 10 kA with maximum discharge current (Imax) at 8/20 micro seconds minimum 20 kA with visual indication (through mechanical flag) in modules to monitor the life of SPD.

Earthing for PV Array: -

(i) The photovoltaic modules and other components of power plant requires adequate earthing for protecting against any serious faults as guided by IEC 60364. The bidder needs to provide relevant certifications for the same.
(ii) The earthing system shall be provided according to the IS 3043 supported with design calculations.
(iii) Necessary provision shall be made for bolted isolating joints of each earthing pit for periodic checking of earth resistance.
(iv) Each string/ array and MMS of the plant shall be grounded properly. The array structures are to be connected to earth pits as per IS standards. Necessary provision shall be made for bolted isolating joints of each earthing pit for periodic checking of earth resistance.
(v) The complete earthing system shall be mechanically & electrically connected to provide independent return to earth.
(vi) For each earth pit, a necessary test point shall be provided.
(vii) In compliance to Rule 11 and 61 of Indian Electricity Rules, 1956 (as amended up to date), all non-current carrying metal parts shall be earthed with two separate and distinct earth continuity conductors to an efficient earth electrode.
(viii) Contractor shall submit the detailed specifications of the array earthing.

EARTHING MATERIAL: -
Solar array MMS structures, string inverters, data loggers, ACCB/ACDB boxes, LTPDB etc. shall be provided with appropriate earthing for protection against faults as guided by IEC 60364-4-41/60364-5-54 and IEC 61140.

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Earthing system shall be designed with consideration of the soil resistivity of the project site.

Chemical earthing electrodes of 3m minimum long, 50 mm minimum diameter, perforated GI pipe, chemical compound filled, double walled shall be installed at the ground level outside the buildings. For each electrode, earth chamber shall be constructed using brick masonry.

The Earth chamber(tentative) shall have features as follows:

- Square sized with 300mm x 300mm minimum inner opening. Exact size shall be chosen to ensure ease of maintenance operation using spanners etc.
- Brick wall thickness all around = 115 mm minimum.
- Depth of chamber = 500 mm minimum below FGL.
- Projection of chamber above FGL = 150mm minimum
- Top of electrode shall have minimum clearance of 100 mm below cover plate.
- Cover plate, cast iron of 5mm minimum thickness, square shaped to fit the opening of chamber, painted with red oxide and two coatings of black paint both sides.
- Cover plate shall have suitable lifting hooks and padlocking arrangement.
- Both the outer and inner walls of the brick wall shall be plastered and painted as per relevant clauses of "General civil works" of this specification.
- ***Supply and installation of all materials shall be in vendor scope***.

General points:

- All items related to earthing ve electrodes, GI flats, hardware etc. in vendor scope of supply.
- GI bolts, nuts, plain washers shall be used. Spring washers shall be zinc/epoxy coated.
- Wherever applicable, welding for GI flats shall be carried out using electric arc welding. Both the flats shall be overlapped for the full width where they are in perpendicular direction in same plane. Where the connection is along same line, both flats shall be overlapped for a minimum of 50mm. L-bend with weld length of 50mm minimum shall be adopted wherever overlap length to be ensured.
- Resistance of welded joint shall not be more than that of GI flat.
- Welds shall be treated with red oxide for rust protection and then coated with bitumen compound for corrosion protection.
- While laying earthing electrodes, adding/mixing of chemical compound and water around the electrode in the dug hole shall be as per instructions of OEM. Vendor shall ensure visit of OEM engineer to site at the time of installation for proper guidance/ supervision.

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12. INTREGATION OF POWER, PROTECTION & CONTROL: -

Plant shall be equipped with adequate level of protection to ensure all safety aspect & smooth operation. ***DCDB/Junction Box (if required) shall be provided by BHEL***. Contractor shall mount them on the structure. Commissioning & testing shall be contractor's scope.
On AC side, ACDB shall be equipped with required level of protection for overload and short circuit protection including SPD, MCCB etc. Disconnecting switches to isolate the DC and AC system for each inverter shall be maintained.

AC from inverters shall be fed into TTA LT panel. Three TTA LT panel (rating 2000 kW) shall be used for the integration of solar power. Solar power to be evacuated at 11 kV in to HT panel through 415 V/11 kV step up transformers.
A manual disconnect switch (manual isolators) beside automatic disconnection to grid would have to be provided at utility end to isolate the grid connection by the utility personal to carry out any maintenance. This switch shall be locked by the utility personal. Before the evacuation of power in to HT panel.

General Requirement: -

- Power Rating : 2000 KW
- Voltage : 415 Volt
- Incoming feeder & current rating : 21 Nos. (160 Amp for each)
- Outgoing feeder & current rating : 1no (3200 Amp – termination to be done through bus duct on LT side of transformer)
- Short Circuit : 50 KA for 1 Sec, Peak short circuit withstand of 105 KA minimum
- Ambient Temperature : 50 degree
- Ingress Protection : IP-65
- Communication Interfacing : Modbus protocol/ provision for SCADA

STANDARDS: As per schedule of Indian standard. The PCCs & MCCs shall comply with the latest edition of relevant Indian standards and Indian Electricity rules and regulations. The following Indian Standards shall be complied with:

TYPE OF M.V. SWITCH GEAR:

- All the PCC's / PDB's / MCC's shall be metal clad, totally enclosed, rigid, floor / wall mounted, air - insulation, cubical type suitable for operation on three phase / single phase, 415 / 230 volts, 50 Hz. neutral effectively / Non effectively grounded at transformer and short circuit level not less than 30 MVA at 415 volts.

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- The PCC's / MCC's shall be designed the withstand and heaviest condition at site, with minimum expected ambient temperature of 55 degree celsius, 90 percent humidity and dusty weather.
- Should confirm to Indian Electricity Act and rules. (as amended up to ate) & approval of FIA. of India.

STRUCTURE for LT panel :

- The PCCs, MCCs & PDBs shall be metal clad enclosed and be fabricated out of high quality CRCA sheet, suitable for indoor installation having dead front operated and floor mounting type.
- All CRCA sheet steel used in the construction of PCCs / MCCs / PDBs shall be 2 mm thick and shall be folded and braced as necessary to provided a rigid support for all components. Joints of any kind in sheet shall be seam welded, all welding slag grounded off and welding pits wiped smooth with plumber metal.
- The PCCs / MCCs / PDBs shall be totally enclosed, completely dust and vermin proof and degree of protection being not less than IP-51 to IS 2147. Gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust proof. All doors and covers shall be fully gasket with foam rubber and / or rubber strips and shall be lockable.
- All panels and covers shall be properly fitted and secured with the frame, and holes in the panel correctly positioned. Fixing screw shall enter into holes taped into an adequate thickness of metal or provided with bolts and nuts. Self-threading screws shall not be used in the construction of PCCs /MCCs / PDBs.
- ***A base channel of 75 mm x 75 mm x 5 mm thick shall be provided at the bottom.***
- PCCs / MCCs /PDBs shall arranged in multi-tier formation. The PCCs / MCCs / PDBs shall be of adequate size with a provision of 20 percent spare space to accommodate possible future additional switch gear. The size of the PCCs / MCCs / PDBs shall be designed in such a way that the internal space is sufficient for hot air movement, and the electrical component does not attain temperature more than 45 degree celsius. If necessary openings shall provided for natural ventilation, but the said openings shall be screened with fine weld mesh.
- Knockout holes of appropriate size and number shall be provided in the PCCs / MCCs/ PDBs in conformity with number, and size of incoming and outgoing conduits / cables.
- Alternatively the PCCs / MCCs / PDBs shall provided with removable sheet plates at top and bottom to drill holes for cable / conduit entry at site.
- The PCCs / MCCs / PDBs shall be designed to facilitate easy inspection, maintenance and repair.
- The PCCs / MCCs / PDBs shall be sufficiently rugged in design and shall support the equipment without distortion under normal and short circuit condition, they shall be suitable braced for short circuit duty.

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PAINTING:

All sheet steel work shall undergo a process of decreasing pickling in acid, cold rinsing, phosphating, pesivating and then sprayed with a high corrosion resistant primer. The primer shall be backed in an oven. The finishing treatment shall be by application. Three coats of synthetic enamel paint of approved colour shall be applied by spray and stoves in dust free atmosphere or the panel shall be powder coated.

CIRCUIT COMPARTMENT:

- Each circuit breaker and switch fuse units shall be housed in separate compartments and shall be enclosed an all sides. Sheet steel hinged lockable door shall be duly inter locked with the breaker /switch fuse units in ON and OFF position. Safety interlocks shall be from being drawn out when the breaker is in ON position.
- The door shall not form as integral part of the drawout position of the circuit breaker. All instruments and indicating lamp shall be mounted on the compartment door. Sheet steel barriers shall be provided between the tires in a vertical section.

INSTRUMENT COMPARTMENT:

Separate and adequate compartment shall provided for accommodating instruments, indicating lamp, control contactors, relays and control fuses etc. These components shall be accessible for testing and maintenance without any danger of accidental contact with live parts of the circuit breaker, switch fuse units, busbars and connections.

BUSBARS:

- The busbar shall be air insulated and made high quality, high conductivity, high strength copper and as per relevant IS code. The busbar shall of three phases and neutral system with separate neutral and earth bar. the busbar and interconnection between busbar and various components shall be of high conductivity, hard drawn, electrolytic copper. the busbar shall be of rectangular cross section designed to withstand full load current for phase busbar and full rated current for neutral busbar and shall be extensible type on either side. The busbar shall be rated for the frame size of the main incoming breaker but in any case not less than 200 amp capacity. The busbar shall have uniform cross section through out the length.
- The busbar and interconnection shall be insulated with heat shrinkable PVC sleeves and be colour coded in red, Yellow, Blue and Black to identify the three phases and neutral of the system. The busbar shall be supported on unbreakable, non hygroscopic DMC insulated supports at sufficientevely close interval to prevent busbar sag and shall effectively withstand electromagnetic stresses in the event of short circuit capacity of 50 KA RMS symmetrical for one second and a peak short circuit withstand of 105 KA minimum.
- The busbar shall be housed in a separate compartment. The busbar shall be isolated with 3 mm thick bakalite sheet to avoid any accidental contact. The

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busbar shall be arranged such that minimum clearance between the busbar are maintained as per below.

- Between phases : 27 mm min.
- Between phases and neutral : 25 mm min.
- Between phases and earth : 25 mm min.
- Between neutral and earth : 23 mm min.

- All busbar connection shall be done by drilling holes in busbars and connecting by chromium plated brass bolt and nuts. Additional cross section of busbar shall be provided in all PCCs / MCCs / PDBs to cover-up the holes drilled in the busbars. Spring and flat washers shall be used for tightening the bolts.
- All connection between busbar and circuit breaker / switches and between circuit breaker/switches and cable terminals shall be through solid copper strips of proper size to carry full rated current.These strips shall be insulated with insulating strips.

ELECTRICAL POWER & CONTROL WIRING CONNECTION

- Terminal for both incoming and outgoing cable shall be suitable for 1100 volts grade, aluminum/copper conductor PVC insulated and sheathed, armoured cable and shall be suitable for connections of solder less sockets for the cable size as indicated on the appended drawing for the PCCs, MCCs, PDBs.
- Both control and power wiring shall be brought out in cable alley for ease of external connections, operation and maintenance.
- Both control and power terminals shall properly be shrouded.
- 10% spare terminal shall be provided on each terminal block. Sufficient terminals shall be provided on each terminal block so that not more than one outgoing wire connected per terminal.
- Terminal strip for power and control shall preferably be separated from each other by suitable barriers of enclosures.
- Wiring inside the module for power, control protection and instrument etc. shall be done with use of 660/1100 confirming to IS 694 and IS 8130. Power wiring inside the starter module shall be rated for full current rating of contactor, but not less than 4 sq mm cross section area. For current transformer circuits, 2.5 sq mm copper conductor wire shall be used. Other control wiring shall be done with 2.5 sq mm copper conductor wires. Wires for connections to the door shall be flexible. All conductors shall be crimped with solder less sockets at the ends before connections are made to the terminals.
- Control power for the motor starter module shall be taken from the respective module switchgear outgoing from R phase and Neutral. Control wiring shall have control fuse (HRC type).
- Particular care shall be taken to ensure that the layout of wiring neat and orderly. Identification ferrules shall be filled to all the wire termination for ease of identification and to facilitate and testing. Suitable washers shall be used for all copper and aluminium connections.
- Final wiring diagram of the PCC, MCC, PDB power and control circuit with ferrules number shall be submitted along with the PCC/MCC/PDB as one of the documents.

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TERMINALS

The outgoing terminals and neural link shall be brought out to a cable alley suitably located and accessible from the panel front. The current transformer for instrument metering shall mounted on the disconnecting type terminal blocks. No direct connection of incoming and outgoing cables to internal components connection of the distribution board is permitted, only one conductor may be connected in one terminal.

WIREWAYS

A horizontal PVC wire way with screwed covers shall provided at the top to take interconnecting control wiring between different vertical sections.

CABLE COMPARTMENT

Cable compartment of adequate size shall be provided in the PCCs, MCCs, PDBS for easy termination of all incoming and outgoing cables entering from bottom or top. Adequate support shall be provided in the cable compartment shall be brought out to terminal blocks in the cable compartment.

EARTHING for LT Panel

- Copper earth busbar of 25 mm x 3 mm shall be provided in the PCCs, MCCs, PDBS for the entire length of panel. The frame work of the PCCs, MCCs, PDBs shall be connected to this earth busbar. Provisions shall be made for connection from earth busbar to the main earthing bar coming from the earth pit on both side of the PCCs, MCCs, PDBs.
- The earth continuity conductor of each incoming and outgoing feeder shall be connected to this earth bar. The armour shall be properly connected with earthing clamp and the clamp shall be ultimately bounded with the earth bar.

LABELS

- Engraved PVC labels shall be provided on all incoming and outgoing feeders. Single line circuit diagram showing the arrangements of circuit inside the distribution board shall be pasted on inside of the panel door and covered with transparent laminated plastic sheet.

NAME PLATE for LT panel

A name plate with panel designation in bold letter shall be fixed at top of the central in panel. A separate name plate giving feeder giving feeder details shall be provided for each feeder module door. Inside the feeder compartment, the electrical component, equipments, accessories like Switchgear, contactor, lamp, relays etc. shall suitably be identified by providing stickers. Engraved name plates shall preferably be of 3 ply, (red-white-red or black-white-black) lamicold sheet. However black engraved perplex sheet name plates shall also be applicable. Engraving shall be done with square groove cutters. Name plate shall be fastened by counter sunk screws and not by adhesives.

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DANGER NOTICE PLATE for LT panel

- The danger plate shall be affixed in a permanent manner on operating side of the panel.
- The danger notice plate shall indicate danger notice both in Hindi and English and with a sign of skull and bones.
- The danger notice plate in general shall meet to requirements of local inspecting authorities.
- Overall dimension of the danger notice plate shall be 200 mm wide and 150 mm high. The danger notice plate shall be made from minimum 1.6 mm thick mild steel sheet and after due pretreatment to the plate, the same shall be painted white with vitreous enamel paint on both front and rear surface of the plate.
- The letter, the figure, the conventional skull and bones shall etc. shall be positioned on the plate as per recommendations of IS : 2551-1982.
- The said letter, the figure and the sign of skull and bones be painted in single red colour as per IS : 5-1978.
- The danger plate shall have rounded corners. Locations of fixing holes for the plate shall be decided to suit design of the panel.
- The danger notice plate, if possible, be of ISI certification mark.

INTERNAL COMPONENTS

- The PCC / MCC / PDB shall be equipped complete with all type of required number of air circuit breakers, switch fuse unit, contactor, relays, fuses, meters, instruments, indicating lamps, push buttons, equipment, fittings, busbar, cable boxes, cable glands etc. and all the necessary internal connections/wiring as required and as indicated on relevant drawings. Components necessary for proper complete functioning of the PCC / MCC / PDB but not indicated on the drawings shall be supplied and installed on the PCC / MCC / PDB.
- All part of the PCC / MCC/ PDB carrying current including the components, connections, joints and instruments shall be capable of carrying their specified rated current continuously, without temperature rise exceeding the acceptable values of the relevant specifications at any part of the PCC / MCC / PDB.
- All units of the same rating and specifications shall be fully interchangeable.

INSPECTIONS

Each equipment should inspect and witness by client & consultant.

- The PCC / MCC / PDB shall be inspected and checked as per inspection manual of the PCC / MCC / PDB manufacturer.
- Various electrical components and accessories of the PCC / MCC / PDB shall be checked as per drawing for the respective PCC / MCC / PDB.
- The PCC / MCC / PDB shall be checked for rigid mounting, earthing connections, proper rating and size of components, internal wiring, etc. All

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mechanical fasteners and electrical connections shall be checked and tightened before installation.

- Type test certificates for all ACB for similar rating shall be submitted.

Test:

- Prior to dispatch of the PCC / MCC / PDB following tests shall be carried out.
- Mechanical endurance test shall have carried out by closing and opening of all the ACB's, MCB's switches etc.
- Over voltage and Insulation resistance test shall be carried out between phases and between phase to earth bus, keeping the isolating switch in ON position. Similar test shall be carried out keeping the isolating switch in closed position.
- All the interlocks, controls and tripping mechanism of the switch gears shall be tested for their proper functioning.

COMPONENTS:

GENERAL

- The type, size, and rating of the components shall be as indicated on the relevant drawings.
- While selection od the capacity of the components resulting from the prevailing conditions like room temperature shall be allowed for the Thermal and magnetic trip rating shall be compensated for the ambient temperature.
- The rating indicated on the drawings are rating anticipated at prevailing site condition.

(i) Air Circuit Breaker

The Circuit Breakers shall be 3/4 pole as specified, Microprocessor based with LCD display, air break drawout type having electrical closing arrangements as defined in the SLD.ACB shall be provided with built in over load, short circuit and earth fault protection. Circuit Breaker carriage shall be mounted on guides to ensure correct alignment. Isolating contacts shall be of the self-alignment type. Breakers shall have three distinct and separate operation positions. Circuit Breaker shall be provided with spring assisted operating mechanism. Circuitbreaker Shall be suitable for minimum fault level 50kA for 1 second (Ics = Icu =Icw= 50kA) & Making capacity 2.1 times breaking capacity.
The circuit breaker ratings shall be as follows:

- Rated Voltage : 415V ± 10%
- RMS symmetrical breaking : 50 KA (minimum) capacity at rated voltage.
- Rated short time current : Not less than 50KA for 1 sec.
- Rated operating duty (P2) : 0-3sec-CO-3min-CO.

The circuit breaker shall be provided with the following.

- 6 NO & 6 NC spare auxiliary contacts wired to terminal blocks.
- 24V DC Shunt Trip Coil for Breakers
- One mechanical position indicator.

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- indicating lamps to show 'ON-OFF', and Auto-Trip conditions.
- Mechanical emergency trip push button.
- Easily removable arc chutes for effective arc quenching.
- Mechanical trip button, integral with the breaker shall be provided at the front.
- Padlocking facility in 'OFF' position.
- Operating handle interlocked with the front cover for safety.
- All breakers to have thermal, magnetic and under voltage releases.
- Triple pole, ambient temperature compensated, adjustable, direct acting thermal release.
- Triple pole, direct acting, adjustable upto 12 times rated current short-circuit trips with time
- delay upto 0.3 seconds for discrimination obtained through rugged and non-aging mechanical means.
- The timing device shall be independent of power supply.
- Under voltage releases to have inherent delay to prevent tripping on transient voltage dips.

Following safety interlocks shall be provided on the circuit breakers:

- The operation of the circuit breaker shall not be possible unless it is in :
  i. Service Position
  ii. Withdrawn to test position.
  iii. Fully drawn-out.
  iv. Bus coupler interlocking with two incomers (when two incomers are on, bus coupler shall not be possibleto close in service position).

Further it shall not be possible to close the circuit breaker without completing the auxiliary
circuits between the fixed and moving portion. All interlocks shall be effective in Service Position.

- The withdrawal or racking in of the circuit breaker without completing the auxiliary circuit between the fixed and moving portion.
- The door of the circuit breaker portion, if any, shall open only if the circuit breaker is in the open position.
- Safety shutters operated automatically by the movement of the circuit breaker shall ensure that the live parts are fully shrouded when the circuit breaker is withdrawn.
- The circuit breaker carriage shall be earthed before the main contacts are plugged in.
- Potential free contact for on/off/trip status monitoring to be provided for completely compatible interface with centralized building automation.
- Auto self starting required after power failure.

(ii) Miniature Circuit Breaker

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Miniature circuit breakers shall be quick make and break and break type conform with British standard BS : 3871 (Part-I) 1965, IEC 898-1995 and IS :8828 (1996). The housing of MCBs shall be heat resistant and having a high impact strength. The fault current of MCBs shall not be less than 9000 amps, at 230 volts. The MCBs shall be flush mounted and shall be provided with trip free manual operating mechanism with mechanical "ON" and "OFF" indications.

The circuit breaker dollies shall be of trip free pattern to prevent closing the breaker on a
faculty current. Tightening torque at terminals shall be not less than 2.5 Nm. Power losses should not be more than as specified in IEC 898-1995.

The MCB contact shall be silver nickel and silver graphite alloy and tip coated with silver.
Proper arc chutes shall be provided to quench the arc immediately. MCB's shall be provided with magnetic fluid plunger relay 3 as for over current and short circuit protection. The over load or short circuit devices shall have a common trip bar in the case of DP and TPN miniature circuit breakers.

All the MCB's shall be tested and certified as per Indian Standard, prior to Installation. For protection of electric circuits with equipment that does not cause surge current (i.e. lighting and socket outlet circuits)'B' curve MCB to be used in which magnetic releases operates between 3 and 5 In.

For protection of electric circuits with equipment that cause surge current (i.e. inductive and motor circuits) 'C' curve MCB to be used in which magnetic releases operates between 5 and 10 In. For protection of electric circuits with equipment that cause surge current (i.e. transformer, heavy start motors circuits) 'D' curve MCB to be used in which magnetic releases operates between 10 and 15 In. Auto self starting required after power failure.

(iii) Fuse

Fuses shall be of high rupturing capacity (HRC) fuse links and shall be in accordance with IS :2000-1962 and having rupturing capacity of not less than 35 MVA at 415 Volts. The backup fuse rating for each motor / equipment. HRC fuses shall be of English Electric make or approved equal.

(iv) Moulded Case Circuit Breaker

Moulded case circuit breakers shall be conforming with IEC 60947-2 and IS 13947 -2. The MCCB shall be air break type and having quick make quick break with trip free operating mechanism. Housing of the MCCB shall be of heat resistant and flame-retardant insulating material. All the MCCB should be provided with adjustable thermal and magnetic release and with rotary handles.

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Operating handle of the MCCB shall be in front and clearly indicate ON / OFF / TRIP positions. The electrical contact of the circuit breaker shall be of high conducting non-deteriorating silver alloy contacts. Shall be equal to system short circuit level i.e. 50 kA/65 kA (Minimum) (Ics =Icu).(Ics) = Service Short circuit breaking capacity (Icu) =Rated ultimate short circuit breaking capacity. Icw as per manufacturer's design for higher ratings, if applicable, shall be 50 kA for 1 sec.

The MCCB shall be provided with thermal / magnetic type bi-metal over load release and
electro-magnetic short circuit protection device. All the releases shall operate on common trip busbar so that in case of operation of any one of the releases in any of the three phases, it will cut off all the three phases and thereby single phasing of the system is avoided.

The MCCB whenever called for in the appendix drawings shall be provided with an earth fault relay. The MCCB shall provide two sets of extra auxiliary contacts with connections for additional controls at future date. The electrical parameters of the MCCB shall be as per the descriptions given in the appended drawings.

(v) Contractors:

Shall meet with the requirements of IS : 2959 and BS : 775.

The contactors shall have minimum making and breaking capacity in accordance with utilization category AC 3 and shall be suitable for minimum class II intermittent duty.

If the contactor forms part of a distribution board then a separate enclosure is not required, but the installation of the contactor shall be such that it is not possible to make an accidental contact with live parts.

(vi) Meter :

Ameter : The Ameter should be digital type 96 x 96 mm size having facility to read current parameters.

Voltmeter : The Voltmeter should be digital type 96 x 96 mm size having facility to read voltage parameters.

KWH METER : Digital KWH meter 96 x 96 x 80 mm size Acc Class 1.0 suitable for true RMS reading having reverse LED. Optically isolated pulse output having pulse with 500 ms and pulse amplitude 12 volts. It should be with RS 485 port with open protocol.

(vii) LOAD MANAGER:

Load Manager (For Incoming Feeders) : The load manager should having facility to read voltage current harmonics power parameters. It should contain real

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time clock. The meter should be field programmable and to generate high / low profile for all power parameters with date & time, also able to store previous period integrated data. The meter should have RS 485 port with open protocol for networking purpose. All the programming should be pass word protected.

Load Manager (For other Feeders) : Load manager facility to measure A, V, PF, kW, kWH with RS 485 port with open protocol for networking. The meter should be totaly field programmable andhaving a password protection. Size should be 96 x 96 mm.

(viii) CURRENT TRANSFORMER:

Where ammeter are called for, CT's shall provided for current measuring. Each phase shall be provided with separate CT of class 1 accuracy and suitable VA burden for operation of associated metering and controls. Current transformer shall be in accordance with IS : 2705-19 64 as amended up to date.

(ix) PUSH BUTTON :

The push button unit shall comprise of the contact element, a fixing holder , and push button actuator. The push button shall be momentary contact type. The contacts shall be of silver alloy and rated at 10 Amps. continuous current rating. The actuator shall be of stranded type and colour as per its usage for ON, OFF and Trip.

(x) INDICATING LAMP :

Indicating Lamp shall be transformer operated low voltage rated and shall supplied complete with translucent covers to diffuse the lamp light. Colour shade for the indicating lamps shall be as below :

- ON indicating lamp : Red
- OFF indicating lamp : Green
- TRIP indicating lamp : Amber
- PHASE indicating lamp : Red, Yellow, Blue.

(xi) SPECIAL REQUIREMNTS:

- Bottom most feeder shall be minimum 300 mm above the bottom of panel base frame.
- Necessary floor stand to be provided whenever required along with the panels.

(xii) Testing & Co-ordination:

Testing and setting the relay set – point and co-ordination between relay on LT/HT fuses, breaker, setting shall be done by contractor. The down stream of the setting should be provided.

- The following drawings to be provided:-
  1. General arrangement and Fabrication details.
  2. Power wiring diagram of the panel.

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3. Control wiring diagram of panel.
4. C.T. ratios with connection.
5. Material list with make, catalogue nos and

- Testing and setting the relay set – point and co-ordination between relay on LT/HT fuses, breaker, setting shall be done by contractor.

Note: Panels shall also have equipped with Transient Voltage Surge Suppressor (TVSS) for protection against transient voltage surges. Digital Ammeter & Digital Voltmeter with their inbuilt selector switches and Digital Load manager which performs as a multifunction meter are provided on the front side of the cubicle. LTPDB is also provided with a Breaker Control Switch (TNC) for electrically operating the ACB. NO & NC contacts for ACB are provided to communicate the On, OFF and Trip status & control to/by SCADA.

Test and Test Reports

- All tests certificates shall be provided to the contractor.

Drawings

Following drawings shall be provided to the contractor:-

- General arrangement and dimensioned layout.
- Schematic Drawing showing the requirement of SV panel, power condition unit(s), junction Boxes. AC and DC Distribution Boards, meters etc.
- Power Flow Schematic.
- Earthing & Lightning arrestor Layout.
- Structural drawing along with foundation details.
- Itemized bill of material for complete SV plant covering all the components and associated accessories.
- Overall layout showing SV Plant in the allocated space of the campus.
- Detail architectural, Civil & Structural plan for the buildings to be constructed.
- Format for reports and charts for analysis various parameters.

13. RATING & NAME PLATE, DISPLAY BOARD & DANGER BOARD: -

Each main and auxiliary item of plant shall have permanently attached to it a rating name plate in a conspicuous position, This shall be of a non- corrodible material preferably chromium plated steel to stand the prevalent atmosphere condition as indicated. The inscription shall be engraved in black on the plate or as plate or as otherwise specified in section C/D.

- The size of the rating and name palate shall depend upon space availability but an inscription shall be approved by the Engineer. The plates shall be should be reasonably sized of clarity and clear inscription.
- In case of indoor equipment, the plate shall be of transparent plastic material with black lettering engraved on the back.

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- The name plates shall be screwed to the body of the equipment.

In addition to this, Vendor shall use danger boards, wherever required, to ensure safety of the persons during the work at site. For all other places where it is required to fix danger plates as per Good Engineering practice and as per Latest Electricity Act stipulations – the same shall be complied with.

14. FIRE FIGHTING SYSTEM: -

Firefighting system shall be part of contractor's scope. This includes supply & installation of following equipments: -

Fire Extinguisher: - The firefighting system for the proposed power plant for fire protection shall be consisting of:

a) Portable fire extinguishers
b) The installation of Fire Extinguishers should confirm to TAC regulations and BIS standards.

Vendor shall provide fire extinguishers as follows for fighting fire electrical wiring, live machinery fires and flammable liquid/ gas as per recommendation by relevant fire safety authority and as per relevant standards IS: 2171 and IS: 10658 marked. DCP type (ABC) 9Kg designed/tested IS 15683/ IS: 13849 with safety release valve, NRV and CE approved valve. Dry powder IS 14609 with standard accessories.

Each fire extinguisher shall be checked once in every two-year span.

Fire Buckets Set: - Fire buckets set in each section of solar farm shall be installed at provided location. Each set shall contain 3 nos. of bucket hanging on stand with canopy. Bucket shall confirm IS:2546-1974.

15. LIGHTNING & SURGE VOLTAGE PROTECTION: -

A lightning and overvoltage concept shall be designed according to IEC 62305 (all parts) and discussed with other relevant project members to guarantee that the system will not have a negative influence on other Installation at the Nalanda University.
Grounding and lightning protection system, including step and total voltage calculation, risk assessment according to IEC 62305-2

The Lightning Arrestor (LA) will be Early Streamer Emission (ESE) type. This lightning rod is made of stainless steel and epoxy resin. The specific function of this lightning rod is producing an upward stream of ionized particles pointed towards the clouds that will channel the electrical discharge produced at the time of lightning.

To properly ground the lightning surges, earthing is provided to each lightning arrestor by providing ***two earth pits (Copper plate earthing 600x600x3.15 mm) which are connected to lightning arrestor with suitable Cu size cable / Cu Strip (20x3 mm) in accordance with IS-3043.***

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The source of over voltage can be lightning or other atmospheric disturbances. Main aim of over voltage protection is to reduce the over voltage to a tolerable level before it reaches the PV or other sub-system components. The bidder needs to provide relevant certifications for the same.

Necessary concrete foundation for holding the lightning conductor in position to be made after giving due consideration to shadow on PV array, maximum wind speed and maintenance requirement at site in future.

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 required Standards 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.

If necessary, more numbers of lightning conductors may be provided.

Contractor shall submit the drawings and detailed specifications of the PV array lightning protection equipment.

16. CCTV Surveillance System: -

Contractor's scope includes design, supply, installation & commissioning, operating & maintaining a complete day night CCTV based surveillance system for the solar farm covering all keys areas for surveillance point of view, including IP rated cameras with required mounting arrangement, IP rated termination box, cable, hoods, centralized DVR system which shall be capable to have last 180 days 24x7 data storage of CCTV footage in it. Remote base operation facility shall be provided for the system.

Minimum resolution shall be 1MP 720p HD for dome & 2MP 1080p HD for Bullet cameras, IR based night vision cameras to be used for security purpose. Contractor has to provide complete solution by using fix + PTZ cameras as required to cover the total solar farm area. Sufficient capacity of NVR with minimum 30days back up to be provided with cloud-based backup with necessary licensing etc. All the misc. accessories like connecting wires, POE switches, IP66 junction boxes, pole / other mounting arrangements, etc. shall be provided as per requirement. Real-time screening via cloud /internet to be made available with access parameters to the client as required.

Minimum Requirement as Follows

1. 2 Nos of PTZ camera with structure (2MP)
2. 8 Nos of Bullet camera with structure (2MP)
3. NVR with Minimum 180 days
4. Accessories for installation of above.

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All the component of system shall be in with latest IEC Codes & relevant standards.

17. **Net Metering including supply & installation of net meter, gross meters, CT and other items and accessories**

This line item pertains to liaison part with DISCOM. Activity will start from co-ordination with customer and submission of application form to DISCOM for installation of bidirectional meter. Subsequently

a. arranging issue of net meter (either from local DISCOM or through approved supplier)
b. Calibration of meter through recognized lab of local DISCOM
c. Arranging Testing of new meter
d. Getting replacement order from DISCOM office after inspection of Old/existing energy Meter
e. Getting estimates done for issue of Solar Meter
f. Arranging order from DISCOM for installation of Bidirectional Meter.

Cost of Bidirectional Meter, Solar Meter, Government receipts for calibration etc. shall be borne by Bidder. In case, such items are to be arranged through the contractor – the cost of supply & installation has been covered elsewhere. Minor accessories required during installation of bidirectional meter shall be in the scope of the contractor. The contractor has to co-ordinate with the agency for installation of net meter at site and the contractor will provide required manpower assistance during installation of the Net Meter.

Bidder to note that Net meter practices varies from DISCOM to DISCOM. Bidder to ensure particular DISCOM guideline state/Area. All equipment like CTs, PTs, Meter Box, Meter(Net/RE) Cable including procurement, DISCOM testing and installation shall be done by Bidder Only.

18. **Security**: Round the clock security is required. Please also read "**Security & safekeeping"** clause as mentioned above

BHEL shall informed the start of security period.

19. **Unloading:** Bidder shall do the unloading and stacking of the BHEL supplied items however **PV Module unloading is not in bidder's scope.**

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Part 'B'
CIVIL & EARTH WORK

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1. Foundation for Inverter , ACDB, LT Panel Etc.

Contractor shall prepare earth for making foundation for installing inverter, ACDB, LT panel, lightning arrester & firefighting system. All building material such as cement, sand aggregate, galvanized steel (galvanizing thickness 85 micron), GI clamp, GI bracket, SS304 made nut, bolt & washer etc. shall be supplied by contractor.

For the foundation Cement Concrete 1:1.5:3 (1 cement, 1.5 coarse sand & 3 graded stone aggregate 20mm nominal size) to be used. These will be mixed to get a compressive strength of 20 N/mm2 (M20 Concrete Grade).
Cement shall be good ISI Portland cement of reputed make. Cement bags shall bear ISI certification mark and date of manufacture. The sand shall be of river sand, clean & free from organic impurities. C.C. (1:1.5:3) concrete shall be mixed well in watertight platform in proportion as specified All ingredients in required proportion shall be mixed, first dry & than required quantity of water shall be added. Mixing shall be turned over twice or thrice, so that surface of the coarse aggregate coated with cement & concrete shall be used within half an hour of mixing. Any quantity remaining unused after an hour of mixing will not be allowed to use. The casted pedestals shall be cured minimum for ten days after completion of work. It shall keep well-watered & shall be protected from direct heat of sunlight by means of wet gunny bags.
Cement shall be procured by Vendor conforming to BIS: 8112 and / or BIS: 1489 Specification latest edition or higher Grade. The cement shall be stored by the Vendor in such suitable covered and lockable stores, well protected from climate and atmospheric effects. The cement go-down shall be constructed by the Vendor as per the drawing in CPWD specifications at his own cost. The cement in bags shall be stored in go-downs in easy countable position. Cement bags shall be used on first in first out basis. Cement stored for beyond 90 days will be required to be tested at Vendors cost, before use in works.

Concrete shall consist of cement, sand & graded stone in required proportion. Coarse aggregate for all concrete shall be graded crushed hard granite, trap or basalt stone and shall conform to the requirements. All materials shall be carefully & accurately measured in measuring box. Cement shall either be weighed or used in full bags. The required quantity of water shall be added by measuring in water cans. Concrete shall be mixed by mixer machine. Before any concrete is placed in position, all loose pieces of Timber, Stones, saw dust etc. shall be removed from the work. No concrete mixed 30 minutes' prior of placing in form shall be accepted. Proper water cement ratio shall be observed.
Mechanical mixing method shall be adopted for mixing of concrete. The mechanical needle vibrator or other approved methods shall be adopted for compaction of the mix. The concrete consolidation shall be through & no honeycomb work (rough, pitted surface or voids in concrete) shall be allowed.

All the formwork shall be provided by the Vendor at his cost & shall be thoroughly wetted before the concrete is placed in position. Formwork shall be of approved quality. Where timber is used, the face in contact with concrete shall be plain & made smooth. All the joints in formwork shall be perfectly close to prevent the

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loss of cement slurry from concrete. After the form works are complete, the Vendor shall get it checked for strength, suitability & levels. For this advance intimation shall be given for inspection.

Sufficient number of framework/shuttering shall be maintained by the contractor at site to match the pace of the work required at site.

Bidder shall provide structure and Galvenium sheet for making canopy for the installation of ACDB, inverters and DCDBs

SAMPLE TESTING: - Sampling and testing of concrete shall be carried out by drawing random sample during various stages of inspection. Guiding standard shall be IS: 516. ***Cube Test on selected sample after 7 days curing & 28 days curing shall be conducted for compression strength.***

2. **Earth Work**

Excavation and Back Filling

Bidder has to above work for the installation of ACDB, LT Panel inverter and wherever is required.

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General Note for Bidder:

Following work also in scope of bidders: -

1. Testing:

Bidder shall organize all necessary tools/ measuring instruments required to operate the various electrical equipment at the time of commissioning: Digital megger 5KV with PI feature, Earth resistance tester, Phase sequence meter, Clamp meters etc., discharge rods, etc.

A. Pre-commissioning inspections / checks / tests on DC side

Bidder shall carry out following minimum pre-commissioning checks:

a. Verification of firmness of SPV module interconnections (MC4)
b. Verification of firmness of DC cable terminations at string inverters using torque wrench (for the specified torque values)
c. Verification of firmness of RS485 cable terminations
d. Verification of firmness of all earthing connections
e. Cable megger/ continuity check for all DC power cables
f. Measurement of open circuit voltage of individual strings
g. Measurement of earth resistance at individual earth pits of solar array: (a) as disconnected from earth mat grid and also, (b) as connected to earth mat grid
h. Submission of test reports to BHEL for acceptance.

B. Pre-commissioning inspections/checks/tests on AC side.

Basic checks

Tightness checks:

- Terminations of AC power cables at string inverters, data loggers, ACCB box, LTPDB panels.
- Terminations of Control/ Instrumentation/ Data/ Communication cables wherever applicable.
- Terminations of earthing at all electrical equipments/ panels.
- Terminations of earth chambers of bidder scope

C. Electrical continuity checks

Megger (1kV) checks for all 1.1kV grade cables
AC/DC supply checks at TBs of all electrical panels/ DBs.

D. Pre-commissioning electrical tests:

String inverters

- DC side open circuit voltage
- Bidder to provide technician support to service engineer of string inverters for all other pre-commissioning tests as per OEM checklist

E. Earth resistance measurements for all chambers of bidder scope

- With electrode connected to grid
- Without connecting electrode to grid

F. Performance Ratio and other Tests- Bidder has to clean PV modules timely to meet PR values as mentioned in attached NTPC scope of work.

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2. Tools & Tackle

After completion of installation & commissioning of the power plant, necessary tools & tackles are to be provided free of cost by the bidder for maintenance purpose. List of tools and tackles to be supplied by the bidder for approval of specifications and make from [NAME OF THE ORGANISATION]/ owner.

3. Safety Measure

The bidder shall take entire responsibility for electrical safety of the installation(s) including connectivity with the grid and follow all the safety rules & regulations applicable as per Electricity Act, 2003 and CEA guidelines etc.

4. Assistance During SCADA installation: -

Performance of plant shall be remotely monitored by installing SCADA. SCADA system shall be supplied & commissioned by another party/agency. However, contractor will provide relevant technical support to the representative at site deputed by supplier for SCADA, at the time commissioning of SCADA.

5. TRIAL RUN & COMPLETION OF EXECUTION OF WORK: -

On completion of execution work, plant shall be under trial run for the three days. On the successful completion of trial run, final inspection shall be carried out by BHEL/third party. After final inspection, contractor shall furnish a declaration letter for the completion of execution work with all evidential proof.

As the work progresses, the contractor shall continue to provide the required details and data for review by the Company's representative to assist in the expeditious inspection of the works when completed. The Company's Representative shall review promptly and revert within 14 days after receipt of such notice. If the works are found to be complete in all respect and carried out in accordance with the Contract, then the Company shall issue a Certificate of Completion and Acceptance work.

If some defects and/or deficiencies are noticed in the Works, the same shall be notified to the Contractor's in writing within 7 days after receipt of Contractor's notice. Such defects and/or deficiencies attributable to the Contractor's work and workmanship shall be rectified promptly by the Contractor at his own expenses for which no extension shall be granted. The Contractor shall thereafter repeat the procedure for giving notice as stated above. Should the Company fail to notify such defects and deficiencies to the Contractor within the said period, the Works shall be deemed to have been completed and accepted by the Company without comments.

6. TRAINING: -

The Successful bidder shall provide necessary training at factor for mutually agreed duration and number of persons to enable the BHEL to maintain the system.

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The bidder needs to submit the proposal completed in all aspects and clearly mentioning layout of the modules, actual requirement of the material in line with the price bid, work schedule/ PERT chart along with the implementation schedule etc. NALANDA UNIVERISTY may at its discretion ask for additional material or decrease the material requirements at the price quoted in the price bid.

7. **Pre- Construction:** The water, electricity and internet facilities to be maintained by the executing agency as others do at present at the site.

Post Construction: Main water source will be facilitated by the end User. The Executing agency has to ensure optimal use of the water to avoid loss. If there will be any unwanted challenged in getting electricity connection from SBPDCL in that case the User may provide the metered connection to run the site office of the executing agency. NIT Conditions Prevails.

8. **Material Quality Plan and inspection Call:** Bidder has to submit material quality plan (MQP) for items (Like AC/DC cables, LT/ACDBs panels etc.) supplied by bidder for approval by BHEL/Customer. Bidder shall raise Inspection call as per approved MQP. 7 days' prior intimation for inspection shall be provided by bidder.

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LIST OF ENCLOSURES:

Following enclosure makes the part of REG2021-20210253

a) SCC

b) GCC

c) FQP

d) MMS drawing

e) Annexure 1 – Deviation sheet

f) Annexure 2 - Make list

g) Annexure 3 – Bill of Quantity

h) Annexure 4 - Standard

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Annexure 1

DEVIATION SHEET

S.No.	Technical Deviation	Remarks

Note:- Technical Deviation(s) mentioned anywhere in the offer except "Deviation Sheet" shall not be accepted & will not be considered for the evaluation of offer.

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Annexure 2

LIST OF MAKE FOR THE MATERIAL

S. No.	Item Description	Make
1	Mounting Structure	Tata Steel/ Jindal Steel / TISCO / RINL / Asian OR any other PSU, GoI fulfilling the technical requirement and approved supplier for CPSU (Tranche-II) Phase-II Scheme being run by the SECI and recognised by the MNRE.
2	String Monitoring Boxes	Trinity Touch/Hensel/VNT/ Fairwood/ Spillsberg/ Eaton Salaris / Statcon /Machine Pulse OR any other PSU, GoI fulfilling the technical requirement and approved supplier for CPSU (Tranche-II) Phase-II Scheme being run by the SECI and recognised by the MNRE.
3	TTA LT Panels including switchgears	ABB / Schneider / Siemens / L&T OR any other PSU, GoI fulfilling the technical requirement and approved supplier for CPSU (Tranche-II) Phase-II Scheme being run by the SECI and recognised by the MNRE.
4	Control Relay	ABB/Siemens/Schneider/L&T OR any other PSU, GoI fulfilling the technical requirement and approved supplier for CPSU (Tranche-II) Phase-II Scheme being run by the SECI and recognised by the MNRE.
5	Meter	Secure / Schneider / L&T / HPL OR any other PSU, GoI fulfilling the technical requirement and approved supplier for CPSU (Tranche-II) Phase-II Scheme being run by the SECI and recognised by the MNRE.
6	CABLES	DC Cable: Polycab/KEI/Ravin/Lapp/ Apar / Havells AC Cable: Polycab/KEI/Ravin/Lapp/Havells / RR Kables
7	Lightning Arrester	Erico / LPI / Cape / OBO / DEHN
8	SPD	DEHN / Cape / OBO / Socomech
9	Connectors	MultiContact/ Amphenol/ Koyo/ Bizlink / Elcon / Stsubi
10	Earthing Material	JMV/ Protech Or other reputed make
11	IP based CCTV	Honeywell/Bosch / Sony OR any other PSU, GoI fulfilling the technical requirement and approved supplier for CPSU (Tranche-II) Phase-II Scheme being run by the SECI and recognised by the MNRE.
12	Fire Extinguisher	Safex/Ceasefire/Vintex/Unicare fire safety or any other reputed equivalent.

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Annexure 3

Bill of Quantity

Sl. No	Name of the Work	S/I/O	Unit	Qty
(A)	**Supply, installation, testing & commissioning:-**			
1	**Installation & commissioning of BHEL supplied items :**			
1(a)	PV Modules MC4 Connectors shall be supplied by Bidder & Min Two sets of Tool Kit shall be supplied by Bidder (Approx 1000 Sets)	I	Nos	19,120
1(b)	Optimizer (2:1)	I	Nos	9,560
1(c)	Inverter & Accessories (50kVA- 200kVA)	I	Nos	50
1(d)	Erection of Module Mounting Structure Required number of nuts & Bolts for the Installation of MMS shall be supplied by Bidder (SS304) a) M6- 162000 Nos b) M10 - 60000 Nos c) M16 -12000 Nos	I	Per Module	19,120
2	**ACDB supply & installation**			
2(a)	Supply of ACDB/ACCB (50kVA-200kVA)	S	Nos	50
2(b)	ACDB/ACCB (50kVA-200kVA)	I	Nos	50
3	**DC cabling**			
3(a)	DC cable Laying through conduit pipe/ cable tray as per requirement - 8x4 Sq mm DC	I	RMT	7,500
3(b)	Cable Ties that shall be in contractor scope of supply	S	AU	1
3(c)	Suplly of ferrule shall be in contactor scope	S	AU	1
4	**AC power Cabling (From Inverter to ACDB)**			
4(a)	Supply of PVC sheathed XLPE copper conductor unarmoured 4core power cable of 1.1 KV grade of following size			
4(a)	50 Sqmm	S	RMT	75
4(b)	Laying and fixing of PVC sheathed XLPE copper conductor unarmoured 4core power cable of 1.1 KV grade of following size (including supply of accessories such as lugs, gland).			
4(b)	Above 35 Sqmm to 95 Sqmm	I	RMT	75
5	**AC LT power Cabling (From ACDB to LT Panel)**			

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5(a)	Laying of PVC sheathed / XLPE, Armoured Aluminium conductor 4core power cable of 1.1 KV grade of following size direct in ground including excavation, sand cushioning, protective covering and refilling the trench etc as required			
	Above 95 Sqmm to 185 Sqmm	I	RMT	3,000
6	**AC LT power bus duct (From LT Panel to Transformer)**			
6(a)	Busduct - 3200A	S	RMT	12
6(b)	Busduct - 3200A	I	RMT	12
7	**AC - HT (11kV) 3Core power cabling from Transformer to HT Panel**			
7(a)	Supply of PVC insulated and PVC sheathed / XLPE, 3 core Armoured Aluminium conductor power cable of 11 kV grade of following size			
	95 Sqmm	S	RMT	900
7(b)	Laying of PVC insulated and PVC sheathed / XLPE, Armoured power cable of 11 KV grade of following size direct in ground including excavation, sand cushioning, protective covering and refilling the trench etc as required			
	Above 35 Sqmm to 95 Sqmm	I	RMT	900
7(c)	Clamps, hooks, ties, double compression cable glands, cable lugs , SS304 bolts/nuts/ plain and spring washers, anchoring arrangement shall be in contractor scope of supply	S	AU	1
8	**Supply & Installation of Conduits along with all accessories for cable laying**			
	Supplying and fixing of following sizes of medium class HDPE/uPVC conduit along with accessories in surface/recess including cutting the wall and making good the same in case of recessed conduit as required.			
8(a)	50 mm	S&I	RMT	3,000
9	**Supply & Installation of cable tray**			
9(a)	upto 35sqmm	S&I	RMT	700
9(b)	above 35sqmm upto 95sqmm	S&I	RMT	700
9(c)	above 95sqmm	S&I	RMT	600
10	**Supply and installation of Earthing Strip**			
10(a)	25x5 mm GI Strip	S&I	RMT	1,500
10(b)	Earthing Wire (Green 2.5 Sqmm)	S&I	RMT	2,000
11	**Supply of Earthing Material and Installation after making of Suitable pit as per standard.**			

11(a)	For chemical Earthing/ Conductor Earthing (Pipe) (as per Approved Documents)	S&I	No.	70
12	**Integration of Power**			
12(a)	Supply of LT Panel having rating of (415 volt, 3200 Amp, 2000kVA)	S	No	3
12(b)	Installation & commissioning of LT panel having rating of (415 volt, 3200 Amp, 2000kVA) including termination of incoming & outgoing cables/busduct	I	No.	3
13	**Supply & Installation of :-**			
13(a)	Rating/Name Plate	S&I	No.	14
13(b)	Display board	S&I	No.	2
13(c)	Danger Board	S&I	No.	60
14	**Fire fighting System**			
14(a)	Portable Fire extinguisher	S&I	Set	10
14(b)	Fire Bucket set	S&I	Set	6
15	**Lightning Protection**			
15(a)	Lightning Arrestor - ESE type	S&I	Nos	6
15(b)	Event Counter	S&I	Nos	6
15(c)	Mast (10 meter long)	S&I	Nos	6
15(d)	Earthing strip (Cu 20 X 3)	S&I	RMT	80
15(e)	Earthing pit (Cu plate type 600 X 600 X 3.15)	S&I	Set	12
16	**Supply & installation of Surveillance System**			
16(a)	CCTV based including mounting accessories, cables, storage devices, etc as per technical specification 1. 2 Nos of PTZ camera with structure (2MP) 2. 8 Nos of Bullet camera with structure (2MP) 3. NVR with Minimum 180 days 4. Accessories for installation of above.	S&I	Set	1
17	**Net Metering including supply & installation of Net meters, gross meters, CT, and other items & accessories alongwith liaisoning with all related local / Govt authorities.**	**S&I**	**Set**	1
18	**Securty Round the clock**	**O**	**Months**	6
19	**Unloading (BHEL Supplied Items)**	**O**	**Lump sum**	1
(B)	**Civil Works:-**			
1	Foundation for inverter, ACDB, LT panel, etc.			
1(a)	PCC 1:1.5:3	S&I	Cum	30
1(b)	Structure for Mounting GI	S	Kg	5,000

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1 (c)	Galvalume sheet for Canopy	S	SQM	240
2	**Earth Work:-**			
2(a)	Excavation of earth	I	Cum	30
2(b)	Back filling of earth	I	Cum	30

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Annexure 4

QUALITY CERTIFICATION, STANDARDS AND TESTING FOR GRID-CONNECTED SOLAR PV SYSTEMS/POWER PLANTS

Quality certification and standards for grid-connected solar PV systems are essential for the successful mass-scale implementation of this technology. It is also imperative to put in place an efficient and rigorous monitoring mechanism, adherence to these standards. Hence, all components of grid-connected solar PV system/ plant must conform to the relevant standards and certifications given below:

Solar PV Modules/Panels

IEC 61215/ IS 14286	Design Qualification and Type Approval for Crystalline Silicon Terrestrial Photovoltaic (PV) Modules
IEC 61701	Salt Mist Corrosion Testing of Photovoltaic (PV) Modules
IEC 61853- Part 1/ IS 16170: Part 1	Photovoltaic (PV) module performance testing and energy rating –: Irradiance and temperature performance measurements, and power rating
IEC 62716	Photovoltaic (PV) Modules – Ammonia (NH3) Corrosion Testing (As per the site condition like dairies, toilets)
IEC 61730-1,2	Photovoltaic (PV) Module Safety Qualification – Part 1: Requirements for Construction, Part 2: Requirements for Testing

Solar PV Inverters

IEC 62109-1, IEC 62109-2	Safety of power converters for use in photovoltaic power systems – Part 1: General requirements, and Safety of power converters for use in photovoltaic power systems Part 2: Particular requirements for inverters. Safety compliance (Protection degree IP 65 for outdoor mounting, IP 54 for indoor mounting)
IEC/IS 61683 (as applicable)	Photovoltaic Systems – Power conditioners: Procedure for Measuring Efficiency (10%, 25%, 50%, 75% & 90-100% Loading Conditions)
IEC 62116/ UL 1741/ IEEE 1547 (as applicable)	Utility-interconnected Photovoltaic Inverters - Test Procedure of Islanding Prevention Measures

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IEC 60255-27	Measuring relays and protection equipment – Part 27: Product safety requirements
IEC 60068-2 / IEC 62093 (as applicable)	Environmental Testing of PV System – Power Conditioners and Inverters

Fuses

IS/IEC 60947 (Part 1, 2 & 3), EN 50521	General safety requirements for connectors, switches, circuit breakers (AC/DC): a) Low-voltage Switchgear and Control-gear, Part 1: General rules b) Low-Voltage Switchgear and Control-gear, Part 2: Circuit Breakers c) Low-voltage switchgear and Control-gear, Part 3: Switches, disconnections, switch-disconnections and fuse-combination units d) EN 50521: Connectors for photovoltaic systems – Safety requirements and tests
IEC 60269-6	Low-voltage fuses - Part 6: Supplementary requirements for fuse-links for the protection of solar photovoltaic energy systems

Surge Arrestors

BFC 17-102:2011	Lightening Protection Standard
IEC 60364-5-53/IS 15086-5 (SPD)	Electrical installations of buildings - Part 5-53: Selection and erection of electrical equipment - Isolation, switching and control
IEC 61643- 11:2011	Low-voltage surge protective devices - Part 11: Surge protective devices connected to low-voltage power systems - Requirements and test methods

Earthing /Lightning

IS3034/IEC 62561	IEC 62561-1 Lightning protection system components (LPSC) - Part 1: Requirements for connection components IEC 62561-2 Lightning protection system components (LPSC) - Part 2: Requirements for conductors and earth electrodes IEC 62561-7 Lightning protection system components (LPSC) - Part 7: Requirements for earthing enhancing compounds

Junction Boxes

IEC 60529	Junction boxes and solar panel terminal boxes shall be of the

	thermo-plastic type with IP 65 protection for outdoor use, and IP 54 protection for indoor use

Energy Meter

IS 16444 or as specified by DISCOMs	A.C. Static direct connected watt-hour Smart Meter Class 1 and 2 — Specification (with Import & Export/Net energy measurements)

Solar PV Roof Mounting Structure

IS 2062/IS 4759	Material for the structure mounting

• IS : 4237	General requirements for switch gear and control gear for voltage not exceeding 4100V.
• IS : 375	Switchgear bus-bars, main connection and auxiliary wiring, marking and arrangement.
• IS : 2147	Degree of protection provided by enclosures for low voltage switch gear and control gear.
• IS : 8197	Terminal marking for electrical measuring instrument and their accessories.
• IS : 2557	Danger notice plates
• IS : 2516	Specification for AC circuit breaker
• IS : 1818	Specification for AC isolator and earthing switch.
• IS : 3072	Code of practice for installation and maintenance of switchgear.
• IS : 8623	Specification for factory built as symbolize of switch gear and control gear for voltage up to and including 4100V. A.C.& 1200V. D.C.
• IS : 8828	Miniature Circuit Breaker
• IS : 4064	Fuse switch and switch fuse unit.
• IS : 9224	HRC fuse unit.
• IS : 2705	Current transformer
• IS : 3155	Voltage transformer
• IS : 3231	Electrical relay for protection
• IS : 1248	Indicating instrument
• IS : 722	Integrating instrument
• IS : 6875	Control switches & push buttons
• IS : 2959	Auxiliary contactor.
• IS : 1822	AC motor starters of voltage not exceeding 4100V
• IS : 13947	Switch Board General Requirement

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• IS:7098 (Part-1)	for XLPE Cables.
• IS:8130 (Part-1)	for Conductor.
• IS: 5831 (Part-1)	for Sheath.
• IS:7098 (Part-2)/ IEC: 60502 (Part-2)	for Inner & Outer Sheath.
• IS: 3975 /7098 / IEC: 60502 (Part-2)	for armour.
• IS: 7098 /10810 / IEC: 60502 (Part-2)	for Electrical & Mechanical Testing.
• IS: 10418	for packaging.

DC Cable

EN:50618
IEC: 60228
TUV 2Pfg 1169/08.2007 PV1 F
EN: 50268-2 / IEC: 61034-2
IEC: 60332-1-2
IEC: 60754-1

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